SECTION 238216.11 - HYDRONIC AIR COILS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

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

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Hydronic air coils.

Integral face-and-bypass hot-water coils.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.

Include rated capacities, operating characteristics, and pressure drops for each air coil.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Floor plans, sections, and other details, or BIM model, drawn to scale, showing the items described in this Section and coordinated with all building trades.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.
			2. FIELD CONDITIONS
				1. Altitude above Mean Sea Level: <Insert feet>.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or AVITRU. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS

"ASHRAE 62.1 Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction.

* + - * 1. ASHRAE 62.1 Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5, "Systems and Equipment," and Section 7, "Construction and Startup."
				2. Performance Ratings: Tested and rated in accordance with AHRI 410 and ASHRAE 33.

In "Minimum Working-Pressure/Temperature Ratings" paragraph below, retain or insert requirements. Pressure rating varies widely, depending on manufacturer. Consult manufacturers.

* + - * 1. Minimum Working-Pressure/Temperature Ratings: **[**200 psig**/**300 deg F**] <Insert value and temperature>**.
				2. Select cooling coils for no moisture carryover at design conditions.

If Project has more than one type or size of hot-water coil, delete "Hot-Water Coil Capacities and Characteristics" paragraph below and schedule coils on Drawings.

* + - * 1. Hot-Water Coil Capacities and Characteristics:

Coil Face Dimensions:

Finned Length: **<Insert inches>**.

Finned Width: **<Insert inches>**.

Number of Rows: **<Insert number>**.

Coating: **<Insert manufacturer; product>**.

Serpentine: **[Half] [Full]**.

Integral Face-and-Bypass Coil: **[Yes] [No]**.

Air Side:

Flow Rate: **<Insert cfm>**.

Finned Area Face Velocity: **<Insert fpm>**.

Static Pressure Drop: **<Insert inches wg>**.

Total Capacity: **<Insert Btu/h>**.

Entering Temperature: **<Insert deg F>**.

Leaving Temperature: **<Insert deg F>**.

Water Side:

Flow Rate: **<Insert gpm>**.

Tube Velocity: **<Insert fpm>**.

Glycol Type: **[Ethylene] [Propylene]**.

Aqueous Glycol Solution Concentration: **[None] <Insert percentage> [by weight] [by volume]**.

Pressure Drop: **<Insert feet>**.

Entering Temperature: **<Insert deg F>**.

Leaving Temperature: **<Insert deg F>**.

If Project has more than one type or size of chilled-water coil, delete "Chilled-Water Coil Capacities and Characteristics" paragraph below and schedule coils on Drawings.

* + - * 1. Chilled-Water Coil Capacities and Characteristics:

Coil Face Dimensions:

Finned Length: **<Insert inches>**.

Finned Width: **<Insert inches>**.

Number of Rows: **<Insert number>**.

Coating: **<Insert manufacturer; product>**.

Serpentine: **[Half] [Full] [Double]**.

Air Side:

Flow Rate: **<Insert cfm>**.

Finned Area Face Velocity: **<Insert fpm>**.

Static Pressure Drop: **<Insert inches wg>**.

Total Capacity: **<Insert Btu/h>**.

Sensible Capacity: **<Insert Btu/h>**.

Entering Dry-Bulb Temperature: **<Insert deg F>**.

Entering Wet-Bulb Temperature: **<Insert deg F>**.

Leaving Dry-Bulb Temperature: **<Insert deg F>**.

Leaving Wet-Bulb Temperature: **<Insert** deg F**>**.

Water Side:

Flow Rate: **<Insert gpm>**.

Tube Velocity: **<Insert fpm>**.

Glycol Type: **[Ethylene] [Propylene]**.

Aqueous Glycol Solution Concentration: **[None] <Insert percentage> [by weight] [by volume]**.

Pressure Drop: **<Insert feet>**.

Entering Temperature: **<Insert deg F>**.

Leaving Temperature: **<Insert deg F>**.

* + - 1. HYDRONIC AIR COILS
				1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Aerofin.

Carrier Corporation.

Coil Company, LLC.

Greenheck Fan Corporation.

Modine Commercial and Industrial Solutions.

RAE Coils; a division of RAE Corporation.

Super Radiator Coils.

Trane.

USA Coil & Air.

Approved equivalent.

