Flanders/FFI®

FOREMOST IN AIR FILTRATION

Channel Ceil System

Vertical Laminar Flow Filter Ceiling

Bulletin PB0891-0207

General

Flanders CHANNEL-CEIL® System is recognized as the state-of-the-art product available for construction of HEPA filter ceilings. Flanders invented the CHANNEL-CEIL® System in 1969 as a solution to the problem of bypass leakage around filters in vertical laminar flow cleanrooms. Since then, this system has been installed in over 4,000,000 sq. ft. of cleanrooms worldwide.

Versatile Applications

The CHANNEL-CEIL® System has found wide acceptance and many applications, including:

- Microelectronics
- Memory Systems
- Parenteral Drug Manufacturing
- Dairy Production
- Thin Film Processing
- Aerospace
- Nuclear Fusion Research

There are many CHANNEL-CEIL® installations using ULPA or VLSI® grade filtration which have achieved environments of Class 1 and better on 0.12 micron particle size. When using standard scan tested HEPA filters, the rooms generally perform at Class 50 to Class 20 on a particle size of 0.5 micron and larger.

Flanders' CHANNEL-CEIL® System is available in two grid system to meet varying requirements concerning installation, seismic qualification, choice of sealant and appearance. This bulletin contains information on one of these ceiling system designs.

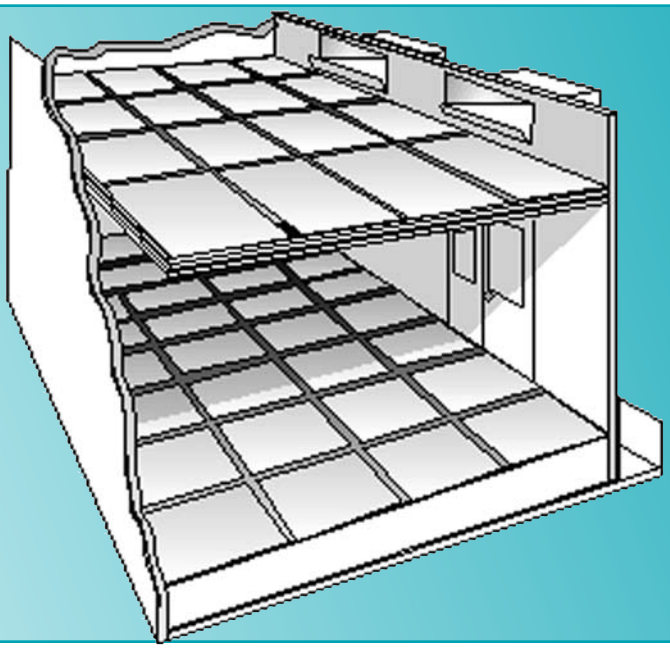
Quality Assurance

Any industry that has dangerous process or exhaust gases and/or particulates has a vital concern for the health and safety of personnel. In addition to corporate concern, the United States Government has dictated that safety equipment meet minimum safety standards. Any equipment sold to meet these minimum standards has to be manufactured using accepted Quality Control procedures.

Flanders has developed a Quality Assurance pro-

Important Features

- A solution to bypass leakage around filters in vertical laminar flow cleanrooms
- Also available in two-grid system
- Factory Mutual approved



