

University of Houston Master Specification

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SECTION 23 3713 - AIR DISTRIBUTION DEVICES

Maintain Section format, including the UH master spec designation and version date in bold in the center columns of the header and footer. Complete the header and footer with Project information.

Edit and finalize this Section, where prompted by Editor's notes, to suit Project specific requirements. Make selections for the Project at text identified **in bold**.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide air distribution devices and accessories as specified, scheduled, and shown on the Drawings.
- B. Types: The types of air distribution devices required for the project include, but are not limited to:
 1. Ceiling diffusers.
 2. Registers and grilles.
 3. Light troffer boots.
 4. Linear slot diffusers.
 5. Perimeter supply/return slot diffusers.

1.3 QUALITY ASSURANCE:

- A. NFPA Compliance: Comply with National Fire Protection Association (NFPA) Standard NFPA 90, as applicable to air diffuser construction and installation.
- B. Design Compliance: When directed by the Engineer, test air outlets to verify compliance with these Specifications. Perform all revisions required to comply with terminal velocity, noise level or maximum temperature variation requirements at no cost to the Owner.
- C. Air Distribution Equipment: Maximum space temperature variation shall not exceed 2°F through the conditioned area from 2' above the floor, to 7' above the floor. The air outlets shall be selected

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by the manufacturer to suit the volume, throw and noise level scheduled as shown on the Drawings and maintain maximum terminal velocities of 50 fpm, unless otherwise indicated.

1.4 SUBMITTALS:

- A. Submittals shall include, but not be limited to, the following:
 - 1. Cutsheets on air devices clearly indicating all features, accessories, mounting provisions, throw, pressure drop, noise criteria, and other pertinent performance data clearly indicated.
 - 2. Dimensioned drawings for all custom and special dimension linear slot diffusers and air devices.
 - 3. Test data and results as specified herein. Test results shall be certified by an authorized officer of the company.
 - 4. Additional information as required in Section 23 0100 "Mechanical Scope of Work".

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver air distribution devices in factory-fabricated water-resistant wrapping.
- B. Handle air distribution devices carefully to avoid damage to material component, enclosure, and finish.
- C. Store air distribution devices in a clean, dry space and protect from the weather.

PART 2 - PRODUCTS

2.1 AIR DISTRIBUTION DEVICE GENERAL REQUIREMENTS:

- A. General: Provide air distribution devices of the size, shape, and type, constructed of materials and components and with finishes as scheduled and shown on the Drawings. Grilles, registers and diffusers shall be provided with sponge rubber or soft felt gaskets. Selections shall meet the manufacturer's own published data for the scheduled performance criteria. The throw shall be such that the velocity at the end of the throw in the five foot occupancy zone will be not more than 50 fpm nor less than 25 fpm. Noise levels shall not exceed those published in the 2019 ASHRAE Handbook – HVAC Applications, Chapter 49, Table 1 for the type of space being served.
- B. Compatibility: Air distribution devices shall be fully compatible with the surfaces in which they are installed and shall be provided with all required mounting accessories for installation in the actual construction at the installation location.
- C. Finishes: All ceiling and wall mounted air devices shall be painted white or off white unless specified otherwise and all air devices shall be the same color unless specified otherwise. Where different finishes are called for, the specified finish shall be factory applied. Finish air outlets with a baked on enamel unless otherwise noted. The Architect's decision on white color compatibility is final.
- D. Ceiling Diffusers: Provide opposed volume control dampers with supply air diffusers where scheduled. Where applicable, provide adapters with diffusers to permit connection to round supply duct. Perforated diffuser may be used in retrofit installations only; architectural louvered style diffuser shall be used in new construction. The interior of all perforated plate diffusers shall be painted flat black. Perforated plate supply air diffusers shall have pattern control blades installed in the diffuser neck. Pattern controllers attached to the perforated plate are **not** acceptable. Provide concealed fastening on all ceiling diffusers.

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- E. Registers and Grilles: Provide registers which contain a key-operated opposed blade damper operable from the face side, unless scheduled otherwise. Supply air registers shall be of the double deflection type, unless otherwise noted. Return air grilles and registers shall have fixed face blades and match the face of the supply air registers, unless scheduled otherwise. Provide concealed fastening for all registers and grilles.

