CLEANROOM FLUSH FILTERED CEILING GRID [AND PLENUM] [AND FAN POWERED PLENUM] SYSTEM SPECIFICATION

Text placed in [ ] indicates an option. This guide specification is intended to be edited and customized depending on the specific job requirements.

CLEANPAK CLEAN-TRAK GUIDE SPECIFICATIONS
TOP-LOAD POWDER-COATED EXTRUDED ALUMINUM GEL-SEAL FLUSH CEILING GRID
[TOP-LOAD POWDER-COATED EXTRUDED ALUMINUM GASKET-SEAL FLUSH CEILING GRID]
[BOTTOM-LOAD EXTRUDED ALUMINUM GEL-SEAL FLUSH CEILING GRID]
[BOTTOM-LOAD STAINLESS STEEL GEL-SEAL FLUSH CEILING GRID]
[POWDERCOATED STEEL PLENUM]
[STAINLESS STEEL PLENUM]
[FAN POWERED PLENUMS]

Section 13042
CLEANROOM FLUSH FILTERED CEILING GRID [AND PLENUM] [AND FAN POWERED PLENUM] SYSTEM

1. PART 1 – GENERAL

1.1. WORK INCLUDED

A. The purpose of this specification is to provide a product description of and the work necessary to erect a filtered ceiling system with flush integral lighting and sprinkler system [including a plenum] [including a fan powered plenum]. The system will be installed by the Contractor in accordance with the manufacturer's instructions as outlined in the manufacturer's installation manual. Testing and certification of ceiling system shall be conducted by an independent testing agency.

1.2. SYSTEM DESCRIPTION

A. The cleanroom filtered ceiling system shall consist of a continuous ceiling grid with powder coated extruded aluminum grid channel [stainless steel grid channel], integrated lighting, integrated sprinkler system, associated connectors, grid hanging all-thread rod from grid to turnbuckle, nominal 2x4 foot [4x4 foot] filters, and accessories such as filter dampers, blank pans, return air grilles, clips, and miscellaneous hanging hardware and clips for wall head track, monorail, and piping. [The ceiling system shall also include a positively pressurized plenum that is an integral part of the ceiling grid. The ceiling grid for plenums is required to have gel seals for sealing the filters to the grid. Gasketed seals between filter and grid for positively pressurized plenums are not allowed.] [The plenum shall have a series of fans installed in the roof to provide for airflow through the system.]

1.3. QUALITY ASSURANCE

A. Owner's Factory Inspection:
   1. The owner or owner's representative shall maintain the right to tour the cleanroom filtered ceiling system at manufacturer's plants any time that fabrication is being performed on components intended for this project.
   2. The manufacturer shall notify the owner when production is finished on the first component. Anytime after that date, the owner may exercise the option, giving 24-hour advance notice minimum, to tour the plant and inspect for component assembly, painting, cleaning, or packaging to ensure that quality control is being maintained.

1.4. SUBMITTAL

A. Submittal shall be by the manufacturer.
B. Required with the Bid: Detailed information on structural, mechanical, electrical, and other services necessary to evaluate installation requirements.
C. Required after execution of Contract: Shop drawings shall be submitted within two weeks of purchase order acceptance, and they shall include: complete specifications, descriptive drawings, catalog cuts, and descriptive literature on all components used in the ceiling system, with make, model, dimensions,

capacity, weight, and electrical schematics. Manufacturer's information for ULPA [HEPA] filters shall be included.

1.5. MANUFACTURER CONTACTS

A. Contact CLEANPAK International directly if additional information is required, such as product or material descriptions, layouts, or installation requirements. CLEANPAK has a complete mock-up of a ceiling system similar to the product available for product demonstration.

2. PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Clean-Trak [and PlenPAK] as manufactured by CLEANPAK.

2.2. FILTERED CEILING GRID SYSTEM

A. The grid system shall be the Clean-Trak Top-Load Extruded Aluminum Gel-Seal Flush Ceiling Grid. Grid shall have an integrated top facing trough to hold gel for a knife-edged top-load filter. The ceiling grid system shall consist of a grid of powder coated extruded aluminum 6063-T6 perimeter channels and internal channels. The ceiling grid shall such that it will be possible to place or to remove filters and other system components from both above and below the grid system. The urethane [silicone] gel sealant used in the U-channels shall be a self-healing substance and shall remain in place under static pressure of 10 inches WC. Sealant shall not be fluid at temperatures below 250 degrees F. The gel sealant shall be furnished by the manufacturer and installed by the contractor after the grid has been leveled in place and caulked.
[The grid system shall be the Clean-Trak Top-Load Extruded Aluminum Gasket-Seal Flush Ceiling Grid. Grid shall have a top flat surface for gasket to seal to a top-load filter. The ceiling grid system shall consist of a grid of powder coated extruded aluminum 6063-T6 perimeter channels and internal channels. The ceiling grid shall such that it will be possible to place or to remove filters and other system components from both above and below the grid system. The gasket shall be furnished by the manufacturer and installed by the contractor after the grid has been leveled in place and caulked.]
[The grid system shall be Clean-Trak Bottom-Load Extruded Aluminum Gel-Seal Flush Ceiling Grid as manufactured by CLEANPAK International. The grid will have a downward facing knife-edge that will accept pre-gelled filters. Filters, blank pans, and FFUs shall be capable of being loaded from the bottom without tipping or rotating of the filters into the grid opening. The powder coated extruded aluminum grid shall have threaded studs for filter retention clips. For bottom-load filters, the gel sealant shall be supplied pre-installed in the filter from the ULPA [HEPA] filter manufacturer.]
[The grid system shall be Clean-Trak Bottom-Load Stainless Steel Gel-Seal Flush Ceiling Grid as manufactured by CLEANPAK International. Stainless steel shall be 304L #4 [304L #2B] [316L #4]. The grid will have a downward facing knife-edge that will accept pre-gelled filters. Filters, blank pans, and FFUs shall be capable of being loaded from the bottom without tipping or rotating of the filters into the grid opening. The stainless steel grid shall have reversed breaks in the metal so as to minimize the bioburden and particle trap areas below the filter. The ends of the cross member joints shall be solidly welded to the adjoining members. Welds shall be ground and polished. For bottom-load filters, the gel sealant shall be supplied pre-installed in the filter from the ULPA [HEPA] filter manufacturer.]

B. Grid members shall be welded together into modules. Grid shall be caulked with an appropriate sealant as necessary. The ceiling support grid shall be structurally constructed so as to remain dimensionally stable.

C. The grid system shall have integrated flush lighting within the grid channel that is capable of full filter coverage of the entire ceiling. Light fixtures, such as teardrop lights, that protrude below the ceiling plane are not permitted as they would interfere with grid face hanging systems. Light fixtures, such as troffers, that negate the possibility of having full filter coverage are not permitted.

1. Provide integrated LED lighting in the grid channel. The grid shall be UL listed and so marked. The driver shall be housed within the grid channel and separated from the low voltage area with a listed wireway cover. Light lens covers shall be a diffused polycarbonate material with diffusion properties built into the base raw material. The LED system shall have a color temperature of 4000K, CRI greater than 80, a power factor greater than 95%, and a THD of less than 20%. The life of the system shall be calculated at an L70 greater than 50,000 hours.

[Provide T8 [T5] linear fluorescent lamps with a color temperature around 4000K. The ballast shall be housed within the grid channel and separated from the low voltage area with a listed wireway cover.]

2. The light lens shall sit flush with the bottom of the grid channel. Light lens covers shall be a polycarbonate material. The lens shall snap flush to the grid channel without external fasteners. Lenses shall be available in clear, opaque white, and amber colors. Amber lens shall provide UV filtration up to a wavelength of 470 nanometers.

D. The grid system shall incorporate a screen that is flush with the light lens and has perimeter slots on all sides of the screen to jet air underneath the lens so as to wash the area below the lens of particles. This is the Clean-Screen as manufactured by CLEANPAK. The screen shall provide laminar flow 4 inches below the grid surface. Screen shall be made from [powder-coated] aluminum [stainless steel]. [The finish of the screen is to match the ceiling grid finish.] The Clean-Screen is to be a minimum of 1.5" from filter face and shall not contact the filter media.

E. The grid system shall be capable of forming a gel seal between module joints. This is the Gel-Link joint gel seal system by CLEANPAK.

F. The installing contractor shall furnish and install the all thread rod from the leveling turnbuckle to and including the connection components at the building structure.

G. The grid system shall be capable of attaching clips for hanging piping, barriers, enclosures, wall head tracks and automation systems.

H. The flush grid shall have an integrated fire protection sprinkler system.

1. The grid system shall have the ability to place fire protection piping through the grid channel itself. Provide sprinkler port penetrations in the ceiling grid channel at all sprinkler head locations, as indicated on the drawings.
2. The ceiling grid shall be able to incorporate a flexible fire protection hose system. The flexible fire protection hose system shall consist of the flexible hoses attached to a 3” nominal diameter pipe and shall be attached to the modular ceiling grid in a collapsed fashion for shipment. The hose shall be Clean-Flex Welded Flexible hose [Clean-Flex WeldFree Flexible hose] as manufactured by CLEANPAK. Flexible hoses shall have a live length of 50.5 inches [72 inches]. [The ceiling grid shall be able to incorporate a hard-piped system. The hard-piped system couplers shall have a threaded [welded] female connection for the field connection. The grid channel shall be capable of accepting a true flush sprinkler head within the width of the extrusion.]
3. Fire sprinkler piping within the ceiling module will be factory-installed, sealed, and painted by the manufacturer. Manufacturer shall provide sleeves and sprinkler heads that forms an airtight seal to the grid.
4. The sprinkler pipe spool connections between modules will be furnished and installed by the sprinkler contractor.