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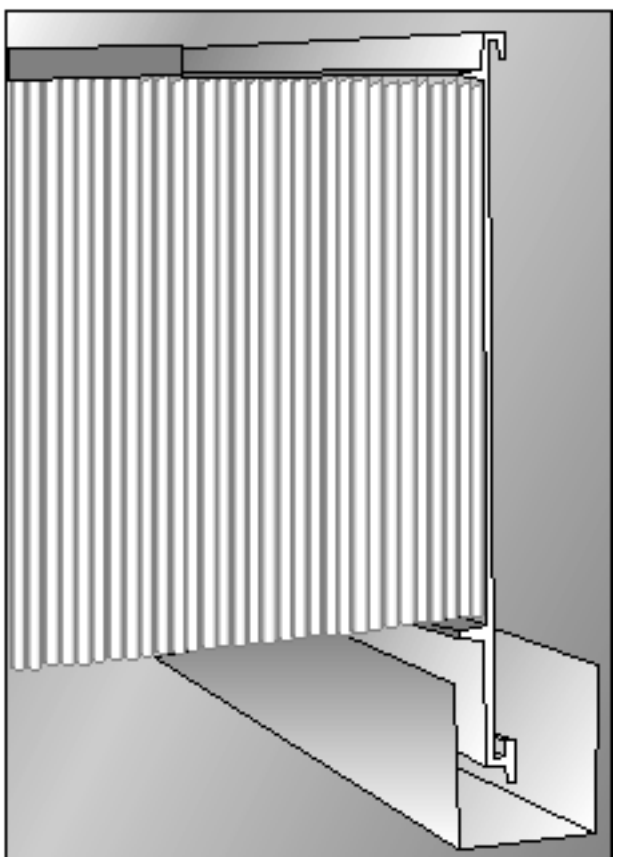
gram to assure that the product or service provided meets these standards. This program addresses the entire range of Flanders' involvement, including the purchase of raw materials, the shortage of these raw materials, incorporation of these materials into a product or service, testing this product or service, and then shipping it to its destination.

The program at Flanders has been audited many times, and each time the program has been acceptable. An uncontrolled copy of the program manual is available with each request for Quality Assurance information. Like any dynamic document, the program is continually being revised to include recent issues of standards and specifications in order that Flanders may use the latest state-of-the-art methods in providing its products and services.

Notes:

1. As part of our continuing program to improve the design and quality of all our products, we reserve the right to make such changes without notice or obligation.

2.Flanders, through its limited warranty, guarantees that the products describe herein will meet all specifications agreed to by the buyer and the seller.



NOTICE . . . Compliance with installation and operation standards must be met to ensure quality performance.

HEPA filters are factory tested to meet the requirements of IEST RP-CC001.3 for Type A, B, C, D, E or F filters:

- Industrial Grade
- Nuclear Grade
- Laminar Flow Grade
- Bio/Hazard Grade HEPA
- VLSI
- ULPA
- Pharmaceutical Grade

Test results appear on both the filter label and upon the filter carton label. An additional quality assurance test report is kept on file and is available on request.

Flanders recommends that all HEPA filters be tested in place by qualified personnel to ensure that the filters have been correctly installed in the containment housing.

Flanders service personnel are available for installations, supervision of installation, testing and certification of compliance to industry and government standards and instruction of the owner's personnel in testing and maintenance procedures. Flanders does not guarantee that its equipment will operate at the performance levels given on the identification labels or in the catalog specifications under all conditions of installation and use, nor does Flanders guarantee the suitability of its product for the particular end use which may be contemplated by the buyer.

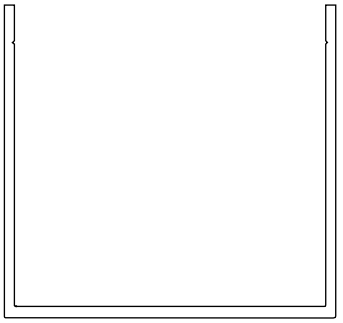
For best results, it is recommended that the buyer supply complete information about the operating conditions of the ventilation system to Flanders for evaluation. When the system components are supplied to the buyer or his agent for final installation and assembly in the field, it should be under the supervision of factory trained personnel.

Failure to adhere to this recommendation or failure of the buyer to have filters timely retested and serviced will nullify or limit any warranties which might otherwise apply and may result in a compromised installation.

Cutaway view of the CHANNEL-CEIL® System and a 4-inch deep DIMPLPLEAT® Filter. The filter skirt is embedded in the sealant to effect the filter-to-grid seal. This concept was invented and developed by Flanders and is used in the majority of the open-plenum vertical laminar flow installations in service in the world.

