**Price Radial Flow Diffusers**

***Division 23 – Heating, Ventilating, and Air Conditioning***

***Section 23 37 13 – Diffusers, Registers, and Grilles***

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

**PART 1 – GENERAL**

**1.01 Section includes**:

1. Radial Flow Diffusers.

**1.02 Related Requirements**

1. Section 01 30 00 – Administrative Requirements
2. Section 01 40 00 – Quality Requirements
3. Section 01 60 00 – Product Requirements
4. Section 01 74 21 – Construction/Demolition Waste Management and Disposal
5. Section 01 78 00 – Closeout Submittals
6. Section 01 79 00 – Demonstration and Training
7. Section 23 31 00 – HVAC Ducts and Casings
8. Section 23 32 00 – Air Plenums and Chases

**1.03 Reference Standards**

A. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy; 2013

B. ASHRAE Standard 70 – Method of Testing the Performance of Air Outlets and Air Inlets; 2006

C. ASHRAE Standard 170 – Ventilation of Health Care Facilities; 2013

D. ASTM Standard E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2016

E. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 2013

F. ASTM D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub; 2015

G. CSA Standard Z317.2-10 – Special Requirements for Heating, Ventilation, and Air-conditioning (HVAC) Systems in Health Care Facilities; 2010

H. NFPA Standard 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015

I. SMACNA (SRM) – Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors’ National Association; 2008

J. UL Standard 723 – Standard for Test for Surface Burning Characteristics of Building Materials; 2008

**1.04 Administrative Requirements**

A. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

**1.05 Submittals**

A. See Section 01 30 00 – Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air volume flow, initial pressure drop, sound performance, and throw, as tested in accordance with ASHRAE Standard 70-2006.

C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication.

D. Certificates: Certify that air capacities, pressure drops, and selection procedures meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.

F. Project Record Documents: Record actual locations of units and control components.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.

2. Extra Filters: Furnish one spare filter as required per component originally supplied with filters.

**1.06 Quality Assurance**

1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.
2. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.07 Warranty**

1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
2. Provide 18 month manufacturer warranty from date of shipment for radial flow diffusers.