* + - * 1. Source Limitations: Obtain hydronic coils from single source from single manufacturer.
				2. Description: Coils constructed of staggered tubes mechanically expanded into continuous collars that are die-formed into the coil fins; self-venting; counterflow design of air to fluid.
				3. Tubes:

Not all manufacturers offer each tube material type. Not all manufacturers offer each tube diameter and thickness. Most manufacturers do not offer all tube material/diameter/thickness combinations. Indicate requirements on Drawings if materials vary by application. Not all manufacturers offer each tube material in combination with each fin and header material types. Consult manufacturers.

Material: **[Copper] [aluminum] [carbon steel] [90/10 cupronickel alloy] [stainless steel] <Insert material>**.

Nominal Diameter: Minimum **[1/2 inch] [or] [5/8 inch] <Insert nominal diameter>** before expanding, selected to provide performance indicated.

Nominal Wall Thickness: As required by performance, minimum **[0.020 inch] [0.025 inch] [0.035 inch] [0.049 inch] <Insert dimension>** thick.

Return Bends: 180-degree bends; material**[, wall thickness,]** and nominal diameter to match tubes.

Fluid Velocity at Design Flow Rate:

Maximum: **[6 fps] <Insert velocity>**.

Minimum: **[3 fps] <Insert velocity>**.

Features: **[Cleanable] [Individually drainable]**.

* + - * 1. Fins:

Type: Plate.

Materials:

Retain one or more of "Aluminum," "Copper," or "Cupronickel" subparagraphs below. Aluminum is most common fin material for HVAC applications. Copper and cupronickel are used in applications with corrosive environments. Indicate requirements on Drawings if materials vary by application. Not all manufacturers offer each fin material type. Not all manufacturers offer each fin material and type in combination with each tube and header material type. Consult manufacturers.

Aluminum: **[0.0060 inch] <Insert dimension>** thick.

Copper: **[0.0060 inch] <Insert dimension>** thick.

90/10 Cupronickel: **[0.0060 inch] <Insert dimension>** thick.

**<Insert fin material and thickness>**.

Spacing: Maximum **[12 fins per inch] <Insert maximum fin spacing>**.

Collars: Full collars for accurate fin spacing and maximum tube contact while leaving no surface of tube exposed.

Configuration: **[Flat-face fins] [Wave-, corrugated-, or waffle-face fins] [Fin type as required by performance requirements] <Insert fin type>**.

Fin and Tube Joint: **[Mechanical bond] [or] [silver brazed]**.

* + - * 1. Headers:

Retain one or more options in "Material" subparagraph below. Indicate requirements on Drawings if materials vary by application. Not all manufacturers offer each header material type. Not all manufacturers offer each header material type in combination with each tube and fin material type. Consult manufacturers.

Material: **[Carbon steel] [Copper] <Insert material> [, removable for cleaning and inspection of tubes]**.

Tube-to-Header Connections: Tube-to-header holes to intrude inward, so landed surface area is 3 times the core tube thickness, to provide enhanced-header-to-tube joint integrity. Evenly extend tubes within the ID of the header no more than 0.12 inch.

Header Top and Bottom Caps: End caps to be die-formed and installed on the ID of header, such that the landed surface area is 3 times the header wall thickness.

Drains: Include low point of **[supply] [supply and return] header with a [NPS 1/2] <Insert pipe size>** drain connection.

Vents: Include high point of **[return] [supply and return] header with a [NPS 1/2] <Insert pipe size>** vent connection.

Supply and Return Connections: **[Copper] [Carbon steel] [Red brass]** pipe; **[threaded] [or] [flanged]**, **[same end] [opposite ends]** of coil.

Protect opening of supply, return, vent, and drain connections with a threaded cap to prevent entry of dirt into coil.

Fluid Velocity at Design Flow Rate: Maximum of **[6 fps] <Insert velocity>**.

* + - * 1. Casings and Tube Sheets:

Depth: Extend coil casing and tube sheets a minimum of **[1/2 inch] <Insert dimension>** beyond face of fins on both entering and leaving sides.

Materials:

Retain one of three subparagraphs below, or all. Indicate requirements on Drawings if materials vary by application. Not all manufacturers offer each casing material type. Consult manufacturers.

Stainless steel, **[Type 304] <Insert type>**, No. 2D finish, ASTM A240.

Galvanized steel, ASTM A653, G90 coating.

Copper, ASTM B152.

* + - * 1. Top and Bottom Casings:

Flange face minimum of **[1-1/2 inches] <Insert dimension>**; double-flange edge for rigidity and ease of removal with secondary flange face minimum of **[1/2 inch] <Insert dimension>**.