CHANNEL-CEIL® Grid

The original CHANNEL-CEIL® System is a suspended filter ceiling based on a deeper U-channel grid. Although the grid was originally designed for Protopet fluid sealant, it is equally effective using BLU-JEL® Seal. This system is equivalent in performance to the CHANNEL-CEIL III grid, but offers added flexibility die to its unique telescope fit feature.

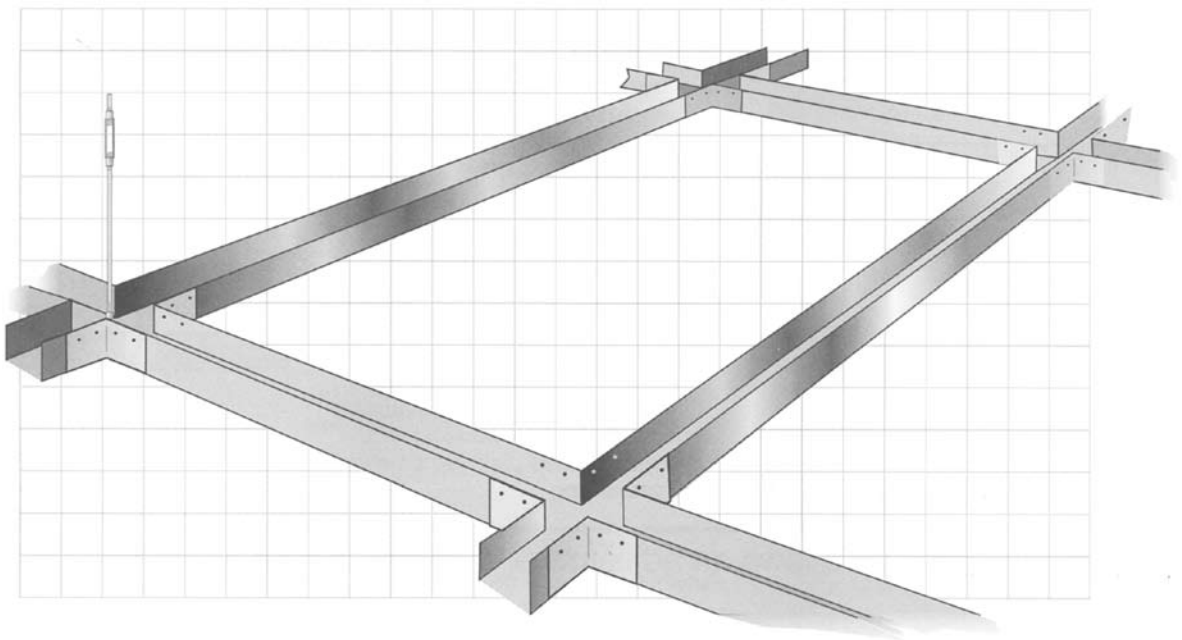


U-channel Grid Section View

It is an exceptionally strong ceiling, and it is seismically qualified to UBC Zone 4. It is also Factory Mutual Approved.

The components of the grid are:

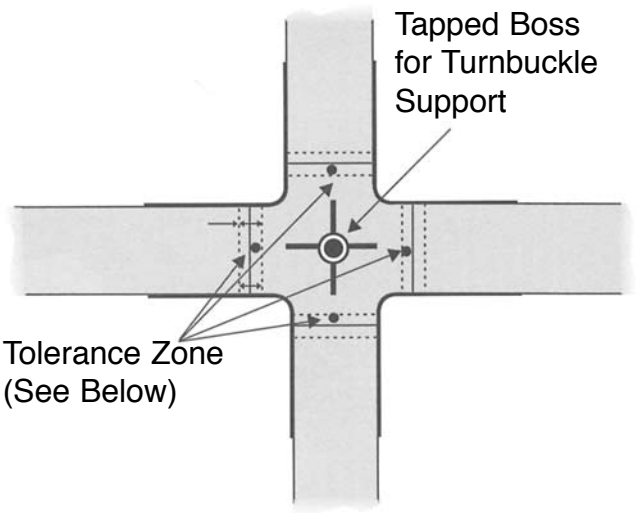
- Turnbuckle Hangers
- U-Channels—2 ft. and 4 ft.
- Cross Castings
- Perimeter Connections
- (Z-Spacers or J-Channels)
- Corner Castings

