

Flush Face Radial Flow Diffuser with HEPA Filter

AFRFDC/FRFDCSS Series

Product Information

Models

Aluminum Construction **AFRFDC**

Stainless Steel Construction **FRFDCSS**

Price FRFDC Series Flush Face Radial Flow Diffusers with replaceable high efficiency filters provide a unique method of air distribution for modern critical environments. They are designed to provide large volumes of filtered air with low room velocities - a situation not always possible with laminar flow panels.

The Price FRFDC combines the best features of both louvered and laminar flow diffusers. Its architecturally pleasing ceiling flush perforated face produces low initial face velocities, minimizing entrainment of room air, while its perforated face and internal louvered baffles distribute large volumes of air in a semi-cylindrical air pattern. A replaceable high efficiency filter allows the FRFDC to "flush" or displace contaminated air from the area with large volumes of clean, low velocity air.

Features

- Face of diffuser easily removed for access to the filter.
- Static pressure port to measure filter pressure drop.
- Surface mount or 1" (25) wide gasketed T-bar ceilings.
- Housing factory scanned for leaks.
- Optional steel full flow damper with remote cable operator.

Filters

- Easily replaceable high efficiency filter with silicone or urethane gel seal, which provides a leakproof seal between the filter and housing.
- Available filter efficiencies:

HE	95% at 0.3 µm
HEPA	99.99% at 0.3 µm
ULPA	99.999% at 0.12 µm

Construction/Finish

- Standard construction is aluminum perforated face and vanes with a filter housing of satin coat steel. Border and perforated face are finished in B12 white powder coat. Housing is mill finish.
- Optional steel volume control damper is finished in B12 white powder coat. Stainless steel also available.

PAO Tested

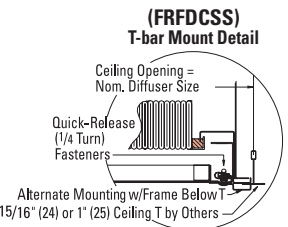
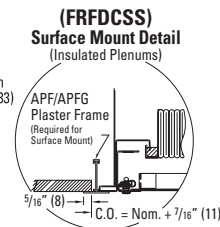
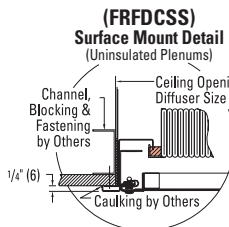
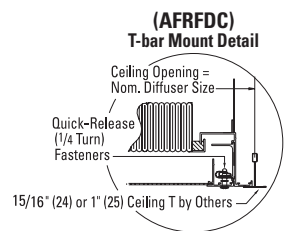
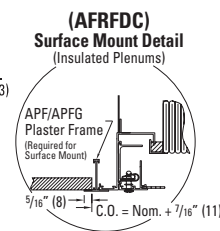
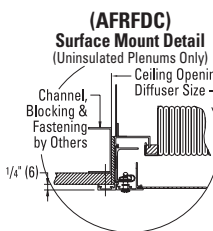
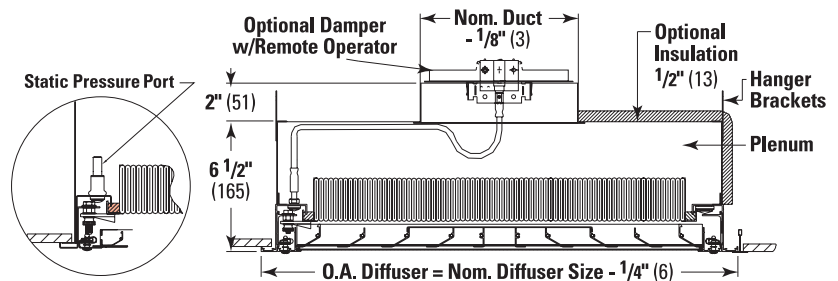
AFRFDC



Dimensional Data

Imperial (in.) / Metric (mm)

Nominal Diffuser Size	Inlet Size	Filter Area
24 x 24	10"	2.037 ft ²
24 x 48	12"	4.890 ft ²



✓ Product Selection Checklist

- 1] Select Diffuser Type by model number (AFRFDC).
- 2] Select Inlet Diameter.
- 3] Select Diffuser Size based on ceiling.
- 4] Select Filter Type (HE, HEPA, ULPA).
- 5] Select Volume Control Damper (VCR8E) if desired (see page E124).
- 6] Select Insulated Housing (AFI) if desired (see page E124).
- 7] Select Damper Construction if required.