**PART 2 – PRODUCTS**

**2.01** **Radial Flow Diffusers**

1. Basis of Design: Price Industries, Inc.
2. Radial Flow Diffuser: Models RFD, RFDSS
3. Radial Flow Diffuser with Cleanroom Filter: Models RFDC, ARFDC
4. Flush Face Radial Flow Diffuser: Models FRFD, AFRFD, FRFDSS
5. Adjustable Flush Face Radial Flow Diffuser: Models FRFDA, AFRFDA, FRFDSSA
6. Flush Face Radial Flow Diffuser with Perforated Face: Models FRFDP, AFRFDP, FRFDPSS
7. Flush Face Radial Flow Diffuser with Cleanroom Filter: Models AFRFDC, FRFDCSS
8. General:
	1. The radial flow diffusers shall provide a low velocity, radial air pattern for minimal entrainment of room air.
9. Performance:
	1. The manufacturer of the radial flow diffuser shall provide performance data for air volume, initial pressure drop, sound levels, and throw. All data must be tested in accordance with the most recent publication of ASHRAE Standard 70.
10. Radial Flow Diffuser [Price Model RFD, RFDSS]:
	1. Supply and install Price [RFD, RFDSS] radial flow diffusers of the sizes, configurations, and capacities indicated on the drawings and/or diffuser schedule.
	2. Plenum, face panel, and frame material shall be (**select one**):
		1. Aluminum [RFD]
		2. Type 304 Stainless Steel [RFDSS]
	3. Construction:
		1. The diffuser shall consist of a perforated face that extends below the ceiling by approximately 5.75 inches (146 mm), and includes an integral plenum with duct connection.
		2. The face shall be perforated [aluminum or stainless steel]:
			1. The face shall incorporate engineered deflection vanes, quick-release latches and piano hinge connection to the plenum.
			2. The hinge shall be designed to allow complete separation of the face and plenum, if required.
			3. The plenum shall be fully accessible for cleaning with no internal baffles or obstructions.
			4. Screw and/or clip-mounting of the diffuser face shall not be accepted.
		3. Mounting frames shall be provided for to allow for surface mount and T-bar installation.
		4. The diffuser shall be provided with:
			1. 2-way radial discharge
			2. 1-way radial discharge
	4. Finish (**select one**):
		1. All aluminum components shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 80 in-lb.
		2. All stainless steel components shall have a #4 polished finish on exposed surfaces.
	5. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with half-inch aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM E84 and UL 723.
	6. Inlet damper (**optional**):
		1. The butterfly style damper shall be (**select one**):
			1. Steel construction with standard white B12 baked-on powder coat finish.
			2. Stainless steel construction with brushed finish.
11. Radial Flow Diffuser with Cleanroom Filter: Models RFDC
	1. Supply and install Price RFDC radial flow diffusers with cleanroom filter of the sizes, configurations, and capacities indicated on the drawings or diffuser schedule.
	2. Construction:
		1. The diffuser shall consist of a ceiling mounting frame, a perforated face, an airtight filter housing, a remote operated volume control damper, and a replaceable high efficiency filter.
		2. The border shall be extruded aluminum construction with an integral knife edge flange which penetrates gel in the filter frame to provide a leak-proof seal.
		3. Plenum and knife edge shall be factory PAO scanned according to standard IEST-RP-CCO34.3 to ensure a leak free assembly.
		4. A static pressure port accessible from the room side shall be factory supplied to measure pressure drop across the filter, and to sample aerosol concentrations before the filter.
		5. The diffuser face shall be multi-angular perforated aluminum that extends below the ceiling by approximately 5.75 inches (146 mm), and includes an integral plenum with duct connections.
			1. The face shall incorporate directional control vanes, quick-release latches and full length hinge connection to the plenum.
			2. The hinge shall be designed to allow complete separation of the face and plenum, if required.
			3. Room side access shall be available to the interior of the unit without removing the plenum.
			4. Screw and/or clip-mounting of the diffuser face shall not be accepted.
			5. The plenum shall be fully accessible for cleaning with no internal baffles or obstructions.
			6. The filter housing shall be coated steel construction and shall be sealed airtight at all joints and corners.
			7. The inlet collar shall be sealed to the top of the filter housing.
			8. A static pressure port shall be fitted to allow measurement of the pressure drop across the filter.
			9. The unit shall be factory sealed and tested to ensure leakage is consistent with the filter.
		6. Mounting frames shall be provided for surface mounting and T-bar installation.
	3. Finish:
		1. The perforated face, plenum, and damper shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 80 in-lb.
		2. The filter housing and inlet connection shall be mill finish coated steel.
	4. Filter:
		1. The filter shall be a two inch thick pleated microglass element in a three inch deep anodized aluminum frame.
		2. The filter shall have an integral cavity filled with gel which shall provide a leak tight seal between the filter frame and the border.
		3. Filters shall be packaged separately from the filter housing in a factory carton until site conditions are appropriate for installation (by others) of the filter in the housing.
		4. The filter shall be held in place by four cam-type retainers which can be turned 90 degrees by hand, providing an easy means of removing and replacing filters without disturbing the filter housing in the ceiling or the duct connection.
		5. The filter shall be individually tested for particle penetration and initial air flow resistance, and shall be of type (**select one**):
			1. High Efficiency (HE) filter shall provide 95% efficiency on 0.30 μm particulate.