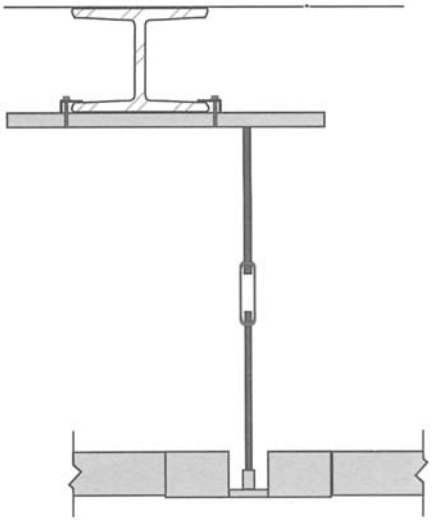


The original CHANNEL-CEIL® System is a highly flexible, high-strength system proven in over 4,000,000 sq. ft. of cleanroom installations worldwide.

Suspension

Cross castings are suspended using threaded rods and turnbuckles.



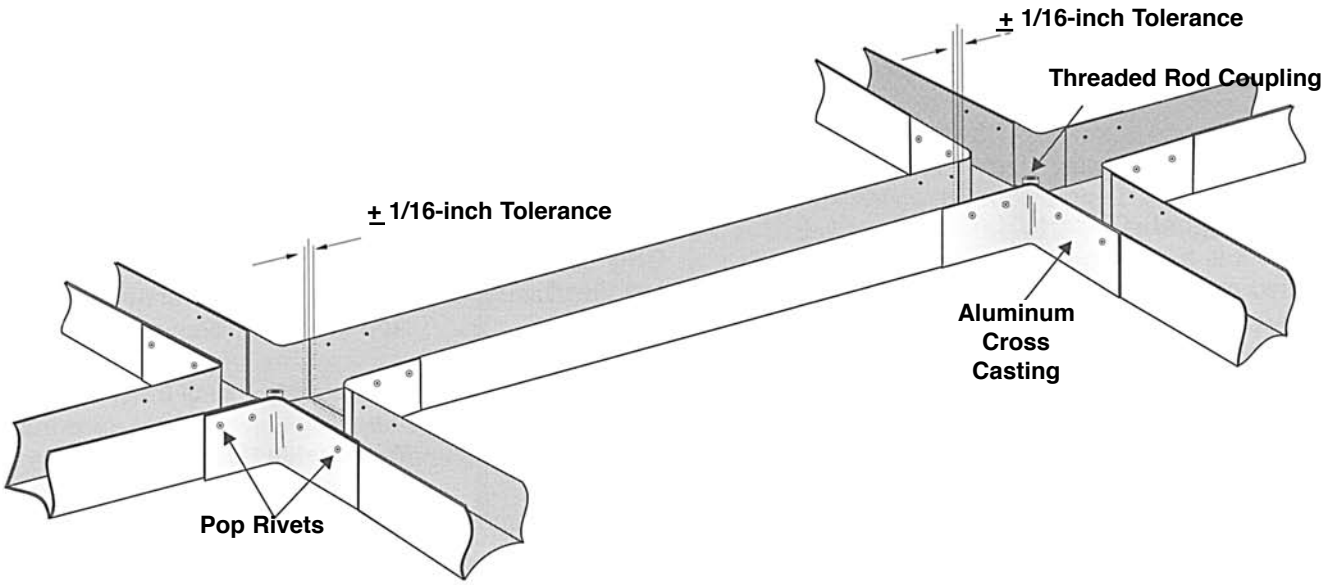


Typical suspension

Cross castings are suspended at locations determined by the room layout. Threaded rods from overhead support structure are attached to supplied 3/8-inch turnbuckles and LH/RH threaded rods that are screwed into the tapped bosses provided on each cross casting.