2.2 RETROFIT AIR DEVICES:

A. Double-sided Light Troffer Boots (not allowed in new construction):

1. Troffer slot type diffusers shall consist of nominal 48" long supply plenums on each side of the lighting fixture, a cross-over duct connecting the two plenums, and a single oval duct side entry connection. The air volume shall be as scheduled or shown on the Drawings.
2. The troffer boot manufacturer shall coordinate the attachment, shape, height, and similar features of the supply plenum with the manufacturer of the air handling troffer type lighting fixture specified in Division 23. The maximum combined height of the light and boot shall be 8" above finished ceiling. Each air troffer shall include an air pattern control device, if required, to coordinate with the lighting fixtures furnished. The lighting fixture and troffer boot assembly shall be designed to direct the supply air horizontally at the ceiling.
3. The lighting fixture and troffer boot assembly shall be tested as a unit at the diffuser manufacturer's laboratory. Certified copies of the test results shall be delivered to the Engineer for review. The test data shall include AK factors for an Anor velometer, diffuser static pressure drop, horizontal airflow, spread, sound data, and velocity profile for horizontal airflow at rates in 20 cfm increments from 60 to 200 cfm. Test data shall be based on a 55°F supply air temperature and 20°F temperature differential. Maximum leakage of the assembly shall not exceed 10% of design flow rate. Upon review of certified test results, the Engineer may require additional tests which will be witnessed by the Engineer, at no additional cost to the Owner.
4. The plenum shall be painted flat black on exposed and inner surfaces as viewed from below the ceiling system. Plenum shall be constructed of at least 26 gauge galvanized steel and shall be substantially airtight, supported, and reinforced as required. **[The entire troffer shall be externally insulated with duct wrap insulation with a continuous vapor barrier.]**
5. The performance shall equal or exceed the following when mounted on the 2 x 4 light fixture specified in Division 26 Sections.

<u>CFM</u>	<u>PRESSURE DROP INCHES W.C.</u>	<u>THROW @ 50 FPM TERMINAL VELOCITY</u>	<u>N.C.*</u>
60	0.04	4'	Less than 20
100	0.07	6'	Less than 20
120	0.10	7'	Less than 20
160	0.17	8'	Less than 25
200	0.28	10'	Less than 35

* Based on 10 dB room absorption.

B. Single Side Light Troffer (not allowed in new construction)::

1. The single side troffer shall be similar to the double-sided light troffer boot, but shall have one supply plenum on the side of a light fixture, with a single 6" oval duct side entry connection. The maximum combined height shall not exceed 7" above finished ceiling.

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2. Test data shall be similar to that specified for the boot, except between 40 and 120 cfm. Performance shall equal or exceed the following when mounted on the 2 x 4 light fixture specified in Division 26.

<u>CFM</u>	<u>PRESSURE DROP INCHES W.C.</u>	<u>THROW @ 50 FPM TERMINAL VELOCITY</u>	<u>N.C.*</u>
40	0.04	3'	Less than 20
60	0.08	6'	Less than 20
80	0.14	8'	Less than 20
120	0.34	17'	Less than 40

* Based on 10 dB room absorption.

C. Perforated Plate Type [] Supply Air Devices (retrofit only):

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model 1100.
 - b. Metal-Aire Series 7000.
2. Devices shall be aluminum/steel construction with an aluminum face and aluminum or steel pans. Frames shall have mitered corners and be suitable for lay-in installation. Perforated faces shall have a concealed hinge mechanism such that the plate remains attached to the frame when opened. Exposed external parts shall have a factory applied white or off-white baked enamel finish. Visible internal parts shall be factory painted flat black. All steel components shall be fully phosphatized prior to painting and there shall be no unpainted steel parts. Diffusers shall incorporate internal pattern control louvers. The use of pattern control devices attached to the perforated plate is not acceptable. Air devices shall be 4-way diffusion pattern unless noted otherwise on the drawings. An opposed blade balancing damper shall be provided where scheduled. Device neck size shall be as shown on the drawings.