			2. High Efficiency Particulate Air (HEPA) filter shall provide 99.99% efficiency on 0.30 μm particulate.
			3. Ultra-Low Penetration Air (ULPA) filter shall provide 99.9995% efficiency on 0.12 μm particulate.
	5. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with half-inch aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM E84 and UL 723.
	6. Inlet damper (**optional**):
		* 1. The inlet damper shall be steel construction with standard white B12 baked-on powder coat finish.
			2. A remote cable shall be used to adjust the damper while the filter is in place.
12. Flush Face Radial Flow Diffuser: Models FRFD, AFRFD, FRFDSS
	1. Supply and install Price [FRFD, AFRFD, FRFDSS] flush face radial flow diffusers of the sizes, configurations, and capacities indicated on the drawings and/or diffuser schedule.
	2. Each diffuser shall supply a [two-way or one-way] radial air pattern.
	3. Plenum and equalization baffle material shall be (**select one**):
		1. Steel [FRFD]
		2. Aluminum [AFRFD]
		3. Stainless Steel [FRFDSS]
	4. Diffuser frame material shall be (**select one**):
		1. Aluminum [FRFD, AFRFD]
		2. Stainless Steel [FRFDSS]
	5. Construction:
		1. The face shall lay even with the ceiling line, with no part of the diffuser projecting below the ceiling system.
		2. The diffuser face shall open easily with quarter-turn fasteners and retainer cable for damper adjustment and cleaning.
		3. The diffuser air deflector blades shall be located below an equalization baffle.
			1. The equalization baffle and plenum shall be shall be fully accessible for cleaning with no internal baffles or obstructions, and provided in (select one):
				1. Aluminum [AFRFD]
				2. Stainless steel [FRFDSS]
				3. Painted steel [FRFD]
		4. The face frame, border, and deflector blade components shall be aluminum [AFRFD] or painted steel [FRFD] construction.
		5. Mounting frames shall be provided for surface mounting and T-bar installation.
	6. Diffuser Finish (**select one**):
		1. All aluminum components shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 80 in-lb.
		2. All stainless steel components shall have #4 polished finish on exposed surfaces.
	7. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with ½” aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM-84 and UL 723.
	8. Inlet damper (**optional**):
		1. The butterfly style damper shall be (**select one**):
			1. Steel construction with standard white B12 baked-on powder coat finish.
			2. Stainless steel construction with brushed finish.
13. Adjustable Flush Face Radial Flow Diffuser: Models FRFDA, AFRFDA, FRFDSSA
	1. Supply and install Price [FRFDA, AFRFDA, FRFDSSA] adjustable flush face radial flow diffusers of the sizes, configurations, and capacities indicated on the drawings and/or diffuser schedule
	2. Each diffuser shall be adjustable to supply a precise, repeatable, low velocity air flow in the following patterns:
		1. Two-way radial
		2. One-way radial
		3. Two-way horizontal
		4. Vertical
	3. Pattern adjustments shall be affected by setting pattern adjustment controllers in predetermined locations above the equalization baffle.
	4. Pattern adjustment at the face using moveable blades shall not be acceptable.
	5. Construction:
		1. Plenum and equalization baffle material shall be (**select one**):
			1. Steel [FRFDA]
			2. Aluminum [AFRFDA]
			3. Stainless Steel [FRFD-SSA]
		2. Diffuser frame material shall be (**select one**):
			1. Aluminum [FRFDA, AFRFDA]
			2. Stainless Steel [FRFDSSA]
		3. The equalization baffle and plenum shall be (**select one**):
			1. Painted steel [FRFDA]
			2. Aluminum [AFRFDA]
			3. Stainless steel [FRFDSSA]
		4. The face frame, border, and deflector blade components shall be (**select one**):
			1. Aluminum [FRFDA, AFRFDA]
			2. Stainless steel [FRFDSSA]
		5. The face of the diffuser shall lay even with the ceiling line, with no part of the diffuser projecting below the ceiling system.
		6. The diffuser face shall open easily with quarter-turn fasteners and retainer cable for damper adjustment and cleaning.
		7. The diffuser air deflector blades shall be located below an equalization baffle.
		8. The plenum shall be fully accessible for cleaning with no internal baffles or obstructions.
		9. Mounting frames shall be provided for surface mounting and T-bar installation.
	6. Diffuser Finish (**select one**):
		1. All aluminum components shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 160 in-lb.
		2. All stainless steel components shall have #4 polished finish on exposed surfaces.
	7. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with half-inch aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM-84 and UL 723.
	8. Inlet damper (**optional**):
		1. The butterfly style damper shall be (**select one**):
			1. Steel construction with standard white B12 baked-on powder coat finish.
			2. Stainless steel construction with brushed finish.
14. Flush Face Radial Flow Diffuser with Perforated Face: Models FRFDP, AFRFDP, FRFDPSS
	1. Supply and install Price [FRFDP, AFRFDP, FRFDPSS] flush face radial flow diffusers with perforated face of the sizes, configurations, and capacities indicated on the drawings and/or diffuser schedule.
	2. Construction:
		1. Diffuser frame, border, and deflector blade material shall be (**select one**):
			1. Aluminum [FRFDP, AFRFDP]
			2. Stainless Steel [FRFDPSS]
		2. Plenum, and equalization baffle material shall be (**select one**):
			1. Steel [FRFDP]
			2. Aluminum [AFRFDP]
			3. Stainless Steel [FRFDPSS]
		3. The perforated face shall be (**select one**):
			1. Painted steel [FRFDP]
			2. Aluminum [AFRFDP]
			3. Stainless steel [FRFDPSS]
		4. The entire face of the diffuser shall lay even with the ceiling line, with no part of the diffuser projecting below the ceiling system.