Grid Assembly

The telescope fit allows an adjustment at each section of the grid.



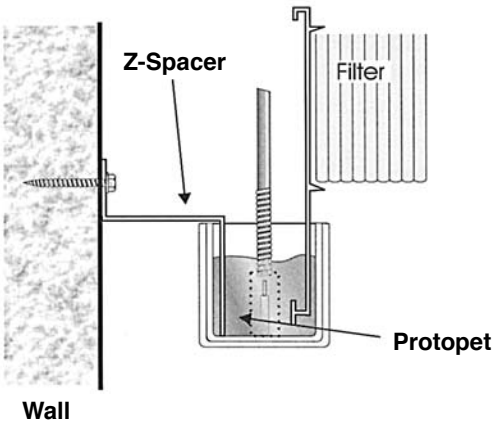
U-channel grid members are then connected to the cross castings with pop-rivets to form a single, continuous, level gridwork. All castings are predrilled for riveting and joints are sealed with caulk. The channels may be adjusted 1/8-inch in or out of the cross castings. No other cleanroom ceiling can guarantee the installer this degree of tolerance during installation.

Fixed or Floating Perimeter Options

Fixed or floating perimeter options are available.

Floating Perimeter

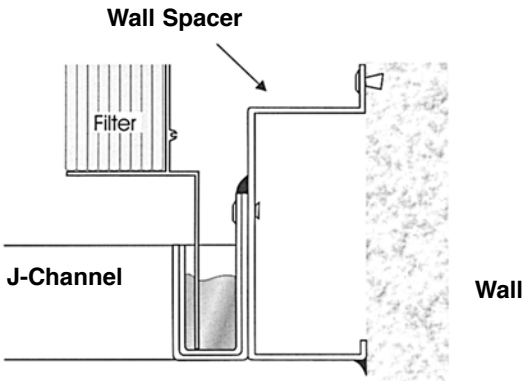
The floating perimeter design is used in newly constructed building with a potential for settling, in a building having expansion joints, or in a building located in an earthquake zone. The Z-spacer isolates the ceiling from vibration and movement of the adjacent walls.

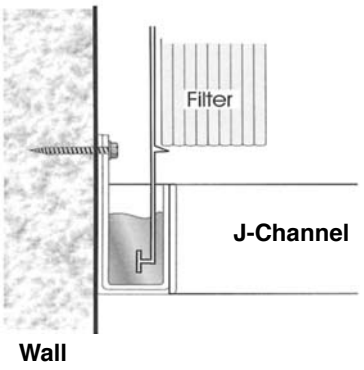


Fixed Perimeter

A 1-inch wide J-channel is permanently fastened and sealed to the wall.

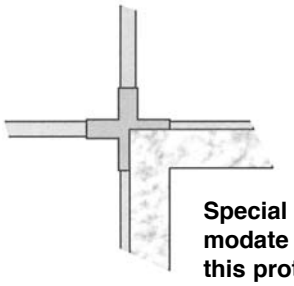
In odd-sized rooms, Wall-Spacers may be used when leftover space is minimal.



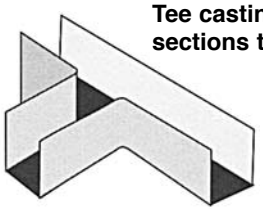


Other Castings

Corners, elbows and tees allow flexible, customized layout of the ceiling.

