SECTION 233723 - HVAC GRAVITY VENTILATORS

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

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

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:

Louvered-penthouse ventilators.

Hooded ventilators.

Goosenecks.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the er-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.[**For louvered-penthouse ventilators specified to bear AMCA seal, include printed catalog pages, showing specified models with appropriate AMCA Certified Ratings Seals.**]
         5. Shop Drawings: For gravity ventilators.

Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.

Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

Retain "Samples" paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each color and texture specified.
        2. Samples for Initial Selection: For units with factory-applied color finishes.
        3. Samples for Verification: For each type of louvered-penthouse ventilator indicated, in manufacturer's standard size.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Roof-framing plans and other details, drawn to scale, and coordinated with each other, based on input from installers of the items involved:

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Sections specifying mechanical vibration, supports, and seismic controls. See ASCE/SEI 7 for certification requirements for equipment and components. Coordinate with structural engineer.

* + - * 1. Seismic Qualification Data: Certificates for ventilators, 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.

Retain "Welding certificates" paragraph below if retaining "Welding Qualifications" paragraph in "Quality Assurance" Article.

* + - * 1. Welding certificates.
      1. QUALITY ASSURANCE

Retain "Welding Qualifications" Paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" Paragraph in "Informational Submittals" Article.

* + - * 1. Welding Qualifications: Qualify procedures and personnel according to the following:

Retain applicable subparagraphs below.

AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

* + - 1. COORDINATION
         1. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1. PRODUCTS

Coordinate with "Gravity Ventilators" Article in Section 077200 "Roof Accessories," to ensure that gravity ventilators are specified only once; gravity ventilators connected to HVAC ductwork are generally specified in this Section. Units that are not ducted or dampered are generally specified in Section 077200.

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 "Delegated Design" Paragraph below if Contractor is required to assume responsibility for design. If specifying large or structurally complex ventilators and relying on manufacturer for information about their structural performance, paragraph can be retained, and ventilator manufacturer or Contractor can engage an Engineer on staff or a local Engineer to prepare the required calculations.

* + - * 1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ventilators.
        2. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

Retain one of three "Wind Loads" subparagraphs below, or insert other requirements of authorities having jurisdiction. If retaining first subparagraph, indicate pressures on appropriate elevation Drawings. Requirements in second and third subparagraphs are examples only. Revise to suit Project. Consult a Structural Engineer to quantify design loads applicable to Project. Verify compliance with codes. See the Evaluations.

Wind Loads: Determine loads based on pressures as indicated on Drawings.

Wind Loads: Determine loads based on a uniform pressure of [**20 (960)**] [**30 (1440)**] <**Insert design wind pressure**> lbf/sq. ft. (Pa), acting inward or outward.

Wind Loads: Determine loads based on pressures indicated below:

Corner Zone: Within <**Insert distance**> of building corners, uniform pressure of <**Insert design wind pressure**>, acting inward, and <**Insert design wind pressure**>, acting outward.

Other Than Corner Zone: Uniform pressure of <**Insert design wind pressure**>, acting inward, and <**Insert design wind pressure**>, acting outward.

<**Insert wind load requirements**>.

Snow Load: Unit to withstand a minimum of [**20- (960-)**] <**Insert design snow load pressure**> lbf/sq. ft. (Pa)snow load.

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: Ventilators, including attachments to other construction, shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain 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 from the device 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**>.

Retain "ASHRAE/IES 90.1 Compliance" Paragraph below to require compliance with ASHRAE/IES 90.1.

* + - * 1. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

"ASHRAE 62.1 Compliance" Paragraph below may be required to comply with Project requirements or authorities having jurisdiction. LEED 2009 IEQ Prerequisite 1 and LEED v4 EQ Prerequisite "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 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

"Thermal Movements" Paragraph below may not be needed for most ventilators; retain if continuous ventilator assemblies are used.

