SECTION 233433.16 - INDUSTRIAL AIR CURTAINS

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.

MasterSpec includes provisions for LEED 2009, LEED v4, ASHRAE 189.1, IgCC, and Green Globes. Some sustainable design requirements are either mandatory or optional and 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 industrial air-curtain unit.
			2. SUMMARY
				1. Section includes industrial air-curtain unit.
			3. 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.

Include rated capacities, operating characteristics, and furnished specialties and accessories.

* + - * 1. Shop Drawings: For air curtains.

Include plans, elevations, sections, and attachment details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

Retain "Delegated-Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Sample Warranties: For special warranties.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For air curtains to include in 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.

Furnish one set of filters.

Furnish one set of fan belts for each unit.

* + - 1. WARRANTY

When warranties are required, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of air curtains that fail in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods.

Warranty Period (Nonheating Units): [**24**] <**Insert number**> months.

Warranty Period (Water or Steam Heating Units): [**18**] [**24**] <**Insert number**> months.

Warranty Period (Gas Heating Units): [**18**] [**24**] <**Insert number**> months.

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
				1. Unusual Service Conditions:

Base fan-performance ratings on the following:

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

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

Humidity: <**Insert number**> wet bulb deg F.

<**Insert conditions**>.

If Project has more than one type or configuration of air-curtain unit, delete "Capacities and Characteristics" Paragraph below and schedule air-curtain units on Drawings.

* + - * 1. Capacities and Characteristics:

Application: [**Thermal barrier**] [**Wind resistance**] [**Interior separation**] [**Fly and insect control**].

Mounting Type: [**Suspension**] [**Wall brackets**] [**Keyhole wall mount**].

Discharge Direction: [**Horizontal**] [**Vertical**].

Door Type: [**Exterior**] [**Interior**].

Door Height: <**Insert dimension**> inches.

Door Width: <**Insert dimension**> inches.

Unit Length: <**Insert dimension**> inches.

Net Weight: <**Insert number**> lb.

Nozzle Velocity: [**1000**] <**Insert number**> fpm.

Airflow: <**Insert number**> cfm.

Intake: [**Internal**] [**External**].

Number of Fan(s): [**One**] [**Two**] [**Three**] <**Insert number**>.

Fan Motor:

Electrical Characteristics:

Horsepower: [**0.5**] [**1**] [**2**] [**3**] <**Insert number**> hp.

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

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

Some manufacturers offer units suitable for 50-Hz power. If units are required for 50-Hz electrical service, verify that each manufacturer can provide such units and revise "Hertz" Subparagraph below. Selecting units for 50-Hz power will restrict competition.

Hertz: 60 Hz.

Speed: [**1750**] <**Insert number**> rpm.

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

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

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

Sound Level Measured 10 Feet from Nozzle: <**Insert number**> dBA.

Hot-Water Coil:

Entering-Water Temperature: <**Insert number**> deg F.

Leaving-Water Temperature: <**Insert number**> deg F.

Water Flow: <**Insert number**> gpm.

Water Pressure Drop: <**Insert number**> feet of head.

Air-Temperature Rise: <**Insert number**> deg F.

Number of Coil Row(s): [**One**] [**Two**] <**Insert number**>.

Steam Coil:

Capacity: <**Insert number**> MBh.

Air-Temperature Rise: <**Insert number**> deg F.

Number of Coil Row(s): [**One**] [**Two**] <**Insert number**>.

Inlet Pressure: <**Insert number**> psig.

Condensing Capacity: <**Insert number**> lb/h.

Electric Heater:

Capacity: <**Insert kilowatts**>.

Air-Temperature Rise: <**Insert number**> deg F.

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

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

Hertz: 60 Hz.

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

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

Control Step(s): [**One**] [**Two**] [**Three**] <**Insert number**>.

Gas-Fired Heaters:

Capacity: <**Insert number**> Btu/h at <**Insert number**> inch wg gas pressure.

Air-Temperature Rise: <**Insert number**> deg F.

* + - 1. INDUSTRIAL AIR-CURTAIN UNIT <**Insert drawing designation**>

Copy this article and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13424) Subject to compliance with requirements, provide products by one of the following:

[Berner International](http://www.specagent.com/Lookup?uid=123457115507).