		5. The diffuser face shall open easily with quarter-turn fasteners and retainer cable for damper adjustment and cleaning.
		6. The diffuser air deflector blades shall be located below an equalization baffle.
		7. Mounting frames shall be provided to allow for surface mount and T-bar installation.
	3. Diffuser Finish (**select one**):
		1. All aluminum components shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 80 in-lb.
		2. All stainless steel components shall have #4 polished finish on exposed surfaces.
	4. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with half-inch aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM-84 and UL 723.
	5. Inlet damper (**optional**):
		1. The butterfly style damper shall be (**select one**):
			1. Steel construction with standard white B12 baked-on powder coat finish.
			2. Stainless steel construction with brushed finish.
15. Flush Face Radial Flow Diffuser with Cleanroom Filter: Models AFRFDC, FRFDCSS
	1. Supply and install Price [AFRFDC, FRFDCSS] flush face radial flow diffusers with cleanroom filter of the sizes, configurations, and capacities indicated on the drawings and/or diffuser schedule
	2. Construction:
		1. The diffuser construction shall be (**select one**):
			1. Aluminum [AFRFDC]
			2. Stainless Steel [FRFDCSS]
		2. The diffuser shall consist of a ceiling mounting frame, perforated face, airtight filter housing, remote operated volume control damper, and replaceable high efficiency filter.
		3. The face of the diffuser shall lay even with the ceiling line, with no part of the diffuser projecting below the ceiling system.
		4. The diffuser face shall open easily with quarter-turn latches and stainless steel retainer cables for damper adjustment and cleaning from the room side without moving the backpan/plenum.
		5. The inlet collar shall be sealed to the top of the filter housing.
		6. The diffuser air deflector blades shall be located below an equalization baffle.
		7. The plenum shall be fully accessible for cleaning with no internal baffles or obstructions.
		8. Mounting frames shall be provided for surface mounting and T-bar installation.
	3. Filter:
		1. The filter shall be a two inch thick pleated microglass element in a three inch deep anodized aluminum frame.
		2. The filter housing shall be:
			1. Aluminum construction [AFRFDC]
			2. Continuously welded [FRFDCSS]
		3. The filter shall have an integral cavity filled with gel which shall provide a leak tight seal between the filter frame and the border.
		4. The filter border shall have an integral knife edge flange which penetrates a silicone gel in the filter frame to provide a leak-proof seal.
		5. The filter shall be supplied with a static pressure port to allow measurement of the pressure drop across the filter.
		6. The unit shall be factory sealed and tested to ensure leakage is consistent with the filter.
		7. Filters shall be packaged separately from the filter housing in a factory carton until site conditions are appropriate for installation (by others) of the filter in the housing.
		8. The filter shall be held in place by four cam-type retainers which can be turned 90 degrees by hand, providing an easy means of removing and replacing filters without disturbing the filter housing in the ceiling or the duct connection.
		9. The filter shall be individually tested for particle penetration and initial air flow resistance, and shall be of type (**select one**):
			1. High Efficiency (HE) filter shall provide 95% efficiency on 0.30 μm particulate.
			2. High Efficiency Particulate Air (HEPA) filter shall provide 99.99% efficiency on 0.30 μm particulate.
			3. Ultra-Low Penetration Air (ULPA) filter shall provide 99.9995% efficiency on 0.12 μm particulate.
	4. Diffuser Finish (**select one**):
		1. All aluminum components shall have a white B12 baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours.
			5. The finish shall have an impact resistance of 80 in-lb.
		2. All stainless steel components shall have #4 polished finish on exposed surfaces.
	5. External Insulation (**optional**):
		1. The diffuser plenum shall be externally insulated with half-inch aluminum foil-backed fiberglass insulation.
		2. Insulation shall not contain formaldehyde.
		3. Insulation and adhesive surface burning characteristics shall have a maximum flame/smoke spread of 25/50.
		4. Insulation shall meet the requirements of ASTM-84 and UL 723.
	6. Inlet damper (**optional**):
		1. The damper shall be (**select one**):
			1. Steel construction with standard white B12 baked-on powder coat finish.
			2. Stainless steel construction with brushed finish.

**PART 3 – EXECUTION**

**3.01 Examination**

A. Verify that conditions are suitable for installation.

B. Verify that field measurements are as shown on the drawings.

**3.02 Installation**

1. Install in accordance with manufacturer’s instructions.
2. See drawings for the size(s) and locations of laminar flow diffuser inlets.
3. Support components individually from structure in accordance with SMACNA (SRM).
4. Do not support components from ductwork.
5. Connect to ductwork in accordance with Section 23 31 00.

**3.03 Adjusting**

1. Ensure supply air to the laminar flow diffusers by performing pitot traverse of the main supply duct.
2. Balance outlets according to manufacturer’s recommendations.
3. Verify that field measurements are as shown on the drawings.

**3.04 Field Quality Control**

1. See Section 01 40 00 – Quality Requirements for additional requirements.

**3.05 Cleaning**

1. See Section 01 74 19 – Construction Waste Management and Disposal for additional requirements.

**3.06 Closeout Activities**

1. See Section 01 78 00 – Closeout Submittals for closeout documentation requirements.
2. See Section 01 79 00 – Demonstration and Training for additional requirements.