D. Perforated Plate Type [] Supply Air Devices (retrofit only):

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Metal-Aire Series 7500.
 - b. Hart & Cooley, Inc. AmeriFlow 9000 Series.
 - c. Titus PAS.
2. Devices shall be aluminum/steel construction with an aluminum face and aluminum or steel pans. Frames shall have mitered corners. Perforated faces shall have a concealed hinge mechanism such that the plate remains attached to the frame when opened. Exposed external parts shall have a factory applied white or off-white baked enamel finish. Visible internal parts shall be factory painted flat black. All steel components shall be fully phosphatized prior to painting and there shall be no unpainted steel parts. Diffusers shall use deflectors attached to the perforated plate in a secure manner to control pattern. Air devices shall be 4-way diffusion pattern unless noted otherwise on the drawings. An opposed blade balancing damper shall be provided where scheduled. Device neck size shall be as shown on the drawings.

E. Perforated Plate Type [] Exhaust and Return Air Devices (retrofit only):

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1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model 1190
 - b. Metal-Aire Series 7000.
 - c. Hart & Cooley, Inc. AmeriFlow 9100 Series.
 - d. Titus PAR.
2. Devices shall be aluminum/steel construction with an aluminum face and aluminum or steel pans. Frames shall have mitered corners. Perforated faces shall have a concealed hinge mechanism such that the plate remains attached to the frame when opened. Exposed external parts shall have a factory applied white or off-white baked enamel finish. Visible internal parts shall be factory painted flat black. All steel components shall be fully phosphatized prior to painting and there shall be no unpainted steel parts. An opposed blade balancing damper shall be provided where scheduled. Device neck size shall be as shown on the drawings. Air device frame shall be suitable for use with the ceiling in which the device is installed. Titus Type PAR, Metal-Aire Series 7000 PCR-AB-6, J and J Model AL-1290 Series or Krueger Model 1190 Series.

2.3 AIR DISTRIBUTION DEVICES:

A. Louver Face Type [] Square Ceiling Supply Diffusers:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Kreuger Series SH.
 - b. Metal-Aire Series 5000.
 - c. Hart & Cooley, Inc. ARS.
 - d. Titus TDC-AA.
2. Diffusers shall be all aluminum construction with mitered corner V-bevel border style surface frames suitable for use with the ceiling in which it is installed. The entire grille shall have a factory applied white or off-white baked enamel finish. Air devices shall be 4-way diffusion pattern unless noted otherwise on the drawings. An opposed blade balancing damper shall be provided where scheduled.

B. Linear Slot Type [] Air Devices:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Metal-Aire Series 6075.
 - b. Titus ML-38 for supply and MLR-38 for return.
2. Devices shall be continuous, extruded aluminum slot diffusers with mitered corners. Diffusers shall have 3/4" slots as scheduled and shall have extruded aluminum pattern control blades (supply slots only). Diffuser mounting frames shall be suitable for use with the ceiling in which the diffuser is installed. The entire diffuser (except pattern control blades) shall have a factory applied **[clear anodized aluminum] [white or off-white baked enamel]** finish. The pattern control blades shall have a factory applied flat black baked enamel finish. Slot diffusers shall have concealed mounting hardware. Provide insulated supply air plenums as shown on the Drawings.

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C. LinearBar Diffuser Type [] Air Devices (for wall and ceiling applications):

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Metal-Aire Series 2100.
 - b. Hart & Cooley L Series.
 - c. Titus CT-580 Series.
2. Devices shall be continuous, extruded aluminum slot diffusers with mitered corners. Diffusers shall have 1/2" slot spacing with 0 degrees or 15 degrees deflection and 1/8" bars as scheduled and shall be suitable for use the ceiling or wall type in which the diffuser is installed. The entire diffuser shall have a factory applied **[clear anodized aluminum] [white or off-white baked enamel]** finish. The pattern control blades shall have a factory-applied flat black baked enamel finish. Diffusers shall have concealed mounting hardware and mitered corners. Provide insulated supply **[and return]** air plenums as shown on the Drawings.

D. LinearBar Diffuser Type [] Air Devices (for floor and sill applications):

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Metal-Aire Series 2100.
 - b. Hart & Cooley L Series.
 - c. Titus CT-PP Series.
2. Devices shall be continuous, extruded aluminum slot diffusers with mitered corners. Diffusers shall have 7/16" slot spacing with 0 degrees or 15 degrees deflection and 7/32" bars as scheduled and shall be suitable for use the floor or sill type in which the diffuser is installed. The diffuser shall be considered 'pencil-proof' meaning a pencil cannot drop between the bars. The entire diffuser shall have a factory applied **[clear anodized aluminum] [white or off-white baked enamel]** finish. The pattern control blades shall have a factory-applied flat black baked enamel finish. Diffusers shall have concealed mounting hardware and mitered corners. Provide insulated supply **[and return]** air plenums as shown on the Drawings.

