SECTION 234100 - PARTICULATE AIR FILTRATION

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

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. Metal panel filters.
2. Flat panel filters.
3. Pleated panel filters.
4. Ring panel filters.
5. Nonsupported bag filters.
6. Supported bag filters.
7. Rigid cell box filters.
8. V-bank cell filters.
9. Self-supported pocket filters.
10. Automatic roll filters.
11. Bulk media.
12. Front- and rear-access filter frames.
13. Side-service housings.
14. Filter gages.

1.3 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
2. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
3. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products 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."

C. Shop Drawings: For air filters. Include plans, elevations, sections, details, and attachments to other work.

1. Show filter rack assembly, dimensions, materials, and methods of assembly of components.
2. Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.
3. Include diagram for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide [**one**] <**Insert number**> complete set(s) of filters for each filter bank. If system includes prefilters, provide only prefilters.
2. Provide [**one**] <**Insert number**> container(s) of red oil for inclined manometer filter gage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance:

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

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

B. Comply with NFPA 90A and NFPA 90B.

C. 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.

2.2 METAL PANEL FILTERS

A. Description: Factory-fabricated, self-supported, cleanable, all-metal, impingement-type, panel-type, permanent air filters with holding frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Media: [**Four**] [**Six**] alternate layers of [**galvanized-steel**] [**aluminum**] [**stainless-steel**] flat and herringbone-crimp screen.

1. Nonoiled for grease removal application.
2. Adhesive coating.

a. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
b. Adhesive: As recommended by air-filter manufacturer and that complies 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."

C. Filter-Media Frame: [**Galvanized steel**] [**Hot-dip galvanized steel**] [**Aluminum**] [**Stainless steel**], hinged, and with pull and retaining handles fastened to the media.

1. Drain holes.

D. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. Holding Frame Size: <**Insert inches (mm)**>.
6. Number of Filters: <**Insert number**>.
7. System Airflow: <**Insert cfm (L/s)**>.
8. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
9. Efficiency: 90 percent on particles 20 micrometers and larger at 500 fpm (2.5 m/s).
10. Arrestance: <**Insert percentage**>.
11. Initial Resistance: <**Insert inches wg (Pa)**>.
12. Recommended Final Resistance: <**Insert inches wg (Pa)**>.

2.3 FLAT PANEL FILTERS

A. Description: Factory-fabricated, self-supported, flat, nonpleated, panel-type, disposable air filters with holding frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: [**Interlaced glass or synthetic fibers**] [**Cotton and synthetic fibers**] coated with nonflammable adhesive.

1. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
2. Adhesive: As recommended by air-filter manufacturer and that complies 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."
3. Media shall be coated with an antimicrobial agent.
4. Metal Retainer: Upstream side and downstream side.

D. Filter-Media Frame: [**Cardboard with perforated metal retainer**] [**Galvanized steel with metal grid on outlet side and steel rod grid on inlet side, hinged, with pull and retaining handles**] sealed or bonded to the media.

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Depth: <**Insert inches (mm)**>.
4. System Airflow: <**Insert cfm (L/s)**>.
5. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
6. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
7. MERV Rating: [**6**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.4 PLEATED PANEL FILTERS

A. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: [**Interlaced glass or synthetic fibers**] [**Cotton and synthetic fibers**] coated with nonflammable adhesive.

1. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
2. Adhesive: As recommended by air-filter manufacturer and that complies 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."
3. Media shall be coated with an antimicrobial agent.
4. Separators shall be bonded to the media to maintain pleat configuration.
5. Welded-wire grid shall be on downstream side to maintain pleat.
6. Media shall be bonded to frame to prevent air bypass.
7. Support members on upstream and downstream sides to maintain pleat spacing.

D. Filter-Media Frame: [**Cardboard frame with perforated metal retainer**] [**Galvanized steel**] [**Aluminized steel**] [**with metal grid on outlet side and steel rod grid on inlet side, hinged, with pull and retaining handles**] sealed or bonded to the media.

