SECTION 233714 - INTEGRATED LAMINAR CEILING SYSTEM INTEGRATION WITH UNISTRUT WITH LAMINAR DIFFUSERS

1. GENERAL

1.1 SUMMARY

1. Section includes integrated laminar ceiling systems coordinated and provided by a single manufacturer which includes laminar flow diffusers, fill-in/blank panels, and integrated ceiling grid with gasketing to support all components within system, and light fixtures (supplied by Division 26).
2. Coordinate with Architectural, Structural and MEP drawings.

1.2 Description of Work

1. Provide Integrated Laminar Ceiling System(s) as specified herein and as shown on the Contract Drawings.

1.3 Reference Codes and Standards

1. ANSI/ASHRAE 70-1991: Method of Testing for Rating the Performance of Air Outlets and Inlets.
2. ANSI/ASHRAE 113-1990: Method of Testing for Room Air Diffusion.
3. ASHRAE Fundamentals and Applications Handbooks - Chapters on Sound and Vibration Control Fundamentals and Control.
4. ANSI/ASHRAE/ASHE Standard 170-2013 - Ventilation of Health Care Facilities.
5. FGI (Facilities Guidelines Institute) Guidelines for Design and Construction of Hospitals and Outpatient Facilities – 2014.

1.4 Quality Assurance

1. The manufacturer shall have published acoustical data for specified air terminal within range of operating conditions. NC level by octave band to be available upon request.
2. Air terminal NC ratings shall be based on a room effect of 10 dB maximum.

1.5 Submittals

1. A line item confirmation of compliance with the spec must be included with submittal.
2. Shop Drawings shall include construction materials, fabrication details, finishes, dimensions, outlet design, air pattern settings, and installation details. Submit dimensioned shop drawings including reflected ceilings detailing locations of diffusers, diffuser air volumes specific to each room, blank-off panels, grid style lights and all ceiling-mounted booms (surgical light(s), equipment booms, anesthesia column(s)/boom(s)) and ceiling-mounted imaging equipment rails, ceiling-level Unistru t® lengths and locations relative to imaging system isocenter.) Shop drawings to include framing system suspension details including project-specific substrate attachment details, framing section details, elevation views, dimensioned rough hard gypsum ceiling opening(s), equipment boom centerlines as required for trade coordination with Division 5 supplied structural boom supports and Owner-supplied imaging system.
3. Submit CAD file of coordinated ceiling plan including all ceiling-mounted equipment to GC for review and trade coordination.
4. Coordination and Review of Related Submittals:
5. Integrated Laminar Ceiling System (ICS) Manufacturer shall review lighting submittals sent by GC for fit/function of grid style lights and downlights (if applicable) within ceiling system and advise GC and/or Architect of any issues with light style or dimensions which would prohibit fit/function within the ICS as shown on plans.
6. Manufacturer to review project-specific imaging system drawings and coordinate locations of all ceiling-mounted electrical boxes, intercoms, any required penetrations within blank-off panels of sufficient size to accept ceiling-mounted components.
7. If booms are located within the Integrated Laminar Ceiling System (ICS), ICS Manufacturer shall review surgical light, anesthesia column, and equipment boom submittals and Pre-Installation Instructions to coordinate best fit of boom soffits or covers within the ICS. GC shall coordinate with ICS Manufacturer’s local manufacturer’s rep providing ICS Manufacturer with documents for review.
8. ICS Manufacturer shall review Unistrut support system submittals provided by GC and advise of conflicts which prohibit installation of ceiling-mounted components and advise GC and/or Architect of conflicts which would prohibit installation of ceiling-mounted components.
9. Product Data - Submit schedule and manufacturer’s data for air outlets and inlets including type, size, location; neck size, velocity profile, and noise level (NC) chart.

1.6 DELIVERY, STORAGE AND HANDLINGs

1. Deliver ceiling components to project site in original, unopened packages and store them in fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
2. Handle ceiling components carefully to avoid damaging components in any way.