* + - * 1. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

Differential values in "Temperature Change (Range)" Subparagraph below (for aluminum in particular) are suitable for most of the United States.

Temperature Change (Range):

Ambient: [**120 (67)**] <**Insert temperature**> deg F (deg C).

Material Surfaces: [**180 (100)**] <**Insert temperature**> deg F (degC).

Retain "Water Entrainment" Paragraph below to require compliance with ASHRAE 62.1, in which Section 5.6.2 - "Rain Entrainment" limits amount of water penetration through intake. Sustainable design systems require compliance with ASHRAE 62.1.

* + - * 1. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

If Project has more than one type or configuration of ventilator, delete "Capacities and Characteristics" Paragraph below and schedule ventilators on Drawings.

* + - * 1. Capacities and Characteristics:

Drawing Tag No.: <**Insert number**>.

Type: [**Louvered penthouse**] [**Hooded penthouse**] [**Gooseneck**].

Height: <**Insert number**> inches (mm).

Width: <**Insert number**> inches (mm).

Depth: <**Insert number**> inches (mm).

Air Flow: <**Insert number**> cfm (L/s).

Maximum Air Pressure Drop: Not more than [**0.10- (25-)**] <**Insert pressure**> inch wg (Pa) static pressure drop.

Maximum Free Area Velocity: [**600 (3.0)**] [**700 (3.6)**] [**800 (4.1)**] <**Insert velocity**> fpm (m/s).

Function: [**Intake**] [**Relief**].

* + - 1. FABRICATION
         1. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.
         2. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
         3. Fabricate units with closely fitted joints and exposed connections accurately located and secured.
         4. Fabricate supports, anchorages, and accessories required for complete assembly.
         5. Perform shop welding by AWS-certified procedures and personnel.
      2. LOUVERED-PENTHOUSE VENTILATORS
         1. Description: Multitier rectangular louvered penthouse for [**intake**] [**relief**] air.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=3507) Subject to compliance with requirements, provide products by one of the following:

[Acme Engineering & Manufacturing Corp](http://www.specagent.com/Lookup?uid=123457088501).

[Greenheck Fan Corporation](http://www.specagent.com/Lookup?uid=123457088504).

[Loren Cook Company](http://www.specagent.com/Lookup?uid=123457088500).

Approved equivalent.

* + - * 1. Source Limitations: Obtain louvered-penthouse ventilators from single manufacturer.

Coordinate roof material option in "Construction" Paragraph below to match retained frame and blade materials.

* + - * 1. Construction:

Material: All-welded assembly with [**4-inch (100-mm)**] [**6-inch (150-mm)**]-deep louvers, mitered corners, and [**aluminum**] [**galvanized-steel**] [**stainless-steel**] sheet roof.

Retain one of two "Frame and Blade Material" subparagraphs below.

Frame and Blade Material: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than [**0.080 (2.0)**] <**Insert value**> inch (mm) for frames and [**0.080 (2.0)**] [**0.060 (1.5)**] <**Insert value**> inch (mm)for blades[**with condensate deflectors**].

Frame and Blade Material: Galvanized-steel sheet, of thickness required to comply with structural performance requirements, but not less than [**0.052 (1.3)**] <**Insert value**> inch (mm)for frames and [**0.040 (1.0)**] [**0.052 (1.3)**] [**0.064 (1.6)**] <**Insert value**> inch (mm)for blades[**with condensate deflectors**].

Frame and Blade Material: Stainless-steel sheet, of thickness required to comply with structural performance requirements, but not less than [**0.050**] <**Insert value**> inch for frames and [**0.050**] [**0.062**] [**0.078**] <**Insert value**> inch for blades[**with condensate deflectors**].

Insulation: [**None**] [**Mineral-fiber insulation and vapor barrier**].