I. Grid system shall be capable of handling structural loads to a deflection criteria not to exceed L/360.

J. All surfaces that are scratched shall be painted and touched up by the contractor after installation. Paint color to match wall panels or as approved by the engineer or owner. [For stainless components, all surfaces that are scratched shall be buffed with non-ferrous material by the contractor.]

K. Filler Blank Panels: Solid filler panels shall be constructed of powder coated steel [aluminum] [stainless steel] with welded corners, designed to affect an airtight seal in the channel grid. [The finish of the panel is to match the ceiling grid finish.] Hold-down clips shall be furnished as necessary to keep the components in place. [The interstitial sides of the panel should match the elevation of the top of the filter modules.]

L. Walkable Filler Panels: Walkable filler panels shall be constructed the same as standard filler panels utilizing 14 gauge steel [aluminum] [stainless steel] and 3/8 inch steel flat bar reinforcing. [The finish of the panel is to match the ceiling grid finish.]

M. Walkable Return Air Pans: Walkable return air pans shall be constructed of 14 gauge steel [aluminum] [stainless steel] with 3/8" diameter perforations to form a 51% open area. Reinforcement shall consist of 0.375 inch flat bar that is welded to pan. [The finish of the panel is to match the ceiling grid finish.]

N. For plenum style filters, furnish dampers on top of the filters to provide a means of balancing the filters. The dampers shall have a gear mechanism that can be actuated through a port in the grid channel for top-load grid systems or through a port in the center bar of the filter for bottom-load systems. These dampers shall be the CLEANPAK Equalizer.

O. Care should be used in the selection of paints, fluid seals, sealants, and other materials which have a high mass loss due to off-gassing. Care should also be used in selection of materials that are resistant to cleaning agents used by the owner.

P. Ducted filters shall be anodized extruded aluminum housing (top cap shall be bare aluminum) with 14" [12”] diameter duct collar connection. Furnish a baffle plate to permit uniform air distribution inside the module. The knife-edge lip shall be a continuous part of the extruded aluminum frame. When the lip of the module is embedded on the gel seal of the grid system a leak proof seal shall be formed between the filter and the grid system. [Furnish open-top plenum style filters.] ULPA [HEPA] filters as manufactured by Camfil.

2.3. [PLENUM INTEGRATED TO CEILING GRID]

A. Provide a plenum attached to the ceiling grid as an integral part of the ceiling grid plenum system. Positively pressurized plenums shall only be used with gelled grid (never with gasketed grid). Modules shall be supplied completely pre-assembled with the grid and plenum as one piece.

B. The plenum ceiling grid modules shall be capable of being suspended from the building structure on an 8’x8’ hanger array or a 8’x12’ hanger array. In the case of self-supported plenums with structural legs off the floor, the modules shall be capable of free-spanning between columns.

C. Plenums will be welded style construction using formed steel roof panels welded to formed steel side panels. Side and top panel thickness shall be sized so as to meet structural load requirements. The roof panels shall be formed such that the panel brakes are towards the inside of the plenum so as to form a smooth outside surface. [The roof panels shall be formed such that the panel brakes are towards the outside of the plenum so as to form a smooth inside surface.] The side panels shall be riveted to the Clean-Trak flush light grid system. Holes will be provided at the perimeter of the plenum roof for suspension. The entire plenum ceiling grid module shall be coated with a baked on powder coating. [Plenums will be welded style construction using formed stainless steel roof panels welded to formed stainless steel side panels. Stainless steel shall be 304L #2B [304L #4] [316L #2B]. Side and top panel thickness shall be sized so as to meet structural load requirements. The roof panels shall be formed such that the panel brakes are towards the inside of the plenum so as to form a smooth outside surface. [The roof panels shall be formed such that the panel brakes are towards the outside of the plenum so as to form a smooth inside surface.] Holes will be provided at the perimeter of the plenum roof for suspension.]

D. Units shall be manufactured to dimensional tolerance of +/- 1/8" on width and length and diagonal dimensions or squareness of +/-1/8".

E. Supply a flexible membrane diffuser to provide uniform air distribution of +/- 20 fpm from the unit average at 6" beyond the filter face when plenums are individually fed from the top with 750 to 1,000 fpm air supply.

