

SPECIAL SPECIFICATION

SECTION 13020S

CLEANROOM CEILING GRID SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section specifies the requirements necessary to design, furnish, and install the cleanroom integrated ceiling grid system (gasketed). The system shall include the following:
1. Heavy duty modular gasketed flush grid (welded and stick-built as indicated on drawings).
 2. Ceiling grid support system/components
 3. Integrated flush lighting
 4. Sprinkler System
 5. Blank pans
 6. Diffuser panel
 7. Plenum Separators
 8. Trim and accessories necessary to create the functional assembly.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the gasketed cleanroom ceiling system:
1. Section 15310 – Automatic Sprinkler and Water Based Fire Protection Systems

2. Section 15766S – Fan Filter Units
 3. Section 16501 – Light Fixtures
 4. Section 15863S – Ulpa Filter
 5. Section 13036S – Cleanroom Wall System
 6. Section 13015S – Cleanroom Access Flooring
 7. Section 01110S – Clean Construction Protocol
 8. Section 01111S – Cleanroom Constnution and Cleaning Procedures
 9. Section 01112S – Cleanroom Certification and Acceptance
- C. CAUTION: Use of this Section without including all of the above-listed items will result in omission of basic requirements.
- D. In the event of conflict regarding the cleanroom ceiling grid system requirements between this section and any other section, the provisions of this Section shall govern.

1.03 REFERENCES/DEFINITIONS

- A. Ceiling Loading Requirements:
1. Point Load: Capable of supporting 150 lb. Load at any point without deformation or deflection.
 2. Applied Dead Load: Actual weight of ceiling grid including ULPA filters, Fan Filter Unit (FFU), springers, lighting, fire protection piping (with water), blank pans (walkable and non-walkable), diffuser panels, ionization, plenum separators, shall be 20 psf. Minimum.
 3. Structural Safety Factor: A minimum safety factor of 2.5 shall be used for all structural calculatons.
 4. Deflection: 1/8 – inch maximum grid deflection under full dead load plus live load.
 5. Hangers: Shall be suspended from the top or side of structural members at locations required to align with support points provided in the interstitial support steel.
- B. System and bracing designs shall be in conformance with applicable building code,

including any local amendments and AISI Specifications for the Design of Cold-Formed Steel.

- C. The support systems shall be suspended from the building structure as required to support the design loads (ceiling dead load and live load). Connections shall conform to the requirements of the construction drawings, this Section and the following additional requirements:
 - 1. Hangers and bracing shall be furnished by the installer and shall consist of threaded rods and/or slotted channel framing provided with turnbuckles for leveling and tightening, and beam clamps, respectively.
 - 2. Load combinations, materials, allowable stresses, and allowable vertical and horizontal deflections shall be in accordance with applicable codes. Provision shall be made for movement of surrounding structure in design of separations and joints. Structural members shall be sufficiently stiff to allow proper operation of ceiling filter sealant systems.
- D. System design shall accommodate standard ACI construction tolerances, deflection of building structural members, and clearance of intended openings in Mechanical deck floor above.
- E. Fire Sprinkler Penetration Placement:
 - 1. Provide penetrations in ceiling grid for sprinkler drop to pass through.
 - 2. Penetrations in ceiling grid for sprinkler drops shall be 8 feet maximum on center in each direction and no more than 6 feet from any full-height partition. See reflected ceiling plans for full layout of sprinkler head placement.
- F. Manufacturing Tolerances – Ceiling Grid;
 - 1. Dimensions of Grid: plus zero, minus 1/8 inch in 24 feet.
 - 2. Squareness of Grid: 1/4" inch, minus 1/4" inch. Measured across the diagonal of a 24-foot by 24-foot area.
 - 3. Accumulative Gain of Ceiling: plus 1/4" inch, minus 1/2" inch, measured over installed length of 100 feet.
- G. Seismic Design Criteria:

1. Seismic loads in accordance with International Building Code 2000. Site Class D, Stiff soil. Importance Factors $I_e=1.5$. $I_p=1.5$ for Seismic Use Group III (three). Site specific parameters:

$S_{ms} = 0.795$, $S_{ds} = 0.53$.

$S_{ml} = 0.374$, $S_{dl} = 0.25$

Seismic Design Category D.

1.04 DESCRIPTION

- A. The cleanroom gasketed ceiling grid shall be field assembled from factory-prepared and prefinished components with extruded aluminum filter support grid, single-point electrical termination for lighting ballast boxes, integrated light fixtures, and diffuser panels.
- B. Fan Filter units shall be provided as specified in Section 15766S, Fan Filter Units, and be compatible with the specified ceiling grid system.
- C. Filter Units for ducted ULPA filters shall be provided as specified in Section 15863S, and be compatible with the specified ceiling grid system.