1.7 JOB CONDITIONS

1. Space Enclosure: Do not install ceilings until space is enclosed and weatherproof, and until wet-work in space is completed and nominally dry, and until work above ceilings is completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.
2. PRODUCTS

### ACCEPTABLE MANUFACTURER

1. Precision Air. No exceptions or alternates will be accepted without prior pre-submittal approval by engineer.  Contractors offering manufacturers other than basis of specification, whether listed as acceptable equal or not, shall submit a line item comparison stating specific deviations from specification at time of bid. Contractor shall be responsible for any cost difference to meet above specification even if alternates are approved by engineer.
2. Manufacturer must be able to clearly demonstrate a minimum of 10 years of applying integrated ceiling systems to critical environment rooms requiring ceiling-mounted imaging equipment.
3. Refer to 1.5 for special submittal requirements.

### Integrated Ceiling System wITH LAMINAR DIFFUSERS for Unistrut Integration

1. Integrated Ceiling System shall be an integrated system coordinated and provided by a single manufacturer. Each system (ICS) shall consist of laminar flow, blank panels, and integrated ceiling grid with ceiling level Unistrut Integration to support system components including adjacent light fixtures (supplied by Division 26).
2. Refer to Integrated Laminar Ceiling System Ventilation Schedule within Mechanical Schedule Sheet for reference to Integrated Ceiling System Type by room number including diffuser type, total supply air volume, and coordination notes.

2.3 LAMINAR FLOW DIFFUSERS

1. Diffuser shall be ASHRAE Group E, non-aspirating laminar flow type in accordance with ASHRAE Standard 170 for Operating Rooms.
2. Provide aluminum laminar flow diffuser modules (LFD) to supply non-aspirating air where shown on the contract documents.
3. Laminar diffusers shall utilize a two-chamber plenum design to deliver air to the space with zero aspiration at the face of the perforated plate. Air shall enter the initial plenum through an inlet collar and inverse conical balancing mechanism. The balancing mechanism shall be adjustable through the plenum via an adjustable screw from the room side.
4. Manufacturer’s published performance data for 24” x 48“ nom. size with 8” inlet shall not exceed 0.10” w.g. at design point of 30 CFM/sq. ft.
5. A solid aluminum plate with two rectangular cutouts located directly above a V-shaped diffusion basket shall separate separate the top and bottom chambers. The lower chamber shall have a V-shaped, perforated diffusion basket mounted within a rectangular, perforated diffusion basket to evenly distribute air over the entire face of the diffuser
6. Plenum frame shall be constructed of 0.063-in. extruded aluminum with mitered, continuously back-welded corners and aluminum top plate. No cracks or gaps in the sides of diffuser plenum will be allowed. Provide four (4) aluminum hanging tabs on plenum for independent support from above (if required).
7. Perforated distribution faceplate shall be constructed of 0.050-in. aluminum with perforations of 16% open area. Plate shall to be retained to the module frame through the use of quarter-turn fasteners. Provide safety retainers of vinyl-coated stainless steel cable to prevent accidental dropping of plate during cleaning. The distribution plate shall be installed in aluminum mounting frame with mitered back welded corners. No diffusion component may be affixed to the back side of the faceplate frame. The back side of faceplate shall be easily accessible for ease of cleaning.
8. All exposed surfaces, including border trim, shall be provided with manufacturer’s standard white baked enamel finish **(*OPTIONAL FINISH:*** 204-R1 clear anodized aluminum), suitable for withstanding typical cleaning solutions and scrubbing implements typically employed in operating room environment.

***OPTIONAL FACTORY INSULATION ($), ADD:***

1. Manufacturer shall insulate the laminar flow diffuser with 1-1/2" duct wrap FSK-backed insulation of 0.75lb/cu. ft. density to prevent heat gain and condensation.

***OPTIONAL REMOVABLE PLUG BUTTON FOR THRU-FACE ACCESS TO INTERNAL VOLUME ADJUSTMENT VALVE ($), ADD TO 2.3 G.:***

Manufacturer shall provide removable plug button for room-side access to volume adjustment valve without need to drop faceplate. Plug button shall match finish color.

***optional stainless steel faceplate, replace 2.3. G. with the following:***

G. Perforated faceplate shall be 22 ga. 304 stainless steel with No. 4 polished finish and shall extend over and wrap around plate frame on all four sides to assure continuous perforated surface appearance between ceiling tee frames. Perforations to be 16% open. Manufacturer shall provide vinyl-coated stainless steel cable safety retainers on two opposite sides to prevent accidental dropping of faceplate.