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: [**1 inch (25 mm)**] [**2 inches (50 mm)**] [**4 inches (100 mm)**].
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. Holding Frame Size: <**Insert inches (mm)**>.
6. Number of Filters: <**Insert number**>.
7. System Airflow: <**Insert cfm (L/s)**>.
8. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
9. Efficiency: 90 percent on particles 20 micrometers and larger at 500 fpm (2.5 m/s).
10. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
11. Initial Resistance: [**0.25-inch wg (62 Pa)**] [**0.35-inch wg (87.2 Pa)**] [**0.45-inch wg (112 Pa)**] [**0.60-inch wg (150 Pa)**] <**Insert value**> at [**350 fpm (1.8 m/s)**] [**500 fpm (2.5 m/s)**].
12. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
13. MERV Rating: [**7**] [**11**] [**13**] [**14**] <**Insert number**> when tested according to ASHRAE 52.2.

2.5 RING PANEL FILTERS

A. Description: Internally supported, flat panel filters for installation in a filter track.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: [**Two**] [**Three**] [**Four**]-ply polyester with sealed edges.

1. Panel Construction: [**Single**] [**with one edge unsealed for support removal**] [**Linked**].
2. Media shall be coated with an antimicrobial agent.

D. Internal Support: 9-gage steel-wire frame.

E. Capacities and Characteristics:

1. Face Dimensions: <**Insert inches (mm)**>.
2. Thickness or Depth: [**1-1/2 inches (38 mm)**] [**1-3/4 inches (44 mm)**] [**2 inches (50 mm)**] <**Insert value**>.
3. Surface Area: <**Insert sq. ft. (sq. m)**>.
4. Holding Frame Size: <**Insert inches (mm)**>.
5. Number of Filters: <**Insert number**>.
6. System Airflow: <**Insert cfm (L/s)**>.
7. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
8. Efficiency: 90 percent on particles 20 micrometers and larger at 500 fpm (2.5 m/s).
9. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
10. Initial Resistance: <**Insert inches wg (Pa)**>.
11. Recommended Final Resistance: <**Insert inches wg (Pa)**>.

2.6 NONSUPPORTED BAG FILTERS

A. Description: Factory-fabricated, dry, extended-surface, nonsupported filters with header frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: [**Glass-fiber**] [**Synthetic**] material constructed so individual pockets are maintained in tapered form under rated-airflow conditions by flexible internal supports.

1. Media shall be coated with an antimicrobial agent.

D. Filter-Media Frame: [**Galvanized steel**] [**Hard polyurethane foam**].

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. Holding Frame Size: <**Insert inches (mm)**>.
6. Number of Filters: <**Insert number**>.
7. System Airflow: <**Insert cfm (L/s)**>.
8. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
9. Efficiency: 90 percent on particles 20 micrometers and larger at 500 fpm (2.5 m/s).
10. Initial Resistance: <**Insert inches wg (Pa)**>.
11. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
12. MERV Rating: [**8**] [**10**] [**12**] [**15**] <**Insert number**> when tested according to ASHRAE 52.2.

2.7 SUPPORTED BAG FILTERS

A. Description: Factory-fabricated, dry, extended-surface, self-supported filters with holding frames in steel, basket-type retainers.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.

1. Media shall be coated with an antimicrobial agent.

D. Filter-Media Frame: [**Galvanized steel**] [**Hard polyurethane foam**].

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. System Airflow: <**Insert cfm (L/s)**>.
6. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
7. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
8. Initial Resistance: <**Insert inches wg (Pa)**>.
9. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
10. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.8 RIGID CELL BOX FILTERS

A. Description: Factory-fabricated, [**adhesive-coated,**]disposable, packaged air filters with media perpendicular to airflow, and with holding frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.

1. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
2. Adhesive: As recommended by air-filter manufacturer and that complies 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."
3. Media shall be coated with an antimicrobial agent.

D. Filter-Media Frames: [**Galvanized steel**] [**Hard polyurethane foam**].

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. System Airflow: <**Insert cfm (L/s)**>.
6. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
7. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
8. Initial Resistance: <**Insert inches wg (Pa)**>.
9. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
10. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.9 V-BANK CELL FILTERS

A. Description: Factory-fabricated, [**adhesive-coated,**]disposable, packaged air filters with media angled to airflow, and with holding frames.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.

1. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
2. Adhesive: As recommended by air-filter manufacturer and that complies 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."
3. Media shall be coated with an antimicrobial agent.

D. Filter-Media Frames: [**Galvanized steel**] [**Hard polyurethane foam**].

E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

F. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. System Airflow: <**Insert cfm (L/s)**>.

6. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
7. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
8. Initial Resistance: <**Insert inches wg (Pa)**>.
9. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
10. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.10 SELF-SUPPORTED POCKET FILTERS

A. Description: Factory-fabricated, panel-type, disposable air filters with contoured media for extended surface.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.

1. Media shall be coated with an antimicrobial agent.

D. Configuration: [**Single-pocket cube**] [**Multipocket**].

E. Filter-Media Frame: [**Galvanized steel**] [**Hard polyurethane foam**].

F. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

G. Capacities and Characteristics:

1. Face Dimensions: <**Insert inches (mm)**>.
2. Thickness or Depth: <**Insert inches (mm)**>.
3. Surface Area: <**Insert sq. ft. (sq. m)**>.
4. System Airflow: <**Insert cfm (L/s)**>.
5. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
6. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
7. Initial Resistance: <**Insert inches wg (Pa)**>.
8. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
9. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.11 AUTOMATIC ROLL FILTERS

A. Description: Factory-fabricated, automatic, motor-driven, roll-type filters with holding casing.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Arrangement: [**Horizontal**] [**Vertical**].

C. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

D. Media: Compressed and rolled, fibrous-glass material; viscous coated.

1. Media shall be coated with an antimicrobial agent.

E. Holding Frame: Galvanized steel with enclosed, clean media roll arranged to allow upstream replacement of filter media.

1. Auxiliary Frame: Locate on downstream side of unit with [**downstream**] [**side**] access.
2. Final Filter: Extended-surface, [**retained**] [**nonsupported**] media.

F. Control and Drive: Electric, gear-reducer, motor-driven, feed-control mechanism equipped with manual media advance and runout switches for stopping media movement of filter bank and operating remote warning signal lights.

1. Manual Control: Manual switch to advance media, and wired to override automatic controls.
2. Automatic Control: Prewired control package to advance media [**when filter resistance exceeds preselected high limit**] [**after preselected operating time**].

G. Capacities and Characteristics:

1. Face Area: <**Insert sq. in. (sq. mm)**>.
2. Face Dimensions: <**Insert inches (mm)**>.
3. Thickness or Depth: <**Insert inches (mm)**>.
4. Surface Area: <**Insert sq. ft. (sq. m)**>.
5. System Airflow: <**Insert cfm (L/s)**>.
6. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
7. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
8. Initial Resistance: <**Insert inches wg (Pa)**>.
9. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
10. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.
11. Electrical Characteristics:

a. Volts: <**Insert value**>.
b. Phase: [**Single**] [**Three**].
c. Hertz: 60.

2.12 BULK MEDIA

A. Description: Air-filter media, factory custom cut or rolled.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Filter Unit Class: UL 900, [**Class 1**] [**Class 2**].