F. In order to accommodate service personnel and equipment, the top panels, support frame, and walking surface shall be designed for either a uniform loading of 30 pounds per square foot, or a point load of 200 pounds anywhere on the top surface. Under this added live load, the deflection of the bottom surface shall not exceed 1/8” at the midspan of the module length. [Plenums shall be capable of fully supporting the weight and seismic loading of air handling equipment that is to be directly attached to and directly supported by the plenums.]

G. Provide pre-drilled bolt holes in the sides of modules for field connection of one module to another where applicable.

2.4. [FANS INTEGRATED IN PLENUM (PlenPAK)]

A. Provide each plenum with an array of top-plate assembly (TPA) fan modules. Each TPA fan module shall be capable of producing 1440 CFM (2446 CMH) of true airflow volume at 1.5 iwg of fan static pressure. The fan shall consist of an integrated motor, controller, and centrifugal plug fan. The impeller shall have backward-curved blades and be mounted directly to the rotor of the motor. Motor shall be an electronically commutated brushless DC external rotor motor with permanently lubricated ball bearings. The motor shall have an isolated shaft for mitigation of electrical arcing across the bearings. The motor shall have an integrated controller directly attached to it that shall have encapsulated electronics, built-in electronic motor overload protection, built-in locked rotor protection, built-in active thermal management and active power factor correction. Motors shall be designed for IP54 protection and a thermal class of THCL 155. The fan assembly shall be statically and dynamically balanced as per ISO

1940, class G2.5. The housing shall incorporate a finger guard on the inlet side of the fan that requires tooled removal. Power input to the unit shall be 200-277VAC 50/60 Hz. The TPA shall have integrated Modbus RTU communication.

B. [Merv 8 prefilter 1" thick 24"x24" mounted on top of each TPA.]

3. PART 3 - EXECUTION

3.1. INSTALLATION - GENERAL

A. Install in accordance with the manufacturer's installation manual. The installing contractor shall be responsible for the complete installation of the cleanroom ceiling system. Certification testing will be by others after installation following specifications issued under separate cover. The installing contractor and/or filter manufacturer will be responsible for the removal, replacement, and re-testing of all ULPA [HEPA] filters failed during the certification tests. All repairs and re-testing cost of the repairs and other related tests that would have to be repeated as a result of repairs done to the system shall be the installing contractor's responsibility.

3.2. MODULE INSTALLATION

A. It is the intent that the modules be installed to line and true level, symmetrical to rooms and spaces, and with due regard to appearance and structural stability. The ceiling shall be level throughout within 1/8 inch.
B. All suspended ceiling system work shall be done in accordance with the procedures endorsed by the Ceiling and Interior Systems Contractor's Association (CISCA), except where specified otherwise.
C. Lay out modules as shown on shop drawings. Coordinate with mechanical and electrical equipment in framing and cutting around ceiling penetrations.
D. Hang level as shown on the drawings in accordance with ASTM C636 and the manufacturer's current printed instructions for the type of installation used.
E. Modules shall be supported per structural specifications. Modules are butted side to side and end to end and bolted together. A sealant is required at all joints. All field assembly and materials by contractor unless noted.
F. Install hanging hardware at specified locations and per manufacturer's instructions.
G. Install seals per manufacturer's instructions.
H. Blank pans and associated hold-down clips are to be installed per manufacturer's instructions.
I. Lighting fixtures are to be installed per the ceiling plans. Wiring shall be installed by electrical contractor to meet all local codes.

3.3. FILTER INSTALLATION

A. Follow filter manufacturer's instructions. Filters and units shall be carefully removed from cartons and other packaging material.
B. The filters shall be installed in the support frames by personnel instructed in the proper method of installation and aware of the need for special handling precautions. The contractor will be responsible for repairing or replacing filters beyond the amount of expected filters with leaks during certification.

3.4. MATERIAL PREPARATION, CLEANING, AND FINAL CLEANUP

A. The general cleanliness requirements shall be that all hardware exposed to the cleanroom interior or in the airstream, regardless of size or complexity, must be visibly free of oil, grease, particles, chips, fibers, dust, dirt, etc., prior to installation in the cleanroom area. Therefore, cleaning shall be performed on all hardware as defined herein.
B. Visual inspection without magnification shall be conducted over 100 percent of the surface. Inspection of surfaces for visible contamination shall be conducted with a 100 watt lamp at a distance of one to two feet. Magnification or similar aids (except for normally worn eyeglasses) shall not be used. Contaminated areas shall be further cleaned.
C. The general cleaning sequence for the units shall be as follows: Visual inspection per above; vacuum removal of particles; solvent wipe cleaning; drying; visual inspection per above.

3.5. CEILING CERTIFICATION

A. At the completion of the ceiling installation, with all components installed and wall system in place, an independent certifier under a separate contract shall conduct a series of tests to ensure that the cleanroom complies with owner's specifications.