[Loren Cook Company](http://www.specagent.com/Lookup?uid=123457114654).

Approved equivalent.

* + - * 1. Source Limitations: Obtain air curtain from single source from single manufacturer.
				2. Housing:

Retain "Galvanized Steel," "Electroplated Steel," "Aluminum," or "Materials" Subparagraph below. Not all manufacturers offer all material options; consult manufacturers.

Galvanized Steel: Galvanized steel with electrostatically applied, epoxy-enamel, powder-coat finish.

Electroplated Steel: Heavy-gauge, electroplated-zinc steel with welded construction and polyester-coated finish.

Aluminum: Heavy-gauge, aluminum construction.

Anodized Finish: Match finish and color of adjacent architectural metals. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

Retain finishes in "Class II, Clear Anodic Finish" and "Class II, Color Anodic Finish" subparagraphs below to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts. Revise mechanical finish if custom finish is required and availability is verified.

Class II finishes in subparagraphs are standard with many manufacturers; heavy-anodized finishes may be available and required. Verify availability with manufacturers.

Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker).

Materials: Stainless steel.

Retain "Fixed Discharge Nozzle" or "Adjustable Discharge Nozzle" Subparagraph below.

Fixed Discharge Nozzle: Integral part of the housing, containing fixed air-directional vanes.

Adjustable Discharge Nozzle: Integral part of the housing, containing adjustable air-directional vanes with [**40**] <**Insert number**>-degree sweep front to back.

* + - * 1. Mounting Brackets: Steel, for [**wall**] [**ceiling**] mounting.

Retain "Air-Intake Louvers" or "Air-Intake (Louvers) (Grilles)" Paragraph below.

* + - * 1. Air-Intake Louvers: Comply with requirements in Section 089000 "Louvers and Vents."
				2. Air-Intake [**Louvers**] [**Grilles**]:

Retain "Louvers" or "Grille" Subparagraph below.

Louvers: Integral part of and same material as the housing, mechanically field adjustable and capable of reducing air-outlet velocity by [**60**] <**Insert number**> percent with louver in totally closed position.

Grille: Integral part of and same material as the housing.

Insect Screen: [**Aluminum**] [**Stainless steel**], removable.

* + - * 1. Fans:

[**Centrifugal, forward curved, double width, double inlet**] [**Vane axial**].

[**Galvanized steel**] [**Painted steel**] [**Aluminum**].

Statically and dynamically balanced.

[**Direct drive**] [**Belt drive, equipped with belt guards, adjustable sheaves, and pulleys**].

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

* + - * 1. Motors: 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."

Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

If unique characteristics are required for motors in this Section, retain subparagraphs below.

[**Single speed**] [**Two speed**] [**Multispeed**].

Resiliently mounted.

Continuous duty.

[**Totally enclosed, air over**] [**Totally enclosed, fan cooled**] [**Open, dripproof**] [**Explosion proof**].

Integral thermal-overload protection.

Bearings: Permanently sealed, lifetime, prelubricated, ball bearings.

Disconnect: Internal power cord with plug and receptacle.

* + - * 1. Water Coils:

Type: [**Continuous circuit**] [**Self-draining**] [**Cleanable**].

Piping Connections: Threaded on [**same end**] [**opposite ends**].

Tube Material: Copper, complying with ASTM B75/B75M.

Tube Diameter: 0.625 inch.

Retain fin spacing in "Fins" Subparagraph below if not in a schedule.

Fins: [**Aluminum**] [**Copper**] with fin spacing [**0.167**] [**0.125**] [**0.091**] [**0.071**] [**0.067**] [**0.056**] [**0.0075**] <**Insert dimension**> inch.

Fin and Tube Joint: [**Mechanical bond**] [**Silver brazed**].

Retain one of four options in "Headers" Subparagraph below.

Headers: [**Cast iron with drain and air vent tappings**] [**Cast iron with cleaning plugs, and drain and air vent tappings**] [**Seamless copper tube with brazed joints, prime coated**] [**Fabricated steel with brazed joints, prime coated**].

Frames: Galvanized-steel channel frame, [**0.052**] [**0.064**] [**0.079**] [**0.0625**] <**Insert dimension**> inch.

Ratings: In accordance with ASHRAE 33.