Example: AFRFDC / 10" / 24" x 48" / HEPA

Flush Face Radial Flow Diffuser with HEPA Filter AFRFDC/FRFDCSS Series



Performance Data

2 Way Radial Pattern

Model / Neck Size	Air Flow (cfm)	ΔPs (in. w.g.)	ΔPt (in. w.g.)	NC	Throw ft, 100-75-50 fpm					
					Vertical			Horizontal		
					5 °F Cooling	10 °F Cooling	15 °F Cooling	5 °F Cooling	10 °F Cooling	15 °F Cooling
24" x 24"	150	0.220	0.225	-	1-2-3	1-3-4	2-4-5	1-1-2	1-2-2	2-2-2
10"	200	0.320	0.328	-	1-3-5	1-3-5	2-3-5	1-2-3	1-2-3	2-2-2
Inlet	300	0.550	0.569	-	2-3-5	3-4-5	4-5-6	3-4-5	3-4-5	3-3-4
24" x 48"	500	0.485	0.510	22	3-4-6	5-6-7	2-4-8	2-2-2	1-1-2	1-1-2
12"	600	0.607	0.643	29	3-4-7	3-5-7	4-6-8	2-2-3	2-2-3	2-2-2
Inlet	700	0.729	0.778	32	5-6-8	4-6-8	5-6-8	3-3-4	2-3-3	2-2-3

Performance Notes:

1. Units are tested in accordance with ASHRAE Standard 70-2006.
2. Air flow is in cubic feet per minute, cfm.
3. All pressures are in in. of water.
4. The NC values, sound pressure level, are based on a room absorption of 10 dB re 10⁻¹² watts and one diffuser.
5. Blanks (-) indicate an NC value less than 20.
6. Performance is based on diffuser with HEPA filter.

Product Overview

Filter Types*

HE 95%	HEPA 99.99%	ULPA 99.9995%
<p>95% (High Efficiency) 0.3µm particle size. Individually tested per MIL-STD-282 for efficiency and resistance. Lower initial resistance and higher dust-holding capacity than HEPA filters.</p>	<p>HEPA filters with a minimum efficiency of 99.99% on 0.3µm particles. Filters are tested in accordance with IES-RP-CC001.3 recommended practice for type C filters. Test aerosol is either Dioctyl Phthalate (DOP) or PSL (Polystyrene Latex).</p>	<p>ULPA filters with a minimum efficiency of 99.9995% on 0.12µm particles. Filters are tested in accordance with IES-RP-CC00.7 for overall penetration and leakage. Challenge aerosol used is PSL (Polystyrene Latex).</p>

µm = Micron = 10⁻⁶m = 0.000001 meter

*Other filter efficiencies available upon request.

Price offers a variety of products with replaceable high efficiency filters. All filtered models are room-side replaceable and are equipped with an easily removable face, allowing for the replacement of the filter without access to the ceiling or ductwork. The filter is attached to the diffuser with four cam-type retainers which provide positive fastening and easy removal. A gel seal filter frame and knife-edge flange provide a leakproof seal between the filter and housing. Several grades of filter are offered, as per the chart on this page.

Construction

High efficiency filters for Price diffusers are a 2 in. (51) or 3 in. (76) thick construction in anodized aluminum frames. See next page for installation details.

The filter media is fabricated using a moisture-resistant microfine fiberglass that is formed into closely spaced pleats. The room-side replaceable filter frame cavity is filled with a silicone or urethane gel seal designed to provide an airtight seal between the filter and the filter housing. The seal remains stable and self-healing under the most demanding conditions, yet allows the filter to be easily removed and replaced. The gel is highly self-adhesive and will not stick to the filter housing when the filter is removed.

The filter frame cavity is 100% sealed,

providing an airtight seal between the filter and the filter housing. The seal remains stable under the most strenuous circumstances.

Packaging

Filters will be packaged separately from the filter housing and shipped directly from the filter manufacturer to the jobsite. This is to minimize the risk of damage to the filters during transportation and handling. Filters should be removed from their cartons and installed once the system has been cleaned and blown down with both roughing and pre-filters in place.