Thickness:

Coils with Fin Length of Up to **[72 Inches] <Insert dimension>**: Minimum of **[16 gauge] [14 gauge] [12 gauge]** thick.

Coils with Fin Length Exceeding **[72 Inches] <Insert dimension>**: Minimum of **[16 gauge] [14 gauge] [12 gauge]** thick.

* + - * 1. End Tube Sheets:

Tube sheet holes rolled to prevent chaffing of tubes during thermal expansion and contraction.

Flange face minimum of **[1-1/2 inches] <Insert dimension>**.

Thickness: Minimum of **[16 gauge] [14 gauge] [12 gauge]** thick.

* + - * 1. Intermediate Tube Sheets:

Tube sheet holes rolled to prevent chaffing of tubes during thermal expansion and contraction.

Space intermediate tube sheets a maximum of **[48 inches] <Insert dimension>** o.c. and locate to provide equal spacing between tube sheet across coil tube length.

Flange face minimum of **[1/2 inch] <Insert dimension>**.

Thickness: Minimum of **[16 gauge] <Insert thickness>** thick.

* + - * 1. Holes: Include number, size, and location of holes in casing and end tube sheets required for coil installation.
				2. Hardware: Use hex-head bolts, nuts, and washers constructed of **[Type1 304] [or] [Type 316]** stainless steel.
				3. Nameplate: Aluminum or stainless steel nameplate with brass or stainless steel chain for each coil, with the following data engraved or embossed:

Retain any of first 12 subparagraphs below.

Manufacturer name, address, telephone number, and website address.

Manufacturer model number.

Serial number.

Manufacturing date.

Coil identification (indicated on Drawings).

Coil fin length.

Coil fin height.

Coil weight with fluid/without fluid.

Coil casing material and thickness.

Coil fin material and thickness.

Coil tube material and thickness.

Coil header material and thickness.

**<Insert requirements>**.

Retain first paragraph below if corrosion-resistant coating is required and is specified in Section 230546 "Coatings for HVAC." If retaining below, consult coil manufacturers to confirm that the coatings included in the referenced Section are available as a factory-applied coating.

* + - * 1. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating. See Drawings for coils requiring a corrosion-resistant coating.

In "Coating" paragraph below, second option refers to coating performance in "Corrosion-Resistant Coating" paragraph in Part 2 "Materials" Article.

* + - * 1. Coating: **[None] [Corrosion resistant] <Insert manufacturer; product name>**.
			1. HOT-WATER HEATING COILS WITH INTEGRAL FACE-AND-BYPASS DAMPERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13582) Subject to compliance with requirements, provide products by the following:

[DRS Marlo Coil; part of DRS Technologies, Inc](http://www.specagent.com/Lookup?uid=123457153360).

[Wing, L. J.; A Mestek Company](http://www.specagent.com/Lookup?uid=123457153359).

Cooney Technologies.

Approved equivalent.

* + - * 1. Source Limitations: Obtain integral face-and-bypass coils from single source from single manufacturer.
				2. Description: Hydronic coil with **[horizontal] [or] [vertical]** tube arrangement**[ as indicated on Drawings]** with integral face-and-bypass dampers and controls installed to control modulating dampers, to achieve discharge air temperature set point. Design includes alternating arrangement of active coil segments and dampers.
				3. Performance:

Each coil capable of maintaining constant discharge air temperature, regardless of variations in entering-air temperature with constant water flow through coil.

Portioning of air across and around heating element to result in uniform temperature within 5 deg F of average temperature when measured anywhere across a vertical plane located **[24 inches] [36 inches]** downstream of leaving face of coil.

In "Casing" paragraph below, not all manufacturers offer each option. Consult manufacturers.

* + - * 1. Casing: **[Galvanized steel] [or] [stainless steel]**, minimum of 16 gauge thick.
				2. Fins: Rectangular shape, constructed of minimum **[0.010-inch-] <Insert dimension>** thick aluminum, with spacing of not closer than **[12 fins per inch] <Insert fin spacing>**.
				3. Headers: **[Carbon steel] [or] [copper]**, selected by manufacturer for flow, pressure, and temperature encountered; drain connections at low points, vent connections at high points, and supply and return connections located on discharge face of coil.

Retain "Insulation" subparagraph below to require insulation on headers. Insulation reduces energy loss and improves stability of air temperatures.