Ratings in "Working-Pressure Ratings" Subparagraph below are standard for most copper-tube coils. Other materials have different ratings; revise to suit Project.

Working-Pressure Ratings: 200 psig, 325 deg F.

Retain "Distribution-header" option in "Steam Coils" Paragraph below if freeze protection is required.

* + - * 1. Steam Coils: [**Distribution-header**] [**Single-tube**] coil, with threaded steam supply and condensate connections.

Retain "Same end" option in "Piping Connections" Subparagraph below if freeze protection is required.

Piping Connections: [**Same end**] [**Opposite ends**] [**Steam supply on both ends; condensate on one end**].

Tube Material: Copper, complying with ASTM B75/B75M.

Tube Diameter: 0.625 inch.

Fins: [**Aluminum**] [**Copper**] with fin spacing [**0.167 inch**] [**0.125 inch**] [**0.091 inch**] [**0.071 inch**] [**0.067 inch**] [**0.056 inch**] [**0.0075 inch**].

Fin and Tube Joint: [**Mechanical bond**] [**Silver brazed**].

Headers: [**Cast iron with drain and air vent tappings**] [**Cast iron with cleaning plugs, and drain and air vent tappings**] [**Seamless copper tube with brazed joints, prime coated**] [**Fabricated steel with brazed joints, prime coated**].

Frames: Galvanized-steel channel frame, [**0.052**] [**0.064**] [**0.079**] [**0.0625**] <**Insert dimension**> inch.

Ratings in "Pressure and Temperature Ratings" Subparagraph below are standard for most copper-tube coils. Other materials have different ratings; revise to suit Project.

Pressure and Temperature Ratings: 100 psig, 400 deg F in accordance with ASHRAE 33.

* + - * 1. Electric-Resistance Coils:

Coil Assembly: Comply with UL 1995.

Frame: Galvanized-steel frame.

Heating Elements: Open-coil resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.

Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box without removing heater from duct or unit.

[**Secondary Protection: Load-carrying, manually reset or manually replaceable, thermal cutouts; factory wired in series with each heater stage.**]

Control Panel: [**Unit**] [**Remote**] mounted with disconnecting means and overcurrent protection. Include the following controls:

Magnetic contactor.

[**Solid-state stepless pulse**] [**Step**] controller.

Toggle switches; one per step.

[**Time-delay relay.**]

[**Pilot lights; one per step.**]

Airflow-proving switch.

* + - * 1. Gas-Fired Heaters:

Comply with ANSI Z83.8/CSA 2.6, "Gas Unit Heaters and Gas-Fired Duct Furnaces."

CSA Approval: Bear CSA label.

Type of Gas: [**Natural**] [**Liquefied petroleum (LP)**].

Assembly and Wiring: Heaters factory assembled, piped, wired, and tested for 120 V ac.

Housing: Steel, with integral draft hood and inserts for suspension-mounted rods.

External Casings and Cabinets: Baked enamel over corrosion-resistant-treated surface.

Heat Exchanger: [**Aluminized**] [**Stainless**] steel.

Burners: Cast iron or aluminized steel with stainless steel inserts.

Retain one of first two subparagraphs below.

Gravity vent.

Power Venter: 120 V ac, with stainless steel shaft.

Automatic Gas Control: [**Single**] [**Two**]-stage, 24-V ac valve.

Retain one of two options in "Ignition" Subparagraph below; spark ignition is optional feature.

Ignition: [**Standing pilot**] [**Electronically controlled spark with flame sensor**].

* + - * 1. Filters:

Retain "Disposable Panel Filters" or "Washable Panel Filters" Subparagraph below. Not all manufacturers offer both options; consult manufacturers.

Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel-type, disposable air filters with glass-fiber media sprayed with nonflammable adhesive in [**cardboard**] [**galvanized-steel**] frame.

Washable Panel Filters: Removable, stainless steel, baffle-type filters with spring-loaded fastening; with minimum 0.0781-inch- thick, stainless steel filter frame.

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

* + - * 1. Controls:

[**Built-in**] [**Remote, Field-Installed**] Thermostat: [**Line voltage**] [**24 V**], factory installed and wired to [**junction box on air curtain**] [**motor-control panel**].