Installation

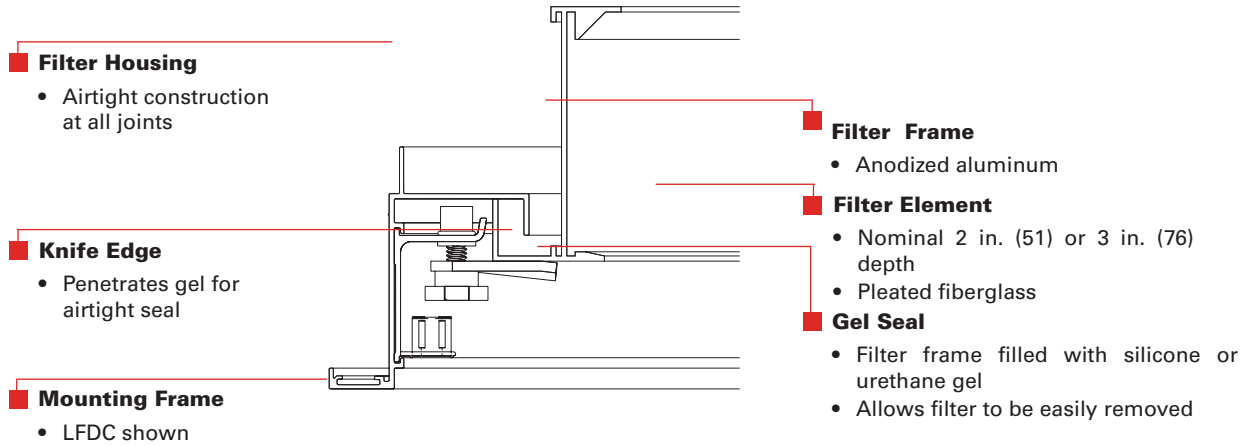
All installations should be operated with roughing (30% ASHRAE efficiency) and pre-filters (90% ASHRAE efficiency). It is recommended that these two stages be utilized, which will extend the high efficiency filter life by nearly 10 times. When installed in such a manner, the filter should provide years of service.

A periodic (annual) check of air flow is recommended. When the filter throughput declines to an unacceptable level due to particle accumulation, the filter should be replaced. Contact Price Customer Service for replacement information.

CRITICAL ENVIRONMENTS

Filter Installation Details

Figure 1. Room-side replaceable filters



- Filter Retainers**
- Four (4) thumb wheel retainers hold filter in housing.
 - Allows easy means of removing and replacing filter without disturbing ceiling seal or duct connections.
 - Price unique adjustable latch prevents air leaks by not penetrating through the knife edge frame.

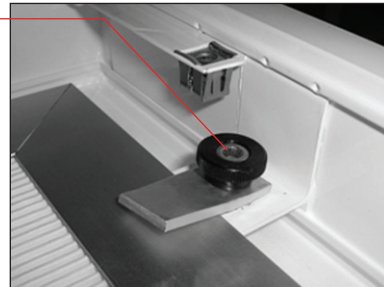
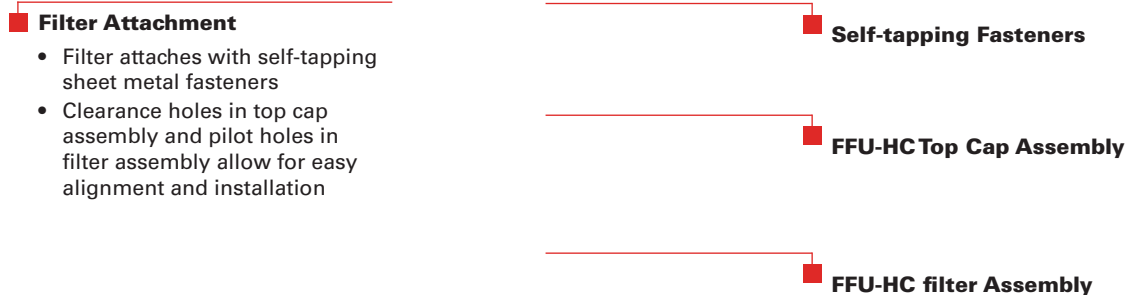


Figure 2. FFU-HC filters



Factory Testing

Factory Testing

In order to achieve the required cleanliness level in a cleanroom or other critical applications, the entire diffuser / filter assembly must be free of leaks to prevent unfiltered air from entering the space. All filters supplied by Price are tested by the filter manufacturer at their factory to verify the specified efficiency and leakage.

Price factory tests **all products with high efficiency filters** using methods corresponding to IEST Recommended Practices for scan testing. This is to ensure that Price products' housing and frames are consistent with the filter's leakage standards. The scan test will identify pinholes in a weld or joint undetectable by conventional leakage tests.