Wind-Driven Rain Performance: Not less than [**99**] [**95**] [**80**] <**Insert number**> percent effectiveness when subjected to a rainfall rate of [**3 inches (75 mm) per hour and a wind speed of 29 (13 m/s)**] <**Insert value**> mph (m/s) at a free-area intake velocity of [**300 (1.5)**] [**400 (2.0)**] [**500 (2.5)**] <**Insert velocity**> fpm (m/s).

Verify availability of seal in "AMCA Seal" Subparagraph below for ventilators indicated. Coordinate with product data requirement in "Action Submittals" Article. Only a limited number of ventilator manufacturers are AMCA listed for certified louvers. Consult manufacturers.

AMCA Seal: Mark units with the AMCA Certified Ratings Seal.

Retain "Exterior Corners" Subparagraph below for exterior mitered corners. If retaining, verify available corner construction with manufacturers.

Exterior Corners: Prefabricated corner units with [**mitered and welded blades**] [**mitered blades with concealed close-fitting splices**] and with [**fully recessed**] [**semirecessed**] mullions at corners.

Retain "Bird Screening" or "Insect Screening" Subparagraph below. ASHRAE 62.1, Section 5.6.5 - "Bird Screens" requires that outdoor intakes be equipped with a screening device designed to limit penetration of a 1/2-inch (12.7-mm) probe. Sustainable design systems require compliance with ASHRAE 62.1.

Bird Screening: [**Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh wire**] [**Aluminum, 1/2-inch- (12.7-mm-) square mesh or flattened, expanded aluminum, 3/4-inch- (19-mm-) diamond mesh wire**] <**Insert type**>.

Insect Screening: [**Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh wire**] <**Insert type**>.

Retain "Galvanized-Steel Sheet Finish" Subparagraph below if galvanized material types are retained in "Construction" Paragraph and "Frame and Blade Material" Subparagraph above.

Galvanized-Steel Sheet Finish:

Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas, and repair galvanizing according to ASTM A780/A780M. Apply a conversion coating suited to the organic coating to be applied over it.

Revise "Factory Priming for Field-Painted Finish" Subparagraph below if a specific type of primer or a baked-on application is required. Coordinate with Section 0991143 "Exterior Painting."

Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.

"Baked-Enamel Finish" Subparagraph below is an example only. Revise to suit Project or paint systems available from manufacturers.

Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**].

* + - * 1. Dampers:

Location: [**Penthouse neck**] [**Inside louver face**] [**Curb damper tray**].

In "Control" Subparagraph below, do not retain "motorized" option if it is specified in Section 230923.12 "Control Dampers." Do not retain "gravity backdraft" option below if specified in Section 233300 "Air Duct Accessories." "Manual" option is uncommon.

Control: [**Manual**] [**Motorized**] [**Gravity backdraft**].

Tray in "Tray" Subparagraph below is available if retaining manufacturer-supplied roof curb. Delete below if specifying curb in Section 077200 "Roof Accessories."

Tray: Provide damper tray or shelf with opening [**3 (76)**] <**Insert dimension**> inches (mm) [**less than interior curb dimensions indicated**] [**of size indicated**].

Retain "Roof Curbs" Paragraph below for roof curbs furnished by louvered-penthouse ventilator manufacturer for field installation. Delete if roof curbs are specified in Section 077200 "Roof Accessories."

* + - * 1. Roof Curbs: [**Galvanized-steel**] [**Stainless Steel**] sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

Configuration: [**Self-flashing without a cant strip, with**] [**Built-in cant and**] [**Built-in raised cant and**] mounting flange.

Coordinate curb height in "Overall Height" Subparagraph below with roof deck construction. Most authorities having jurisdiction require the bottom of intakes serving healthcare occupancies to be a minimum of 36 inches (915 mm) above roof surface. Consult authorities having jurisdiction.

Overall Height: [**12 inches (300 mm)**] [**36 inches (915 mm)**].