E. High Induction Perimeter Supply/Return Slot Diffuser:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Titus N-1 for supply applications and N-1-R for supply/return applications.
 - b. Approved equal.
2. Provide slot-type supply or supply/return diffuser as scheduled or shown on the Drawings. The supply/return diffuser shall be installed above the ceiling and located as indicated on the Drawings. **[The perimeter supply linear boot diffusers shall have an internal, fixed, curved, aerodynamically shaped outlet designed to provide the maximum amount of induced secondary room air.]** The return air slot (where scheduled) shall be located so that the supply air pattern will not be affected. The supply air shall be discharged horizontally along the ceiling with a down discharge center section (where scheduled).
3. The diffuser shall be designed, tested, and constructed in a manner so as to comply with the performance criteria and sound level requirements specified hereinafter. Diffuser shall be

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constructed of at least 24 gauge galvanized steel and shall be reinforced as required. The air volume, length and duct connection size, and application (supply or supply/return) shall be as scheduled or shown on the Drawings. The diffuser manufacturer shall coordinate the attachment, support, tee spacing, and similar features of the diffuser with the applicable trades.

4. The entire assembly shall be tested as a unit at the manufacturer's laboratory. Submit certified copies of the test results to the Engineer for review. The test data shall include AK factors for an Alnor velometer, sound data, diffuser static pressure drop, horizontal air throw, and drop for the air supply rates per lineal foot of diffusers indicated below. The test data shall be based on a 55°F air supply temperature, a 20°F temperature differential and an 85°F heating supply air temperature.
5. The diffuser shall be painted flat black on interior surfaces and the exposed surfaces as viewed from below the ceiling system shall be painted flat black **[the entire diffuser assembly shall be externally insulated with duct wrap insulation with a continuous vapor barrier]**.
6. The perimeter ceiling supply/return linear diffuser shall be designed to equal or exceed the following performance characteristics:

<u>CFM/ LIN. FT. DIFFUSER</u>	<u>MAX. DIFFUSER STATIC PRESSURE LOSS - IN W.C.</u>	<u>THROW @ 50 FPM TERMINAL VELOCITY</u>	<u>NC LEVEL*</u>
30	0.1	7'	Less than 20
40	0.1	14'	Less than 23
50	0.1	17'	Less than 30
60	0.15	19'	Less than 34
70	0.20	21'	Less than 38

* Based on 10 dB room absorption.

7. The Engineer will have the option to witness additional tests after receipt of certified test results to verify compliance with these Specifications at no additional cost to the Owner.

F. High Induction Perimeter Supply/Return Diffuser [] Air Devices:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Titus N-1-D for supply applications and N-1-DR for supply/return applications.
 - b. Approved equal.
2. Devices shall be high induction, side inlet slot diffusers with length and neck size as shown on the drawings. The diffusers shall have an aerodynamically designed, venturi shaped air outlet designed to direct supply air from the ends of the diffuser horizontally across the ceiling and to provide maximum aspiration and entrainment of room air. The supply air shall maintain a ceiling pattern with varying volumes of air to minimum flow. Supply air from the center section shall be in a downward vertical throw pattern. The diffuser shall have a maximum height of 9" and shall be able to be completely supported by two ceiling tee's on nominal 2-3/4" centers. The diffuser shall be constructed of minimum 24 gauge non-rusting steel and all surfaces exposed to view below the ceiling shall be painted flat black. **[Diffusers shall be factory-insulated with external duct wrap insulation with a continuous vapor barrier.]**

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G. Linear slot Type []:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model PTBS.
 - b. Metal-Aire Series PHP.
 - c. Titus TBD.
2. Air devices shall be adjustable pattern, plenum slot, side inlet slot diffusers with length and neck size as shown on the drawings. Slots shall be constructed of galvanized steel with exposed surfaces painted flat black. **[Diffusers shall be factory-insulated with internal duct liner insulation.]** Slot diffusers shall be designed to deliver scheduled cfm directed horizontally across the ceiling with a maximum pressure drop of 0.08" while not exceeding NC30 based upon a room absorption of 10 dB, RE 10-12 watts. Slot performance shall be certified by independent lab testing.