Factory leak testing takes place in a Class 10,000 cleanroom, where each plenum is challenged with aerosolized polyalphaolefin. A photometer is used to scan the plenum for leaks.

A label is attached to each plenum verifying the unit has passed the factory test.

PAO Tested

Note: PAO - Price factory is polyalphaolefin (PAO).

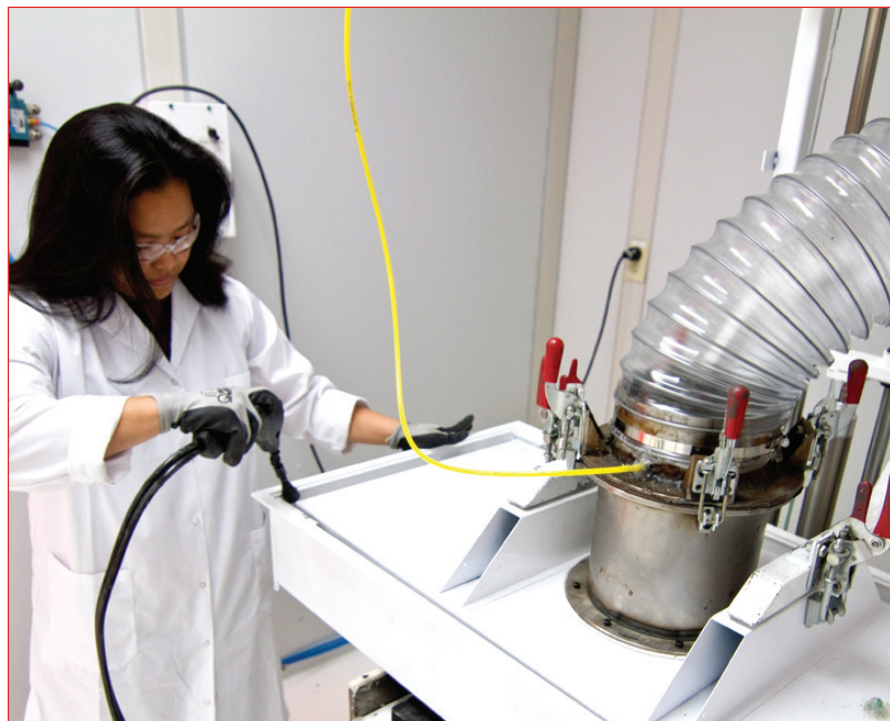
Clean Room Assembly

To further ensure product quality and consistency, Price goes beyond PAO testing. All Price products with high-efficiency filters are assembled inside the same 2000 sq.ft cleanroom that is home to the PAO testing. Certified technicians assemble Price model families LFDC, RFDC, AMDC and FFU in this clean, carefully controlled manufacturing environment. The Price cleanroom features secure access doors to ensure only certified Price technicians are working on or testing these products which are destined for such critical applications. Airborne contaminant control is achieved in the Price cleanroom using Price FFU units to supply nearly 20 air changes per hour of HEPA filtered supply.

Cleanroom for factory assembly and leak test



Factory PAO Test



Application Information

Cleanroom Applications

Applications for Price products with high efficiency filters include clean space environments in research, industry and medical facilities.

- **Microelectronics** - manufacturing semiconductor circuits including material production, water fabrication, assembly, and testing where particle size removal to $0.12\mu\text{m}$ is necessary.
- **Pharmaceutical** - manufacture of sterile pharmaceutical products, such as injectables and topicals where bacterial contamination removal is critical.
- **Biotechnology** - applications in fermentation, food processing, antibiotics, and genetic engineering where contamination and containment of organisms is to be controlled.
- **Medical** - used in surgery and patient isolation areas where contamination must be limited to prevent infection.
- **Other** - including aerospace manufacturing and assembly, advanced materials research, and laser/optic industries.

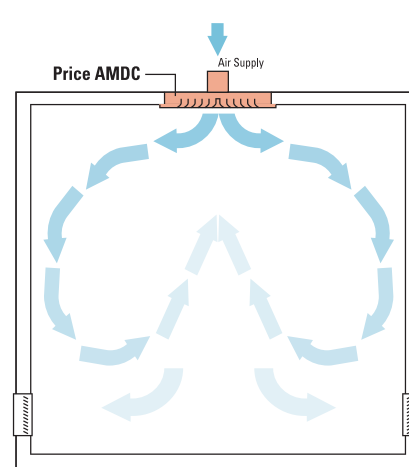


Air Flow

Cleanrooms can be differentiated by two types of supply air flow: non-unidirectional (turbulent) and unidirectional (low-turbulence) flows.