1.05 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings and erection diagrams. Shop drawings shall be prepared by the ceiling system manufacturer. Show details of all finished Work as indicated on Drawings including following items: attachments, anchorages, reinforcements, assemblies, and closing connections between members and with adjacent construction; locations of all joints, joinery techniques, and materials, fastening, and sealing methods; and sealant materials and sealant systems. Identify all materials, including metal alloys, fasteners, and all shop and field sealants by product name and locate on shop drawings. Shop drawings shall include instructions and explanatory details for sequence of installation of all materials. Show relative layout of all adjacent construction, all correctly dimensioned. Provide isometric or other drawings which explain or define certain interconnections.
- B. Provide samples of all finishes. Accepted samples will become the standard for acceptance of all installed work.
- C. Provide certification of compliance, together with test results for various specified requirements.
- D. Provide design and calculations for the support system by a certified Structural Engineer.

1.06 QUALITY ASSURANCE

- A. The owner or its representative shall maintain the right to tour the cleanroom ceiling manufacturer's plant anytime that fabrication is being performed on components intended for this project.
- B. The manufacturer shall notify the owner when production is finished on the first component of each type. Anytime after that date, the Owner or its authorized representative may exercise the option, giving 24-hour advance notice, to tour the plant and inspect for component assembly, painting, cleaning, or packaging to ensure that quality control is being maintained.
- C. Structural framing and design of the support system shall be certified by a licensed professional structural engineer holding a license in the state of New Mexico.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Factory requirements for delivery, storage, and handling shall be in accordance with Section 01110S - Clean Construction Protocol.
- B. Jobsite storage and handling of all system components shall be the responsibility of the Contractor.

1.08 PROJECT/SITE CONDITIONS OR SPECIAL CONDITION

- A. Special clean wipedown and packaging is required of all modules in accordance with Section 01111S – Cleanroom Construction and Cleaning Procedures.

1.09 WARRANTY

- A. Upon completion of testing and documentation of substantial completion, a one (1) year warranty service agreement will take effect. During this period the cleanroom installer shall be responsible for providing replacement parts and/or labor (at no cost to the Owner) should failure occur. (Fluorescent lamps excluded.)

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cleanpak (Clean-Trak Flush Grid System)

- B. Huntair Inc.
- C. Approved Equal

2.02 MATERIALS

A. Ceiling Grid:

1. The ceiling grid system shall be a field-assembled modular welded grid and stick-built grid of 2-foot by 4-foot channel grid constructed of extruded aluminum grid members. The ceiling support grid shall be structurally constructed to remain dimensionally stable and retain the necessary sealing requirements when the permissive hanging load is suspended from the grid. The support grid shall be capable of withstanding 2 inches WC of static pressure without deflection.
2. The grid portion of the ceiling support lattice shall be supported with threaded rods (as required) connected to the building structure. The grid shall be arranged so that filter units, fan filter units and other system components can be handled from above the grid system.
3. Metallic members shall be corrosion-resistant materials and have finished coating of white powder-coat epoxy, static dissipative rated at 10⁶ ohms to 10⁹ ohms per square.
4. The grid system shall include sprinkler penetrations providing airtight seals and escutcheons. Furnish two anodized friction plug caps for each head location to seal unused positions.
5. The ceiling grid shall be capable of supporting the fan filter units (FFUs).
6. coverage shall be as indicated on the reflected ceiling plan.
7. The ceiling grid shall incorporate a means of continuous support of Owner-provided equipment in the future. After support hangers are in place, lamps shall still be removable without disassembly.
8. Sealer plugs, clips, or covers shall be furnished for field installation over all openings in the ceiling assembly left after mounting of all accessories. Reveals to be sealed include air gap next to light fixture frame/lens, sprinkler heads, utility hangers, and empty grid members.

B. Blank Ceiling Panels:

1. Blank ceiling panels shall be walkable and nonwalkable.
 - a. Type A (walkable)
2. The panels shall consist of a 1" overall thickness panel with 3/4" cell. .003-inch lightweight aluminum honeycomb core capable of supporting 437 lbs. point load with a maximum deflection of .095 in.. Aluminum panels shall be designed to affect an airtight seal in the ceiling grid with hold down clips. Finish shall be standard galvanized mil finish with raised diamond surface on one side.
 - a. Type B (non-walkable):
3. The panels shall be constructed of minimum 0.032-inch aluminum or 14-gauge epoxy powder coated aluminum with welded corners designed to affect an airtight seal in the ceiling grid, and shall function the same as the filter module skirt. Both sides of the blank panel shall be epoxy powder coated aluminum.
 - a. Grated Ceiling Panel :
4. Grating panels shall be aluminum rectangular bar 1" deep, sized to fit onto a 2'x4' grid module. Panels shall be of aluminum cross bars at 4" o.c. (at 2' direction) and bearing bars at 1 3/16" o.c. with plain surface finish. Grating shall be provided with min 80% open area and shall support a concentrated load of 600 lbs. minimum.
5. Blank panels shall be fitted for special conditions and penetrations, such as safety equipment and communication hardware.
6. Hold-down clips shall be used for positive seal of blank panel (non-walkable) edge onto the gasket seal. Clip shall attach to the grid assembly and shall be suitable to resist positive pressure gradient on bottom cleanroom face of panel. Clip may be eliminated where steel panels are used. Clips shall allow the removal of blank panels from below.