H. Louver Face Type [] Wall Supply Grilles:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model 5880.
 - b. Metal-Aire Series 4000.
 - c. Titus 272.
2. Grilles shall be all aluminum construction with 3/4" airfoil double deflection blades, mitered frames and an opposed blade balancing damper where scheduled or shown on the Drawings. Grilles shall be suitable for mounting in the wall type in which it is installed. The entire grille shall have a factory applied white or off-white baked enamel finish. Grilles shall have concealed mounting hardware and shall be provided with flush mounting frames in front of house areas. Front of house shall be defined as areas of the building typically occupied by building occupants and shall exclude electrical rooms, IDF/MDF rooms, janitor closets, and mechanical areas.

I. Louver Face Type [] Wall Return Grilles:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model AFS580
 - b. Metal-Aire Series RHE.
 - c. Titus 3-FL.
2. Grilles shall be all aluminum construction with 3/4" airfoil double deflection blades, mitered frames and an opposed blade balancing damper where scheduled or shown on the Drawings. Grilles shall be suitable for mounting in the wall type in which it is installed. The entire grille shall have a factory-applied white or off-white baked enamel finish. Grilles shall have concealed mounting hardware and be provided with flush mounting frames in front of house areas. Front of house shall be defined as areas of the building typically occupied by building occupants and shall exclude electrical rooms, IDF/MDF rooms, janitor closets, and mechanical areas.

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- J. Type [] Slot Return Air Boots: Boots shall be minimum 24 gauge galvanized sheet metal, constructed as detailed on the Drawings. The entire boot shall be painted flat black and shall have an appearance similar to the project supply air slot diffusers when installed.
- K. Type [] Slot Blankoff: Blank-off shall be minimum 24 gauge galvanized sheet metal, constructed. The entire blank-off shall be painted flat black and shall have an appearance similar to the project supply air slot diffusers when installed.
- L. Type [] Garage Supply/Exhaust Grilles: Grille shall consist of a framed mesh grille in the CMU wall opening as detailed on the Drawings and furnished under another Division. Division 23 to provide a framed sliding blade guillotine type damper with screw stops on the plenum side of each CMU opening.
- M. Louver Face Type [] Wall and Ceiling Return/Exhaust Grilles:
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger Model AFS585
 - b. Titus 4-FL.
 2. Grilles shall be all aluminum construction with 45 degree louvers on 1/2" centers, mitered frames and an opposed blade balancing damper where scheduled. Grilles shall be suitable for mounting in the wall or ceiling type in which it is installed. The entire grille shall have a factory applied white or off-white baked enamel finish. Grilles shall have concealed mounting hardware and be provided with flush mounting frames in front of house areas. Front of house shall be defined as areas of the building typically occupied by building occupants and shall exclude electrical rooms, IDF/MDF rooms, janitor closets, and mechanical areas.
- N. Louver Face Type [] Wall and Ceiling Return/Exhaust Grilles:
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Titus 25-RL.
 2. Grilles shall be all steel construction with 30 degree curved blades on 1/2" centers, mitered frames and an opposed blade balancing damper where scheduled. Grilles shall be suitable for mounting in the wall or ceiling type in which it is installed. The entire grille shall have a factory applied white or off-white baked enamel finish. Grilles shall have concealed mounting hardware and be provided with flush mounting frames in front of house areas. Front of house shall be defined as areas of the building typically occupied by building occupants and shall exclude electrical rooms, IDF/MDF rooms, janitor closets, and mechanical areas.
- O. Grid Face Type [] Wall and Ceiling Supply, Return and Exhaust Grilles:
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Krueger EGC.
 - b. Metalaire CC1.
 - c. Titus 50F.
 2. Grilles shall all aluminum construction with a 1/2" x 1/2" x 1" grid face, mitered frame and an opposed blade balancing damper where specified. Grilles shall be suitable for mounting in the

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wall or ceiling type in which it is installed. The entire grille shall have a factory applied white or off-white baked enamel finish. Grilles shall have exposed screw mounting hardware.