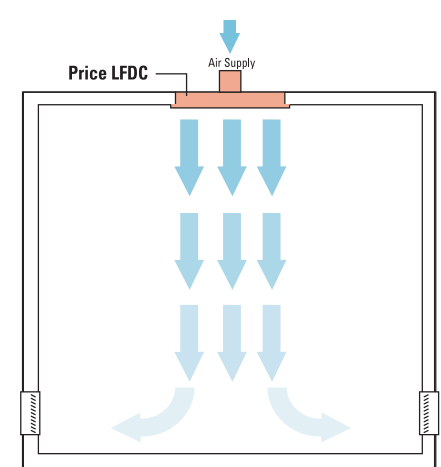
- Non-unidirectional air flow leads to a dilution of air contamination by entraining room air and turbulently mixing it with clean primary supply air.
- The Price RFDC, FRFDC, AMDC, RVDC are designed to provide non-unidirectional flow of air into a room.
- Unidirectional air flow displaces contamination by moving clean supply air in a low-turbulence or laminar flow through an entire room. When the clean air is introduced from the ceiling, this provides a nominally parallel air flow; this space is known as a vertical laminar flow room.
- The Price LFDC and FFU are designed to provide a unidirectional or vertical laminar flow of air into a room.

A cleanroom ceiling is comprised of laminar flow diffusers with filters. As the class of the cleanroom gets lower (cleaner), a larger proportion of the ceiling will require filtered diffusers.



Non-Unidirectional Air Flow

Contaminated room air is mixed and diluted with clean supply air, providing less demanding levels of cleanliness.



Unidirectional Air Flow

Contaminated room air is displaced with clean supply air, providing highest degree of cleanliness.

Application Information

The cleanliness level of a cleanroom is partly determined by the type of filter utilized and the rate of air change in the room. Refer to the Engineering Guide for filter efficiency recommendations.

The filter selection by particle removal efficiency is determined by the application. The MERV rating is used to denote particle removal efficiency. MERV is the Minimum Efficiency Reporting Value based on ASHRAE Standard 52.2-1999. Typically, medical or food processing applications may require MERV 14 to 18 (95% to 99.99%), while microelectronics applications may utilize MERV 20 (99.999% on 0.1 micron particles). For hospital applications, the filter efficiency is determined by ASHRAE or other governing bodies. The table to the right can be used as a reference. Where two filter banks are indicated, Filter Bank No. 1 should be located upstream of air-conditioning equipment and Filter Bank No. 2 should be downstream of the supply fan. Where only one filter bank is indicated it should be located upstream of air-conditioning equipment.

Air supply volume must take into account the following:

- Minimum air change rates to meet the appropriate clean room standards for removal of internal contamination.
- Internal heat gain.
- Air volume required to pressurize the room.

Performance data tables are provided to demonstrate the air flow characteristics of all Price products with filters. Selection of the size and number of air outlets can be made by determining total air volume requirements (air changes) in the room and the required air velocities within the room.

Filter Efficiency for Central Ventilation and Air-Conditioning Systems in General Hospitals

Minimum Number of Filter Beds	Area Designation	Filter Efficiencies, MERV ^a	
		No. 1	No. 2
2	Orthopedic operating room Bone marrow transplant operating room Organ transplant operating room	8	17 ^b
2	General procedure operating rooms Delivery rooms Nurseries Intensive care units Patient care rooms Treatment rooms Diagnostic and related areas	8	14
1	Laboratories Sterile storage	13	--
1	Food preparation areas Laundries Administrative areas Bulk storage Soiled holding areas	8	--

^aMERV = Minimum Efficiency Reporting Value, based on ASHRAE Standard 52.2-1999.

^bHEPA filters at air outlets.

Reference: 2007 ASHRAE HVAC Applications Handbook.

Products with HE/HEPA/ULPA Filters

AFRFD - with High Efficiency Filter

Supply and install Price FRFD Flush Face Radial Flow Diffuser with high efficiency filter of the sizes and capacities indicated on the drawings or diffuser schedule.

Each diffuser shall provide a radial, non-aspirating low velocity supply of clean air to the space.