* + - 1. HOODED VENTILATORS
         1. Description: Hooded [**rectangular**] [**round**] penthouse for [**intake**] [**relief**] air.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=3508) Subject to compliance with requirements, provide products by one of the following:

[Acme Engineering & Manufacturing Corp](http://www.specagent.com/Lookup?uid=123457088508).

[Greenheck Fan Corporation](http://www.specagent.com/Lookup?uid=123457088513).

[Loren Cook Company](http://www.specagent.com/Lookup?uid=123457088512).

Approved equivalent.

* + - * 1. Source Limitations: Obtain hooded ventilators from single manufacturer.
        2. Construction:

Retain one of two "Material" subparagraphs below.

Material: Galvanized steel, of thickness required to comply with structural performance requirements, but not less than 0.064-inch- (1.62 mm-) thick base and 0.040-inch- (1.0-mm-) thick hood; suitably reinforced.

Material: Aluminum, of thickness required to comply with structural performance requirements, but not less than 0.063-inch- (1.6-mm-) thick base and 0.050-inch- (1.27-mm-) thick hood; suitably reinforced.

Material: Stainless Steel, of thickness required to comply with structural performance requirements, but not less than 0.050-inch- thick base and hood; suitably reinforced.

Insulation: [**None**] [**Mineral-fiber insulation and vapor barrier**].

Retain "Bird Screening" or "Insect Screening" Subparagraph below. ASHRAE 62.1, Section 5.6.5 - "Bird Screens" requires that outdoor intakes be equipped with a screening device designed to limit penetration of a 1/2-inch (12.7-mm) probe. Sustainable design systems require compliance with ASHRAE 62.1.

Bird Screening: [**Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh wire**] [**Aluminum, 1/2-inch- (12.7-mm-) square mesh or flattened, expanded aluminum, 3/4-inch (19-mm) diamond mesh wire**] <**Insert type**>.

Insect Screening: [**Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh wire**] <**Insert type**>.

* + - * 1. Galvanized-Steel Finish:

Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas, and repair galvanizing according to ASTM A780/A780M. Apply a conversion coating suited to the organic coating to be applied over it.

Revise "Factory Priming for Field-Painted Finish" Subparagraph below if a specific type of primer or a baked-on application is required. Coordinate with Section 0991143 "Exterior Painting."

Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.

"Baked-Enamel Finish" Subparagraph below is an example only. Revise to suit Project or paint systems available from manufacturers.

Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**].

* + - * 1. Dampers:

Location: [**Hood neck**] [**Curb damper tray**].

In "Control" Subparagraph below, do not retain "motorized" option if it is specified in Section 230923.12 "Control Dampers." Do not retain "gravity backdraft" option below if specified in Section 233300 "Air Duct Accessories." "Manual" option is uncommon.

Control: [**Manual**] [**Motorized**] [**Gravity backdraft**].

Tray in "Tray" Subparagraph below is available if retaining manufacturer-supplied roof curb. Delete below if specifying curb in Section 077200 "Roof Accessories."

Tray: Provide damper tray or shelf with opening [**3 (76)**] <**Insert dimension**> inches (mm) [**less than interior curb dimensions indicated**] [**of size indicated**].

Retain "Roof Curbs" Paragraph below for roof curbs that are shop fabricated for field installation. Delete if roof curbs are specified in Section 077200 "Roof Accessories."

* + - * 1. Roof Curbs: [**Galvanized-steel**] [**Stainless-steel**] sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

Configuration: [**Self-flashing without a cant strip, with**] [**Built-in cant and**] [**Built-in raised cant and**] mounting flange.

Coordinate curb height in "Overall Height" Subparagraph below with roof deck construction. Most authorities having jurisdiction require the bottom of intakes serving healthcare occupancies to be a minimum of 36 inches (915 mm) above the roof surface. Consult authorities having jurisdiction.

Overall Height: [**12 inches (300 mm)**] [**36 inches (900 mm)**].