Insulation: Insulate headers with mineral-fiber insulation covered by a metal jacket.

Supply and Return Connections:

Terminate ends with MNPT.

Connections **[NPS 2-1/2] <Insert pipe size>** and larger shall have thread-on flanges. Select flange class, Class 150 or Class 300, for system pressure and temperature encountered.

* + - * 1. Tubes:

Materials: **[Copper] [90/10 cupronickel] [or] [carbon steel]**.

Nominal Diameter: 5/8 inch.

Nominal Wall Thickness: As required by performance, minimum of **[0.035 inch] [0.049 inch]** thick.

* + - * 1. Dampers: Clamshell design arranged to modulate airflow across or around individual heating elements.

Material: **[Galvanized steel] [or] [stainless steel]**, minimum of 16 gauge thick.

Actuator: **[Face] [or side]** mounted; electric motor for proportional control, failing in last position.

* + - * 1. Brazing: High-temperature brazing alloy with not less than 5 percent silver when brazing like non-ferrous materials together; high-temperature brazing alloy with more than 30 percent silver when brazing ferrous to non-ferrous materials.
				2. Hardware: Use hex-head bolts, nuts, and washers constructed of **[zinc-plated carbon steel] [or] [stainless steel]**.
				3. Nameplate: Aluminum or stainless steel nameplate with brass or stainless steel chain for each coil, with the following data engraved or embossed:

Retain any of first five subparagraphs below.

Manufacturer name, address, telephone number, and website address.

Manufacturer model number.

Serial number.

Manufacturing date.

Coil identification (indicated on Drawings).

**<Insert requirements>**.

Retain first paragraph below if corrosion-resistant coating is desired and is specified in Section 230546 "Coatings for HVAC." If retaining below, consult coil manufacturers to confirm that the coatings included in the referenced Section are available as a factory-applied coating.

* + - * 1. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating. See Drawings for coils requiring a corrosion-resistant coating.

In "Coating" paragraph below, second option refers to coating performance in "Corrosion-Resistant Coating" paragraph in Part 2 "Materials" Article.

* + - * 1. Coating: **[None] [Corrosion resistant] <Insert manufacturer; product name>**.
			1. MATERIALS
				1. Aluminum: ASTM B209.
				2. Copper Tube: ASTM B75 annealed temper or ASTM B280 drawn temper.
				3. Copper Sheet: ASTM B152.
				4. 90/10 Cupronickel Alloy: ASTM B122.
				5. Steel:

Pipe Connections: ASTM A53.

Retain "Corrosion-Resistant Coating" paragraph below if corrosion-resistant coating is required and is specified in this Section. Indicate coils requiring coating on Drawings.

* + - * 1. Corrosion-Resistant Coating: Where indicated on Drawings, coat coils with a corrosion-resistant coating capable of withstanding a **[3000] <Insert time>**-hour salt-spray test in accordance with ASTM B117.

Standards:

ASTM B117 for salt spray.

ASTM D2794 for minimum impact resistance of 100 in. lb.

ASTM D3359 for cross-hatch adhesion of 5B.

Application: **[Immersion] [Spray]**.

Thickness: **[1 mil] <Insert value>**.

Gloss: Minimum gloss of 60 on a 60-degree meter.

* + - 1. SOURCE QUALITY CONTROL

Consult coil manufacturers for available test pressures.

* + - * 1. Hydronic Coils: Factory tested with air while coil is completely submerged underwater to design pressure indicated, but not less than **[300-psig] <Insert pressure>** internal pressure.
				2. Coils to display a tag with inspector's identification as proof of testing.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.
				2. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.
				3. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. Install coils level and plumb.
				2. Install coils in metal ducts and casings constructed in accordance with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
				3. Install **[galvanized-steel] [stainless steel]** drain pan under each cooling coil.

Construct drain pans with connection for drain; insulated and complying with ASHRAE 62.1.

Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.

Extend drain pan upstream and downstream from coil face.

Extend drain pan under coil headers and exposed supply piping.

* + - * 1. Straighten bent fins on air coils.
				2. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.
			1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified for hydronic piping systems.

* + - * 1. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Install piping adjacent to coils to allow service and maintenance.
				3. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Control valves are specified in Section 230923.11 "Control Valves," and other piping specialties are specified in Section 232116 "Hydronic Piping Specialties."

END OF SECTION 238216.11