C. Perimeter Infill/Trim:

1. The manufacturer shall provide sufficient quantity of matching grid and filters or blank panels to close the gap between the ceiling modules and the perimeter walls.
2. Grid pieces shall include full-width inverted grid and any other matching components as required to provide extensions of the grid pattern to the wall or between modules.

3. Filler grids do not require integral lighting or sprinkler piping, but the grid shall be predrilled to accept sprinkler heads in the same flexible scheme as the rest of the grid.

D. Plenum Separator:

1. Material shall be 20 ga. min. metal ribbed panel. Refer to cleanroom support framing plan for extent and locations of separators.
2. Provide framing member backing to keep plenum separator from swaying.
3. Provide 2" min. overlap at all seams and caulk (continuous) with VOC compliant sealant
4. Provide access doors as shown on plan. Install neoprene gasket material at perimeter of doors to insure an airtight seal when door is in a closed position.

2.03 ACCESSORIES

A. Lighting System

Luminaries shall be integral to the flush cleanroom ceiling system and shall be UL listed. Complete lighting system consisting of lamps, lenses, wiring , and ballasts shall be furnished and installed as part of the ceiling grid system.

B. Sprinkler System

1. Provide sprinkler penetrations in the framing system at all sprinkler head locations, as indicated on the drawings.
2. The cleanroom ceiling manufacturer shall coordinate with the fire protection contractor to determine the placement of sprinkler heads for each room. Fire sprinkler piping within the ceiling module will be factory-installed, sealed, and painted by ceiling grid manufacturer.
3. Sprinkler connections will be furnished and installed by the sprinkler contractor.
4. Flexible hoses shall be Clean-Flex Weld Free flexible fire protection hose that integrates into the ceiling grid members without having to go through blank cans. The flexible hose system shall be Factory Mutual listed for use in the ceiling system.
5. Sprinkler heads shall be 1/2" quick response that fits into the ceiling ports.

6. Acceptable heads for the flexible hose system are Central GB-QR pendant with Belleville seal and Star SG-QR pendant.
7. Optional sprinkler tilt up main system shall consist of 3" main pipe with pre-attached flexible hoses. The tilt up main system, including the sprinkler heads and flexible hose shall be furnished and installed as part of the ceiling grid system.
8. Refer to Section 15310 Automatic Sprinkler and Water Based Fire Protection Systems.

2.04 FABRICATION

- A. Grid members shall be attached together to form a structural horizontal frame capable of spanning between lateral braces.
- B. Grid members and all internal components shall be factory painted with electrostatic powder-coat epoxy after all prefabrication has been completed. Minimum thickness of finish shall be 6 mils.
- C. A plugged and gasket-sealed opening shall be provided through the ceiling grid to permit particle counter probe to be inserted into upstream air to measure filter challenge concentration.

2.05 FINISHES

- A. The finish of the system shall be factory applied baked on epoxy finish.

PART 3 - EXECUTION

3.01 INSTALLERS

- A. Factory representative shall supervise entire ceiling installation.
- B. The interface of the framing system at the perimeter walls shall provide a finished, architecturally integrated appearance.
- C. Ceiling system shall be laterally restrained above all walls.

3.02 EXAMINATION

- A. Visual inspection: Filters shall be visually inspected prior to installation into ceiling grid in

the following manner:

1. Verify that the site is clean, sealed and ready in all aspects for installation of fan filter units into the ceiling grid.

3.03 ERECTION

- A. All penetrations in the cleanroom ceiling grid shall be predrilled and sealed at the factory.
- B. No field drilling of the ceiling grid will be permitted.
- C. All penetrations through the ceiling plane must be sealed airtight to prevent contaminant migration through the ceiling from the interstitial area into the cleanroom.

3.04 INSTALLATION

- A. The contractor shall be responsible for the complete installation of the ceiling assembly.
- B. It is the intent that the grid system 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 (2mm) per 100 feet, length, in a continuous run of grid.
- C. The ceiling modules shall be suspended directly from structure as shown on the drawings in accordance with ASTM C636 and the manufacturer's current printed instructions for the type of installation used.
- D. Grids will be supported, as a minimum, 6 hanging points for an 8-foot wide by 24'-long welded module and 4 hanging points for a stick-built module. All field assembly and materials shall be provided by the Contractor.
- E. Finished installation shall create a continuous strip of fixtures.

END OF SECTION