* + - 1. GOOSENECKS
         1. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 6-5; with a minimum of 0.052-inch- (1.3-mm-) thick, galvanized-steel sheet.

Retain one or both of "Bird Screening" and "Insect Screening" paragraphs below. If both bird screening and insect screening are required, indicate location of each on Drawings.

Retain "Bird Screening" Paragraph below to require compliance with ASHRAE 62.1, in which Section 5.6.5 - "Bird Screens" requires that outdoor intakes be equipped with a screening device designed to limit penetration of a 1/2-inch (12.7-mm) PROBE. Sustainable design systems require compliance with ASHRAE 62.1.

* + - * 1. Bird Screening: [**Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire**] [**Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire**] [**Flattened, expanded aluminum, 3/4 by 0.050 inch (19 by 1.27 mm) thick**] <**Insert type**>.
        2. Insect Screening: [**Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm)**] <**Insert type**>.
        3. Galvanized-Steel Sheet Finish:

Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas, and repair galvanizing according to ASTM A780/A780M. Apply a conversion coating suited to the organic coating to be applied over it.

Revise "Factory Priming for Field-Painted Finish" Subparagraph below if a specific type of primer or a baked-on application is required. Coordinate with Section 0991143 "Exterior Painting."

Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.

"Baked-Enamel Finish" Subparagraph below is an example only. Revise to suit Project or paint systems available from manufacturers.

Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**].

Retain "Roof Curbs" Paragraph below for roof curbs that are shop fabricated for field installation. Delete if roof curbs are specified in Section 077200 "Roof Accessories."

* + - * 1. Roof Curbs: [**Galvanized-steel**] [**Stainless Steel**] sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

Configuration: [**Self-flashing without a cant strip, with**] [**Built-in cant and**] [**Built-in raised cant and**] mounting flange.

Coordinate curb height in "Overall Height" Subparagraph below with roof deck construction. Most authorities having jurisdiction require the bottom of intakes serving healthcare occupancies to be a minimum of 36 inches (915 mm) above roof surface.

Overall Height: [**12 inches (300 mm)**] [**36 inches (900 mm)**].

* + - 1. MATERIALS

Retain materials in this article that are required for gravity ventilators specified in succeeding articles.

* + - * 1. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T5 or T-52.
        2. Aluminum Sheet: ASTM B209 (ASTM B209M), Alloy 3003 or 5005, with temper as required for forming or as otherwise recommended by metal producer for required finish.
        3. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) zinc coating, mill phosphatized.
        4. Stainless Steel Sheet: ASTM A666, Type 304, with No. [**4**] [**6**] finish.
        5. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

Use types and sizes to suit unit installation conditions.

Use [**Phillips flat**] [**hex-head or Phillips pan**]-head screws for exposed fasteners unless otherwise indicated.

* + - * 1. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components, with capability to sustain without failure a load equal to 4 times the loads imposed for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
        2. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

1. EXECUTION
   * + 1. INSTALLATION
          1. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.
          2. Secure gravity ventilators to roof curbs with zinc-plated hardware [**, that comply with the wind and seismic fastening requirements**]. Use concealed anchorages where possible. Refer to Section 077200 "Roof Accessories."
          3. Install goosenecks on curb base where throat size exceeds [**9 by 9 inches (230 by 230 mm)**] <**Insert measurement**>.
          4. Install gravity ventilators with clearances for service and maintenance.
          5. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
          6. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.
          7. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
          8. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
          9. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
          10. Refer to Section 077200 "Roof Accessories" for flashing and counterflashing of roof curbs.
       2. CONNECTIONS

Coordinate duct installation and specialty arrangements with schematics on Drawings and with requirements specified in duct systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts." Drawings indicate general arrangement of ducts and duct accessories.
      1. ADJUSTING
         1. Adjust damper linkages for proper damper operation.
         2. Adjust damper linkages for proper damper operation.

END OF SECTION 233723