

SECTION 233100 - HVAC DUCTS AND CASINGS

- PART 1 GENERAL
1.01 SECTION INCLUDES
A. Metal ductwork
B. Nonmetal ductwork
C. Round spiral ductwork
D. Double wall insulated round ductwork
E. Kitchen hood ductwork, Type I grease hoods
F. Dishwasher exhaust ductwork
G. Exterior above grade ductwork
H. Duct cleaning
1.02 PERFORMANCE REQUIREMENTS
A. No variation of duct configuration or sizes permitted except by written permission...

- 2.03 DUCT MANUFACTURERS
2.04 MANUFACTURED METAL DUCTWORK AND FITTINGS
A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
B. Round Spiral Ducts: Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.
C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1 inch thick fiberglass insulation, perforated galvanized steel inner wall; filling with solid inner wall...

- PART 3 EXECUTION
3.01 EXAMINATION
A. Examine drawings for the Architectural, Structural, Electrical and all other trades prior to preparation of ductwork shop drawings and prior to the fabrication of any ductwork.
B. Resolve any conflicts encountered with the Engineer prior to fabrication.
3.02 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
C. Install all steel metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal con with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring...

- R. At exterior wall louvers, seal duct to louver frame and install blank-out panels, insulated.
3.03 CLEANING
A. Clean duct system and force air at high velocity through duct to remove accumulated dust or clean with high power vacuum machines. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
3.04 SCHEDULES
Ductwork Material:
B. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor.
1. Low Velocity Supply (Heating Systems): Galvanized Steel, Aluminum.
2. Low Velocity Supply (System with Cooling Coils): Galvanized Steel, Aluminum.
3. Return Air Intake: Galvanized Steel, Aluminum.
4. General Exhaust: Galvanized Steel, Aluminum.
5. Outside Air Intake: Galvanized Steel.
6. Kitchen Hood Exhaust, Type I: Carbon Steel, Stainless Steel, Constructed per NFPA 96.
7. Dishwasher Exhaust: Stainless Steel, Glass Fiber Reinforced Plastic, seal or weld all joints water tight.
8. Ductwork Pressure Class:
1. Low Velocity Supply (Heating Systems): Scheduled System ESP+0.25", round up to next higher pressure class.
2. Low Velocity Supply (Systems with Cooling): Scheduled System ESP +0.5", round up to next higher pressure class.
3. Return and Relief: 1 inch.
4. General Exhaust: Scheduled System ESP +1.0", round up to next higher pressure class.
5. Outside Air Intake: 1 inch.
6. Kitchen Hood Exhaust: See drawings for maximum fan static pressure plus 50% additional.
7. Dishwasher Exhaust: 2 inch.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

- PART 1 GENERAL
1.01 SECTION INCLUDES
A. Air turning devices/extractors.
B. Volume control dampers.
C. Flexible duct connections.
D. Duct access doors.
E. Fire dampers.
2.01 AIR TURNING DEVICES/EXTRACTORS
A. Manufacturers: Krueger; Ruskin Company; Thrus.
B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction, with individually adjustable blades, mounting straps.
2.02 VOLUME CONTROL DAMPERS
A. Manufacturers: Louvers & Dampers, Inc.; Nalor Industries Inc.; Ruskin Company; Prefco Inc.
B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
C. Blade Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
F. The contractor shall provide either a mechanical or electrical cable operated system wherever dampers are located in non-accessible areas.
1. Mechanical cable operator system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with coasing and concealed ceiling regulator control.
2. Electrically operated damper control system shall be similar and equal to United Exhaust Corporation, "Power Balance" system including motor operated damper, RJ-11 plenum rated cabling and flush ceiling or wall mounted RJ-11 jack in remote plate. Include one hand held battery pack operator pack to be delivered to the Owner upon completion of the balancing.