2.4 Blank-Off Panels

1. For any boom or access locations within the system, the ICS manufacturer shall furnish solid face blank-off panels where indicated on the drawings and where structural supports may penetrate the ceiling or where interstitial access is required. Panel to have solid plate installed within extruded aluminum perimeter frame with mitered corners, providing a seal between the room and interstitial space.
2. For all surgical light, equipment or anesthesia boom locations within ICS, before any boom with articulating arms are attached to the structural plates, the installing contractor shall field cut panels as required for installation of booms. Do not cut blank-off panels in half.
3. All narrow blank panels located behind equipment rails shall be factory-welded to the framing and silicone sealed to the anterior surface of framing system at factory.

***OPTIONAL FLUSH FILL-IN PANELS AT ALL BOOM LOCATIONS, REPLACE 2.4 B. ABOVE WITH THE FOLLOWING:***

1. For all surgical light and boom locations, the blank-off panels shall be dropped style with bottom of panel to be flush with bottom of gasketed ceiling framing system. Before any articulating arm booms are attached to the structural plates, the installing contractor shall field cut panels as required to allow installation of booms. Do not cut blank-off panels in half.
	1. Integrated Ceiling Framing System for integration with unistrut
2. Laminar flow diffuser manufacturer shall furnish extruded aluminum tee and angle frame assembly suspension system to support laminar diffusers, blank-off panels and light fixtures. The tee shall be 1-1/2" wide x 1-7/16" high and angles shall be ¾” wide x 1-7/16” high. Minimum wall thickness of the tees and angles shall be 0.125".
3. The suspension system shall be factory-welded in sub-assemblies. Where framing sub-assemblies butt together, the adjoining surfaces shall be gasketed and mechanically-fastened with self-tapping wafer head screws.
4. Factory-welded ceiling framing sections shall be custom-engineered to fit between ceiling-level Unistrut channels. Aluminum mounting brackets shall be factory welded to framing sections for attachment to Unistrut and designed to be self-leveling when attached to the ceiling level Unistrut. ICS manufacturer shall supply Unistrut spring nuts, bolts and washers as required to attach framing to Unistrut supplied by Division 5 Unistrut subcontractor.
5. ICS manufacturer to furnish 2.5” wide extruded aluminum Unistrut closure strips. Closure strips shall be finish matched to ceiling framing.
6. ICS manufacturer shall supply lengths ¾” wide x 1-7/16” high trim angles on entire perimeter of system as required to be field cut by installing contractor if necessary to cover rough hard ceiling opening.
7. All tees shall be pre-punched on 6" centers for independent suspension from above for all framing not located between ceiling-level Unistrut channels.
8. ICS manufacturer shall furnish 1/8" thick closed-cell polyethylene gasket tape to be field installed on the frame assembly to provide seal between diffuser/tee grid or blank-off panel/tee grid interface.
9. The ceiling framing system shall be finished to match laminar flow diffuser modules (LM) and blank-off panels.
	1. light fixtures
10. Any light fixtures within ICS shall be supplied, installed and wired by Division 26. The ceiling grid shall allow light fixture working parts to allow for maintenance access and proper functionality.
11. Coordinate with GC or Division 26 Electrical Contractor to obtain submittal cuts including overall and lens door dims, for review by ICS manufacture. Notify General Contractor and Architect promptly of any fit or function issues.
12. EXECUTION

3.1 INSPECTION/EXAMINATION

1. Integrated Ceiling System manufacturer’s factory service team member, not local representative, shall perform on-site inspection and interference assessment of above-ceiling spaces including the structural support system prior to release of custom-engineered materials to fabrication.
2. Local manufacturer’s representative shall be available for coordination meetings.
3. Verify balancing dampers are installed on all duct take-off to diffusers, despite whether dampers are specified as part of the diffuser assembly.
4. The installing contractor shall examine all openings, mechanical and electrical work, and adjoining and adjacent construction to receive ICS prior to commencing this work.
5. The installing contractor shall field verify that the rough hard ceiling opening dimensions are as indicated within ICS manufacturer’s submittals. Hard ceiling conditions shall be plumb and level with square corners at required elevation detail (1/4” above the bottom of the finish level Unistruts) as shown in manufacturer’s submittals ,and ready to receive the ICS. Openings or ceiling height not acceptable for ICS installations shall be corrected by the appropriate contractor until conditions are satisfactory to installing contractor.
6. The General Contractor shall coordinate corrective/remedial work promptly.
7. Proceeding with the installation of the ICS indicates the installing contractor accepts the openings and conditions.