The diffuser shall consist of a ceiling mounting frame, perforated face, airtight filter housing, remote operated volume control damper, and replaceable high efficiency filter.

The border shall be of aluminum construction and suitable for use in gasketed T-bar ceilings or plaster ceilings. The border shall have an integral knife edge flange which penetrates a filled with a silicone or urethane gel in the filter frame to provide a leakproof seal.

The perforated face shall be flush with ceiling level, 0.04" (1) thick aluminum, and shall incorporate quick-release latches. Room-side access shall be available to the interior of the unit without moving the backpan/plenum. The face shall open easily with 90° quick-release fasteners and safety chains for easy access to the filter.

The filter housing shall be of .040" (1) thick aluminum construction and sealed airtight at all joints and corners. The inlet collar shall be sealed to the top of the filter housing. A static pressure port shall be fitted to allow measurement of the pressure drop across the filter. The unit is to be factory sealed and tested to assure leakage is consistent with the filter.

The optional volume control damper shall be a steel construction full flow type damper located in the inlet collar. A remote cable operator shall be used to adjust the damper while the filter is in place.

The filter shall be a 2" (51) thick construction element in an anodized aluminum frame. The filter shall have an integral cavity filled with a silicone or urethane gel which shall provide a leak-tight seal between the filter frame and the border. 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 into the housing.

The filter shall be selected from the following particle sizes: 95% HE on .3 µm, 99.99% HEPA on .3 µm or 99.999% ULPA on 0.12 µm, and shall be individually tested for particle penetration and initial air flow resistance.

The filter shall be held in place by four (4) cam-type retainers which can be turned 90° by hand, providing an easy means of removing and replacing filters without disturbing the filter housing in the ceiling or the duct connection.

The border, perforated face filter housing, and optional volume control damper shall be a B12 white powder coat finish.

The manufacturer of the radial flow diffuser with replaceable filter shall provide performance data for air volume, initial pressure drop, sound levels, and throw. All data must be tested in accordance with ASHRAE Standard 70-2006 "Method of Testing for Rating the Performance of Air Outlets and Inlets."

FRFD CSS - with High Efficiency Filter

Supply and install Price FRFD CSS Stainless Steel Flush Face Radial Flow Diffuser with high efficiency filter of the sizes and capacities indicated on the drawings or diffuser schedule.

Each diffuser shall provide a radial, non-aspirating low velocity supply of clean air to the space.

The diffuser shall consist of a ceiling mounting frame, perforated face, airtight filter housing, remote operated volume control damper (optional), and replaceable high efficiency filter. The border shall be of 304 stainless steel construction and suitable for use in gasketed T-bar ceilings or plaster ceilings. The frame shall have an integral knife edge flange which penetrates a silicone or urethane gel in the filter frame to provide a leakproof seal.

The perforated face shall be .037" (1) thick brushed 304 stainless steel perforated with .188" (5) diameter holes staggered 60° on .25" (6) centers, surrounded by a brushed stainless steel frame. The face shall have stainless steel 90° quick-release fasteners for easy access to the filter. The face assembly shall be fastened to the rest of the diffuser with safety chains.

The filter housing shall have continuously welded corners, and the inlet collar shall be sealed to the top of the filter housing. A static pressure port shall be fitted to allow measurement of the pressure drop across the filter. The unit is to be factory sealed and tested to assure leakage is consistent with the filter.

The volume control damper (optional) shall be a steel construction full flow type damper located in the inlet collar. A remote cable operator shall be used to adjust the damper while the filter is in place.

The optional volume control damper shall be a sterile white thermal setting finish. The filter shall be a 2" (51) thick construction element in an anodized aluminum frame. The filter shall have an integral cavity filled with a silicone or urethane gel, which shall provide a leak-tight seal between the filter frame and the border. 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 into the housing.

The filter shall be selected from the following particle sizes: 95% HE on .3 µm, 99.99% HEPA on .3 µm or 99.999% ULPA on 0.12 µm, and shall be individually tested for particle penetration and initial air flow resistance.

The filter shall be held in place by four (4) cam-type retainers which can be turned 90° by hand, providing an easy means of removing and replacing filters without disturbing the filter housing in the ceiling or the duct connection.

The manufacturer of the radial flow diffuser with replaceable filter shall provide performance data for air volume, initial pressure drop, sound levels, and throw. All data must be tested in accordance with ASHRAE Standard 70-2006 "Method of Testing for Rating the Performance of Air Outlets and Inlets."