- 2.03 FLEXIBLE DUCT CONNECTIONS
A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq. yd.
a. Net Fabric Width: Approximately 24 inches wide.
2. Metal: 1/8 inch wide, 24 gage thick galvanized steel.
2.04 DUCT ACCESS DOORS
A. Manufacturers: Acador Products Inc.; Nalor Industries Inc.; Ruskin Company; SEMCO Incorporated.
B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. Install minimum 1 inch thick insulation with sheet metal cover.
1. Up to 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Access doors with sheet metal screw fasteners are not acceptable.
2.05 FIRE DAMPERS
A. Manufacturers: Louvers & Dampers, Inc.; Nalor Industries Inc.; Ruskin Company; Prefco Inc.
B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
C. Ceiling Dampers: Galvanized steel, 22 gage frame and 18 gage flap, two layers of 0.125 inch ceramic fiber on top side with locking clip.
D. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat resistant - asbestos fiber blanket.
E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations or closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.
F. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel shafts. 1/2 inch thick plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

- PART 3 EXECUTION
3.01 INSTALLATION
A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Duct construction and pressure class shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, of fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
C. Locate all dampers and control elements in accessible areas wherever possible to avoid access doors. Provide ceiling access to all dampers and control elements located above inaccessible ceiling areas. Provide minimum 12 x 12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. Do not locate dampers closer than 5 feet or 10 duct diameters from the air terminals. Where available, the distance is greater.
F. All fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment's flexible duct connections immediately adjacent to the equipment.
G. All equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
H. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

- PART 1 GENERAL
1.01 SECTION INCLUDES
A. Cabinet and ceiling fans.
PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Greenheck; Loren Cook Company; PennBarry; CaptiveAir.
2.02 POWER VENTILATORS - GENERAL
A. Performance Rating: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
B. Sound Rating: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
C. Fabrication: Conform to AMCA 99.
D. UL Compliance: UL listed and labeled, designed, manufactured, and tested as suitable for the purpose specified and indicated.
2.03 CABINET AND CEILING FANS
A. Centrifugal Fan Unit: V-Belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.
C. Grille: Aluminum with baked white enamel finish or molded white plastic as specified on the Drawings.
D. Backdraft Damper: Gravily actuated, aluminum blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
E. Shafts: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-balanced ball bearings.

- PART 3 EXECUTION
3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Provide sheaves required for final air balance at no additional expense to the project.
C. Secure roof and wall exhausters with cadmium plated steel lag screws to roof curb or wall structure.
D. Counterflash duct to roof or wall opening.
E. Install backdraft dampers (gravily or motorized as depicted on design drawings) on inlet to roof and wall exhausters.
F. Hung Cabinet Fans:
1. Install fans with resilient mountings and flexible electrical leads.
2. Install flexible connections specified between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan wiring runing.
G. Provide gravity backdraft dampers on outlet from cabinet and ceiling fans and as indicated.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

- PART 1 GENERAL
1.01 SECTION INCLUDES
A. Rectangular ceiling diffusers.
B. Perforated face ceiling diffusers.
C. Spiral duct mounted diffusers.
D. Grid core exhaust and return grilles.
E. Wall registers and grilles.
1.02 SUBMITTALS
A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, accessories, and noise level.
1.03 QUALITY ASSURANCE
A. Test and rate louver performance in accordance with AMCA 500-L.
B. Code requirements shall supersede any conflicting requirements of this Section.
1.04 QUALIFICATIONS
A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.

- PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Greenheck; Price Industries; Nalor Industries Inc.; Hart & Cooley; Ruskin.
2.02 RECTANGULAR CEILING DIFFUSERS
A. Type: Square, adjustable pattern, stamped, multi-core, or architectural plaque diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.
2.03 PERFORATED FACE CEILING DIFFUSERS
A. Type: Perforated face with fully adjustable pattern and removable face.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with steel frame and baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.
2.04 SPIRAL DUCT MOUNTED DIFFUSERS
A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
B. Frame: -3/8 inch margin with countersink screw mounting and gasket.
C. Fabrication: Heavy duty extruded aluminum, with factory off-white enamel finish.
D. Damper: Air scoop damper/extractor shall be constructed of heavy duty aluminum. The air scoop damper to be operable from the face with a screwdriver.
E. Rough Service: Provide front pivoted or welded in place blades, securely fastened to be immovable.
F. Mount flush to duct surface. Confirm duct diameter with the sheet metal contractor (including internal insulation, if specified). Air dimensions are shown on the drawings.
2.05 GRID CORE EXHAUST AND RETURN GRILLES
A. Type: Fixed grilles of 1/2 x 1/2 x 1 inch louvers.
B. Fabrication: Aluminum with factory off-white enamel finish.
C. Frame: 1-1/4 inch margin with countersink screw mounting.
D. Frame: Channel lay-in frame for suspended grid ceilings where face size exceeds 18 x 18 inch.
E. Damper (if specified on drawings): Integral, ganging-operated, opposed blade type with removable key operator, operable from face.
2.06 WALL SUPPLY REGISTERS/GRILLES
A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
B. Frame: 1-1/4 inch margin with countersink screw mounting and gasket.
C. Fabrication: Steel with 20 gage minimum frame and 22 gage minimum blades, steel or aluminum with 20 gage minimum frame or aluminum extrusions, with factory off-white enamel finish.
D. Damper: Integral, ganging-operated opposed blade type with removable key operator, operable from face.
E. Rough Service: Provide front pivoted or welded in place blades, securely fastened to be immovable.

END OF SECTION

SECTION 236100 - SELF-CONTAINED AIR-CONDITIONERS

- PART 1 GENERAL
1.01 SECTION INCLUDES
A. Water cooled unitary packaged heat pumps.
B. Controls.
PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Carrier Corporation; Trane Inc.; Climatmaster; Dakin Applied; Florida Heatpump; Waterfurnace.
2.02 AIR CONDITIONING UNITS
A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, air filter, and control wiring devices. Install minimum 1 inch thick insulation with sheet metal cover.
B. Assembly: Horizontal flow or up flow air delivery as indicated on the Drawings, in duct-through configuration as indicated.
C. Energy Efficiency: Equal or greater than the efficiency of the equipment scheduled on the Drawings.
2.03 CABINET
A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.
B. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.
C. Drain Pan: Galvanized steel with corrosion-resistant coating.
2.04 A/E: Fan: Direct or V-Belt driven, with permanently lubricated bearings, double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, rearally mounted.
B. Motor: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
2.05 COMPRESSOR
A. Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection.
2.06 EVAPORATOR COIL
A. Direct expansion cooling coil of seamless copper or aluminum tubes expanded into aluminum fins.
B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.
2.07 CONDENSER
A. Co-Axial, copper tube in copper tube or shell tube with lined copper tubes in steel shell with water temperature activated water regulating valve, non-cycling reset relay.
B. Heat pump reversing valve.
C. Fan: Double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, with permanently lubricated bearings.
D. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
2.08 AIR FILTERS
A. Easily removed 2 inch thick disposable panel filters.
2.09 CONTROLS
A. Factory wired controls shall include controller, high and low pressure cutouts, internal wiring thermostat for compressor, control circuit transformer, non-cycling reset relay.
B. Provide voltage, adjustable room thermostat to control compressor, condenser, heating coil if any, and supply fan to maintain temperature setting. Include system selector switch (off-heat-auto-cool), and fan control switch (auto-on), and automatic start accessories capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.
C. Provide two-position solenoid valve on the bleed water to each unit. This valve shall be interlocked with the compressor operation by the Mechanical Contractor.

END OF SECTION

PART 3 EXECUTION

- 3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and in accordance with requirements of NFPA 90A.
B. Provide water cooled air conditioning equipment.
1. On inlet provide: Ball or Butterfly Valve, Strainer, Two Position Solenoid Valve interlocked with Compressor Operation, Pates Port, Flex Braided Hose.
2. On outlet provide: Flex Braided Hose, Air Vent, Pates Port, Automatic Flow Control Valve, Ball or Butterfly Valve.
C. Pipe condensate from drain pan to condensate drainage system or nearest floor drain.
D. Replace all air filters immediately prior to turnover to the Owner and provide one set of spare filters for the Owner's use.



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