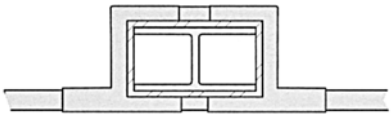


Special castings easily accomodate obstructions such as this protruding corner



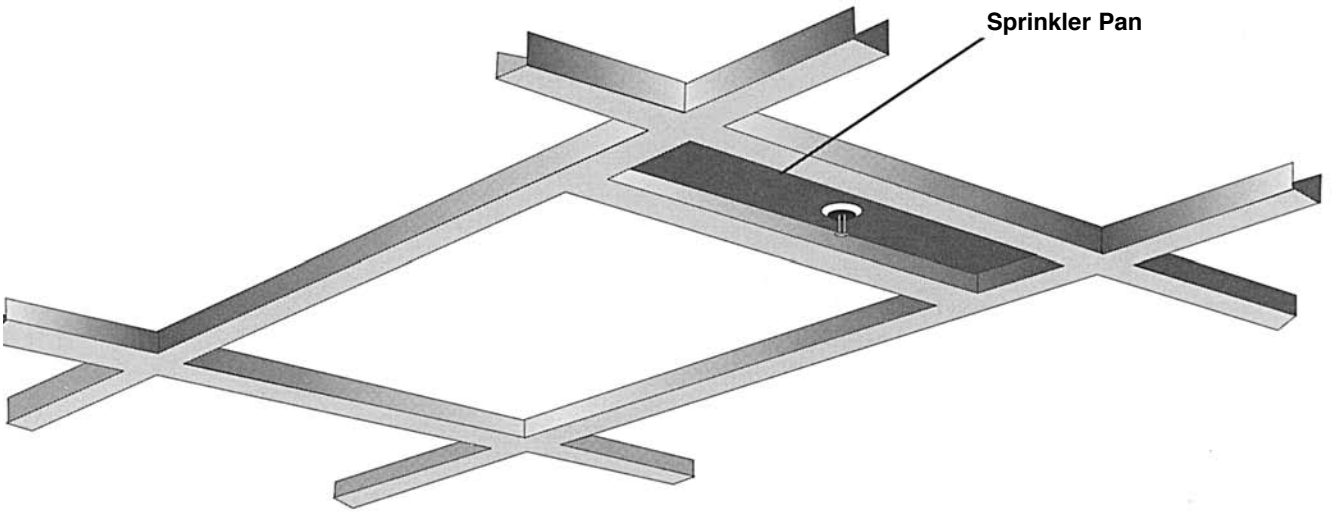
Tee castings join main grid sections to sections of J-Channel

A typical construction is an I-beam column that is enclosed and fitted



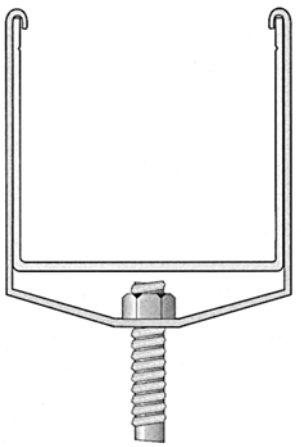
Sprinkler Penetrations

Pans for sprinkler penetrations are mounted in small sections of the grid. Undersize openings in the grid are designed to hold pans for sprinklers and other penetrations through the ceiling. The skirted pans mount and seal in the grid and provide a sealable pass-through location for pipes, etc.

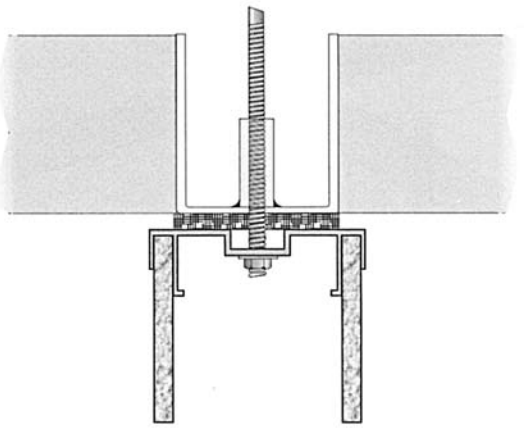


Support for Walls and Utilities

Threaded rods and special attachments support walls or utilities.