Automatic Door Switch: [**Roller type**] [**Combination roller-plunger type**] [**Plunger type**] [**Magnetic**], installed in door area to activate air curtain when door opens and to deactivate air curtain when door closes.

Start-Stop, Push-Button Switch: Manually activates and deactivates air curtain.

Three-Speed Switch: Manually activates, deactivates, and controls air-curtain fan speed.

[**Time-Delay Relay: Factory installed and adjustable to allow air curtain to operate from 0.5 seconds to 10 hours.**]

Motor-Control Panel: Complete with motor starter, 115-V ac transformer with primary and secondary fuses, terminal strip, and NEMA 250, [**Type 1**] [**Type 12**] enclosure [**with door-mounted, HAND-OFF-AUTO switch**] [**with built-in, variable fan-speed control**].

* + - * 1. Accessories:

Mounting Brackets: Adjustable mounting brackets for drum-type roll-up doors.

* + - 1. SOURCE QUALITY CONTROL

Retain "Source Quality Control" and "Testing" paragraphs below for units that include hot-water or steam-heating coils.

* + - * 1. Source Quality Control: Test to 300 and 200 psig underwater.
				2. Testing: Test and inspect steam coils in accordance with ASHRAE 33.

Verify availability of certification in first paragraph below; not all manufacturers use AMCA certification for fan performance.

* + - * 1. Comply with AMCA 220, "Laboratory Methods of Testing Air Curtains for Aerodynamic Performance Ratings," for airflow, outlet velocity, and power consumption.

Verify availability of certification in first paragraph below; not all manufacturers certify coils.

* + - * 1. Comply with AHRI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils," for components, construction, and rating.

Retain first paragraph below if applicable to Project. Air-velocity control louvers are not permitted on NSF-certified air curtains.

* + - * 1. Comply with NSF 37, "Air Curtains for Entranceways in Food and Food Service Establishments."
				2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

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

* + - * 1. Steam coil will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Examine roughing-in for [**hot-water**] [**steam**] [**gas**] piping systems to verify actual locations of piping connections before air-curtain installation.
				3. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. Install air curtains with clearance for equipment service and maintenance.

Indicate air-curtain mounting on Drawings and show vibration-control devices and seismic restraints appropriate for Project.

Retain "Equipment Installation" Paragraph below for installation of equipment with seismic restraints without vibration isolation devices.

* + - * 1. Equipment Installation: Install air curtains[**with seismic-restraint devices**]. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
				2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
			1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for heating hot-water piping specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Comply with requirements for steam piping specified in Section 232213 "Steam and Condensate Heating Piping" and Section 232216 "Steam and Condensate Heating Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
				3. Comply with requirements for natural-gas piping specified in Section 231123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
				4. Comply with requirements for LP gas piping specified in Section 231126 "Facility Liquefied-Petroleum Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
				5. Where installing piping adjacent to equipment, allow space for service and maintenance.
				6. Breeching: Comply with applicable requirements in Section 235116 "Fabricated Breechings and Accessories." Connect breeching to full size at flue outlet.
			1. ELECTRICAL CONNECTIONS
				1. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
				4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Retain one of two subparagraphs below. First subparagraph cross-references Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second subparagraph is an abbreviated version of product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

* + - 1. CONTROL CONNECTIONS
				1. Install control and electrical power wiring to field-mounted control devices.
				2. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
			2. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain first "Testing Agency" Paragraph below if Owner 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 "Tests and Inspections" Paragraph below with any combination of paragraphs above.

* + - * 1. Tests and Inspections:

After installing air curtains completely, perform visual and mechanical check of individual components.

After electrical circuitry has been energized, start unit to confirm motor rotation and unit operation. Certify compliance with test parameters.

Inspect for water leaks.

Test gas train and verify that there are no gas leaks.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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

* + - * 1. Air-curtain unit will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. ADJUSTING

Retain first paragraph below for belt-driven units.

* + - * 1. Adjust belt tension.
				2. Adjust motor and fan speed to achieve specified airflow.
				3. Adjust discharge louver and dampers to regulate airflow.
				4. Adjust air-directional vanes.
			1. DEMONSTRATION
				1. [**Engage a company field advisor to train**] [**Train**] Facility’s Director’s Representative's maintenance personnel to adjust, operate, and maintain industrial air curtains.

END OF SECTION 233433.16