C. Media: [**Spun glass**] [**Synthetic**] [**Polyester**], [**in a roll**] [**cut into pads**].

1. Pad Dimensions: <**Insert inches (mm)**> by <**Insert inches (mm)**>.

D. Capacities and Characteristics:

1. Thickness or Depth: <**Insert inches (mm)**>.
2. System Airflow: <**Insert cfm (L/s)**>.

3. Maximum or Rated Face Velocity: <**Insert fpm (m/s)**>.
4. Arrestance: [**85**] <**Insert number**> percent when tested according to ASHRAE 52.2.
5. Initial Resistance: <**Insert inches wg (Pa)**>.
6. Recommended Final Resistance: <**Insert inches wg (Pa)**>.
7. MERV Rating: [**6**] [**8**] [**13**] <**Insert number**> when tested according to ASHRAE 52.2.

2.13 FRONT- AND REAR-ACCESS FILTER FRAMES

A. Framing System: [**Galvanized-steel**] [**Aluminum**] framing members with access for either upstream (front) or downstream (rear) filter servicing, cut to size and prepunched for assembly into modules. Vertically support filters to prevent deflection of horizontal members without interfering with either filter installation or operation.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Prefilters: Incorporate a separate track[**with spring clips**], removable from front[**or back**].

C. Sealing: Factory-installed, positive-sealing device for each row of filters, to ensure seal between gasketed filter elements and to prevent bypass of unfiltered air.

2.14 SIDE-SERVICE HOUSINGS

A. Description: Factory-assembled, side-service housings, constructed of [**galvanized steel**] [**aluminum**], with flanges to connect to duct or casing system.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Prefilters: Integral tracks to accommodate 2-inch- (50-mm-) deep, disposable [**or washable**]filters.

C. Access Doors: [**Hinged, with continuous**] [**Continuous**] gaskets on perimeter and positive-locking devices, and arranged so filter cartridges can be loaded from either access door.

D. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.

2.15 FILTER GAGES

A. Diaphragm-type gage with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Diameter: [**4-1/2 inches (115 mm)**] [**2 inches (50 mm)**].
3. Scale Range for Filter Media Having a Recommended Final Resistance of 0.5-Inch wg (125 Pa) or Less: 0- to 0.5-inch wg (0 to 125 Pa).
4. Scale Range for Filter Media Having a Recommended Final Resistance of 0.5- to 1.0-Inch wg (125 to 250 Pa) or Less: 0- to 1.0-inch wg (0 to 250 Pa).
5. Scale Range for Filter Media Having a Recommended Final Resistance of 1.0- to 2.0-Inch wg (250 to 500 Pa) or Less: 0- to 2.0-inch wg (0 to 500 Pa).

6. Scale Range for Filter Media Having a Recommended Final Resistance of 2.0- to 3.0-Inch wg (500 to 750 Pa) or Less: 0- to 3.0-inch wg (0 to 750 Pa).
7. Scale Range for Filter Media Having a Recommended Final Resistance of 3.0- to 4.0-Inch wg (750 to 1000 Pa) or Less: 0- to 4.0-inch wg (0 to 1000 Pa).

B. Manometer-Type Filter Gage: Molded plastic, with epoxy-coated aluminum scale and logarithmic-curve tube gage with integral leveling gage, graduated to read from 0- to 3.0-inch wg (0 to 750 Pa), and accurate within 3 percent of the full-scale range.

C. Accessories: Static-pressure tips, tubing, gage connections, and mounting bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Install filter assemblies on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in [**Section 033000 "Cast-in-Place Concrete."**] [**Section 033053 "Miscellaneous Cast-in-Place Concrete."**]
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

C. Install filters in position to prevent passage of unfiltered air.

D. Install filter gage for each filter bank.

E. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

F. Install filter-gage, static-pressure taps upstream and downstream from filters. Install filter gages on filter banks with separate static-pressure taps upstream and downstream from filters. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.

G. Coordinate filter installations with duct and air-handling-unit installations.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:

1. Operate automatic roll filters to demonstrate compliance with requirements.
2. Test for leakage of unfiltered air while system is operating.

D. Air filter will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.3 CLEANING

A. After completing system installation and testing, adjusting, and balancing of air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 234100