Support clips provide a structure for hanging equipment or utilities directly from the grid.



Where required, the 3/8-inch threaded rods supporting the grid system may also extend into the room area to provide heavy-duty support walls or equipment.

NOTES

Guide Specifications

1.0 General

1.1 The CHANNEL-CEIL® System shall be manufactured by Flanders Filters, inc., Washington, N.C. The design shall be approved by the Factory Mutual Research Corporation for surface burning requirements per ASTM-E84-70 Tunnel test. All test results shall be zero (0) for flame spread, fuel contribution and smoke generation.

2.0 Seismic Qualification and Strength

2.1 The system shall be seismically qualified for the requirements of the Uniform Building Code, Zone 4. The results shall be compared with the requirements for the owner's facility and plant site to assure that the seismic qualification requirements are satisfied.The properly-installed grid shall support a point load of 175 pounds at any location with a deflection of less than 0.250 inches.

3.0 Design and Construction

3.1 The system shall consist of a grid of U-channels of extruded aluminum connected with aluminum castings and of crosses, tees and elbows, riveted to the extrusions at their junctions and caulked.The grid shall be filled with fluid sealant. Filters shall have skirts at the downstream side. The skirts shall be embedded in the fluid sealant in the latticework to form a leakproof seal between the filters and the latticework. The extrusions used in the grid shall have a minimum wall thickness of 0.10 inches and a minimum inside depth of 1.8 inches. Castings shall have a minimum wall thickness of 0.09 inches and the clearance of the fit between castings and extrusions shall not exceed 0.20 inches. All metallic components shall be corrosive resistant materials or coatings.

3.2 Each 2' x 4' section of the grid shall be supported from overhead by 3/8-inch threaded rods, which shall be connected at one end to turnbuckles. The turnbuckles shall be attached to tapped bosses in the castings of the grid system and permit final leveling of the grid.

3.3 The grid shall be filled with Flanders fluid sealant (specify Protopet or BLU-JEL® Seal).The sealant shall be a highly viscous, non-Newtonian, odor-free, non-evaporating and self-healing substance. The skirts of the filters shall mate into the U-Channel containing the sealant.

3.4 Perimeter wall connections of the grid system shall be [specify: fixed or floating]. Fixed perimeters shall consist of wall-mounted perimeter J-channels, mechanically sealed to the wall. The wall row of filters shall be mounted in the J-channels. As an option, a floating perimeter, consisting of a Z-spacer, where one end is fastened and sealed to a wall and the other end is submerged in the sealant of the first row of the grid, shall be provided.

3.5 The grid shall permit installation of leak-free blank panels to bring service connections of water, air, fire protection and other desirable utilities through the ceiling. Panels shall be constructed of steel components with welded corners and a white powder paint finish. All panels shall be installed with skirts embedded in the fluid sealant to form a leakproof seal between the panel and the grid.

3.6 When the system has been properly installed, it shall be possible to install or remove filters and other system components from either above or below the grid. The plenum height above the grid shall be no less than 28 inches to facilitate filter installation and change-out

3.7 The aluminum extruded grid members, filler panels, sprinkler panels and all other visible components shall have a white powder paint baked finish applied at the factory.

3.8 If required, the castings shall be modified to allow the 3/8-inch threaded support rods to extend through the tapped bosses for the attachment of walls, partitions,robotics, etc. in the field by others.

Flanders/FFI ®

Flanders Filters, Inc.
531 Flanders Filter Road
Washington, NC 27889

Phone: (252) 946-8081
Toll Free: (800) 637-2803
Fax: (252) 946-3425

Website: www.flanderscorp.com

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