- P. Fire Rated Diffusers: Where indicated on drawings, provide radiation dampers at diffuser neck to provide a UL listed assembly. Refer to Section 23 3114 "Ductwork Accessories".
- Q. Type [] Security Grilles:
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Metalaire SG2000.
 - b. Titus SG-1500FL
 2. Grilles shall be all aluminum construction with mitered frames, concealed fastenings and rectangular bar louvers. Grilles shall be tamper resistant and specially designed for installation in a minimum security environment. Louver shall be 3/16" by 3/4" welded aluminum bars with zero degree deflection. Grilles shall be factory modified for proper mounting in the ceiling or wall type in which they are installed. Grille shall have an clear anodized finish. Grilles shall be directly supported from the building structure where the mounting surface does not provide an adequate structure to properly install the grille.
- R. Type [] Operating Room Ceiling Supply Laminar Flow Diffusers:
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
 - a. Precision Air Products Series PAT-A
 - b. Titus
 - c. Nailor
 - d. Price
 2. Diffusers shall be all aluminum construction using aluminum extrusions for framing. Framing shall be of a design such that through the application of solid plates, two separate plenums shall be formed. Air shall be admitted to the initial plenum through a side mounted oval collar. The inlet collar shall have a control mechanism, accessible behind the faceplate, to meter the air volume admitted to the upper plenum chamber. Air shall then pass through air diffusion devices in a secondary plate into the lower plenum where it is forced by pressure displacement through the diffuser perforated faceplate. The housing shall have an extruded aluminum frame with all corners continuous heli-arc welded to form an air tight shell. The perforated final diffusion faceplate shall be 14 gauge aluminum, perforated with 16% free area in a square pattern. The faceplate shall be held in place in the housing frame with an aluminum mounting with mitered and back-welded corners. The faceplate shall be attached with flush quarter-turn fasteners to allow access for balancing and filter changeout. Vinyl coated stainless steel cable safety retainers shall be provided to prevent dropping of the faceplate assembly during disassembly. The housing frame shall be suitable for use with a plaster/drywall or lay-in ceiling as shown on the Drawings. The actual mounting type shall be coordinated with the ceiling type as shown on the Architectural Drawings. The entire diffuser housing shall be finished with a white baked glass epoxy enamel. During operation of the diffuser assembly there shall be zero aspiration at the face of the perforated plate and velocities in the plane of the perforated plate shall vary no

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more than 10% when tested with a velometer directly to the face of the plate, to establish a uniformity of air discharge.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install air distribution devices in accordance with manufacturer's written instructions and recognized industry practices to ensure that products serve intended functions.
- B. Coordination: Coordinate with other trades, including ductwork, and ductwork accessories, as necessary to interface air distribution devices properly with other work.
- C. Locations: Locations of air distribution devices shown on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be governed by the established pattern of the lighting fixtures. Where air distribution devices are installed in acoustical tile and other ceilings they shall be either centered on tile or ceiling joints as directed by Architect at job site. Coordinate location of all ceiling air devices with Architectural reflected ceiling plans. **[All devices installed in UL floor/ceiling or roof/ceiling assemblies shall be compatible with the assembly specified on the Architectural Drawings.]**
- D. Mounting Provisions: Coordinate mounting provisions and accessories required for proper installation of air devices in finish and construction at the point of installation. Refer to details on the Mechanical and Architectural Drawings for special installation details and provide all mounting accessories shown or required for the complete and proper installation of each air device.
- E. Accessories: Where scheduled, the grilles, registers and ceiling outlets shall be provided with deflecting devices and manual balancing damper. These devices shall be the standard product of the manufacturer, subject to review by the Architect, and equal to brand scheduled.
- F. Insulation: Refer to Specification Section 23 0700, "System Insulation", for field insulation of air devices, where required.
- G. Security Air Devices: Tamper resistant air devices in Secure Areas shall be installed in accordance with Manufacturer's recommendations for the construction types used on the project. In all cases, tamper resistant air devices shall be securely mounted to the building construction.

3.2 FIELD QUALITY CONTROL:

- A. Test: Test installed devices to demonstrate satisfactory compliance with specified and indicated requirements.
- B. Adjustment: Adjust air distribution devices to provide air distribution patterns shown on the drawings or required.
- C. Air Balancing: Balance the airflow through each air device to the volumes shown on the Drawings. Refer to Specification Section 23 0593, "Testing, Adjusting and Balancing for HVAC" for additional balancing requirements.

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