3.3 INSTALLATION

1. Install diffusers where shown in accordance with manufacturer's instructions and reviewed submittals.
2. Hang diffusers independently of the ceiling construction from hanger wires as may be required by diffuser weight in accordance with plan details.
3. Connect diffusers to air plenum branch supply ducts in accordance with plan details.
4. Provide balancing dampers on duct take-off to diffusers.

3.4 Installation oF ceilinG FRAMING SYSTEM

1. Verify location of all components as shown on the ICS manufacturer’s approved submittals.
2. The ICS manufacturer's factory service team member, not local representative, shall be scheduled to be on site at commencement of framing and ceiling-level Unistrut installation. Technician shall provide installation supervision. Service shall be scheduled to take place after installing contractor assures ICS manufacturer that room construction is at a stage compatible with the supervision services to be provided.
3. Using hardware supplied by ICS manufacturer (spring nuts, bolts and washers), attach framing to Unistrut as per manufacturer’s installation supervisor’s project-specific instructions based on site conditions.
4. Where any adjacent welded framing sub-assemblies butt together with half-tees, the adjoining surfaces shall be gasketed and mechanically-fastened with self-tapping wafer head screws.
5. Gasket tape provided by ICS manufacturer shall be field installed on the top side of all horizontal ceiling grid surfaces as shown in ICS manufacturer’s submittal. Gasketing to be installed after framing surfaces have been wiped clean, free from any construction dust.
6. Provide inserts, power-driven type anchors, hangers or other Architect / Engineer approved hanger anchoring and suspension system devices and methods.
7. Install suspended ceiling hangers plumb and free from contact with insulation or other objects within ceiling plenum not part of supporting structural or ceiling suspension systems. Splay hangers only where required to avoid obstructions and offset resulting horizontal forces by bracing, counter splaying, or other Architect / Engineer approved methods.
8. Where width of ducts, cable trays and other construction within ceiling plenums causes hanger spacing to interfere with the location of hangers required to support suspension system members, install supplemental suspension members and hangers in the form of trapeze or equivalent Architect / Engineer approved devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
9. Secure wire hangers to structure by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners appropriate for the substrates.
10. Hanger wires for framing sections not attached to ceiling-level Unistrutshall be installed a maximum 2’-0” on center in both directions and a maximum 6 inches from framing ends.
11. Hangers shall not penetrate ductwork, ductwork insulation or piping insulation. Integrated Ceiling System shall not be suspended from ductwork, conduit, pipes or plumbing equipment. Hangers shall not interfere with heating and ventilating equipment and their maintenance.
12. Blank-off panels for equipment penetrations within the ICS shall be field cut and installed by contractor before booms are attached to structural plates. Blank-off panels shall not be cut in half.
13. The Electrical Contractor will utilize the ICS for lay-in type lighting fixtures. The Electrical Contractor shall provide any separate primary support or secondary frame members required to anchor and support lighting fixtures and equipment and to supplement and strengthen the standard suspension system in conformance with N.E.C. requirements. Provide openings for flush down- lighting fixtures located within blank-off panels as shown on Electrical Drawings and reflected ceiling plans.
14. After the medical equipment rails have been installed, contractor shall be responsible to field measure exposed ceiling-level Unistrut areas and field cut the 2.5” wide strut closure strips to required sizes in accordance with manufacturer’s installation instructions.. Before installation onto exposed Unistrut, contractor shall apply 3/8” wide PSA-backed gasketing provided by ICS manufacturer to closure strips as per manufacturer’s instructions. Contractor shall not install strips until medical equipment rails have been installed into final positions or damage to strips may occur in removal for rail attachment.

END