**Radiant Panels - Heating and Cooling**

Section 23 82 43

### **Part 1 - General**

1. **Related documents**
2. Drawings and general provisions of the contract, including general and supplementary conditions and division 1 specification sections, apply to this section.
3. **Summary**
	1. This section includes the following:
		1. Hydronic radiant heating and cooling ceiling panels
4. **Definitions**
	1. Low voltage: as defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote control, signaling and power limited circuits.
		1. **Submittals**
			1. Product data: includes rated capacities, specialties and accessories for each product indicated.
			2. Shop drawings: Include plans, elevations, sections, details and attachments to other work. Indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.
5. Include schedule showing model designation, size, room location and accessories furnished.
6. IOM
7. Coordination drawings: reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
8. Suspended ceiling components
9. Method of attaching hanging systems to building structure.
10. Size and location of initial access modules for acoustical tile.
11. Items penetrating finished ceiling, including the following:
	1. Lighting fixtures
	2. Air outlets and inlets
	3. Speakers
	4. Sprinklers
	5. Access panels
12. Perimeter moldings
13. Samples for initial selection: for units with factory applied color finishes.
14. **Quality**
	1. Product Options: Drawings indicating size, profiles, and dimensional requirements of radiant ceiling panels.
	2. Radiant ceiling panels shall be shipped with an adhesive film protective coating on each individual element on the visual side.
	3. Radiant ceiling manufacturer to supply 5 year warranty from date of shipment.
	4. Panels to be manufactured in a certified ISO9001:2015 facility.
	5. Radiant ceiling panels and accessories shall be rated and tested for pressures as shown on drawings and manufacturers technical documentation.
15. **Coordination**
	1. Coordinate layout and installation of radiant panels and suspension components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system and partition assemblies.

### **Part 2 – Products**

1. **Manufacturers**
	1. Manufacturers: subject to compliance with requirements, provide products by one of the following:
		1. Zehnder Rittling
		2. Alternates: Approved equals or alternates are acceptable if and only if a mock-up and witness test is performed to demonstrate that the substitution meets the design criteria.
2. **Hydronic Radiant Heating and Cooling Ceiling Panels**
3. Material:
4. Radiant ceiling panels to include grpahit activation, copper meander, steel cassette and supported steel cross channels.
5. Panel Surface: All panels to have *<solid>* perforation pattern consisting of 2mm (0.08") diameter holes providing 25% open area as standard. Perforated panels to be supplied with an acoustical absorbing fleece for sound attenuation. The microfiber fleece shall be non-flammable and meet the requirements of building material standards DIN 4102/B1 and BS 476/ASTM E84.
6. Sound absortion data shall be avialable for all panel configerations and tested in accordance with DIN EN ISO 354.
7. Factory cut outs shall be supplied for radiant panels for integration with lights, projector brackets, speakers, fire sprinklers, and other air outlet devices.
8. Panel steel cassettes to be constructed of 24-gauge galvaneal sheet metal *<stainless steel>.* Cross channels to be constructed of 20-gauge galvanealed sheet metal to provide support for mounting system.
9. Non active radiant panels shall be supplied where indicated on the drawings. Non active panel steel cassettes to be constructed of 24-gauge galvaneal sheet metal *<stainless steel>.*
10. Radiant ceiling panel surface to be coated with highly emissive powder coat paint for optimal radiative properties. Color to be selected by architect.
11. Carbon graphite activation to be comprised of copper pipe embedded in a expanded graphite layer. The graphite layer shall be bonded to the steel cassette using low VOC adhesive.
12. Copper meander to be supplied with same end, opposite end or 2X meader connections based on drawings.
13. Max working temperature/pressure to be 185F / 145psi.
14. Radiant panels shall be 2-pipe *<4-pipe>.*
15. Radiant ceiling panels to be supplied with the following edges:
	1. T-Bar
	2. Free Hanging, Sail or Cloud
	3. Tegular
16. Free hanging, cloud or sail panels shall be factory supplied with backclips to eliminate gaps.
17. Factory installed fire resistant 1‘‘ Rockfon insulation *<1‘‘ fiberglass>* shall be provided with glass lined fiber fleece to provide acoustical absorption and shall have ASTM E85 / ASTM E1264 classification.
18. Stainless steel flexible hoses to be suppled with panels for connections to surrounding panels and distribution system. Panel connection by means by brazing or press is not acceptable.
	1. Corrugated flexible hoses shall have the following characteristics: standard length 30‘‘, maximum pressure 145 psi, maximum temperature 185° F, bend radius of 0.7 inches, water flow section comprised of stainless steel, and fire rating of UL-94 VO under card listing QMFZ2.E80017.
	2. Braided flexible hoses shall have the following characteristics: standard length 30‘‘, maximum pressure 145 psi, maximum temperature 185 F, bend radius of 2.5 inches, water flow section comprised of ethylene thermoplastic rubber (EPTR), and fire rating of UL-94 VO under card listing QMFZ2.E80017.
19. Factory supplied mounting and hanging hardware for radiant panels.
	1. Standard G Kit
		1. Kit shall consist of toggle end 5 foot No. 2 wire cable and express gripple connector.
	2. Y-Configured Wire Rope
		1. Kit shall consist of (2) toggle ends (Y) on 5 foot No. 2 wire cable and express gripple connector.
	3. Standard G Kit with Fine Adjustment
		1. Kit shall consist of toggle end on 5 foot No. 2 wire cable, express gripple connector, duct pin, toggle plate, panel mounting clip, and self-tapping screw.
	4. Chain Kit
		1. Kit shall consist of fixing clips for panel connection and chain.
	5. Torsion Spring Hanging System
		1. Specialized grid system with torsion spring hangers factory installed on radiant panels. Steel clips that locate and align the panels to the grid with torsion springs are to be factory machine riveted to the return edge of the panels using countersunk rivets and flush with the face of the panel. No fasteners of any kind shall be visible on exposed face surfaces of ceiling panels or support tees. No chains/cables are required for panel installation.
20. Radiant panel performance and output as measured in BTU/hr;
21. Nominal panel size as scheduled
22. Heating Performance:
	* + 1. Radiant panel capacity shall be tested and certified by manufacturer in accordance with DIN 14037 or ASHRAE 138-2013
23. Cooling Performance:
	* + 1. Radiant panel capacity shall be tested and certified by manufacturer in accordance with DIN 14240 or ASHRAE 138-2013.

**PART 3 – EXECUTION**

 **3.01 Pre-Design Services**

A. Bid shall include the costs to complete final selections and coordination with the Engineer at the Engineers office. Allow for a minimum of three (3) days.

 **3.02 Installation – General**

A. Install radiant panel level and plumb. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.

B. To ensure proper installation and handling of the radiant panels, a complete IOM shall be supplied and reviewed before installation has begun.

C. Complete installation and startup checks according to manufacturer’s written instructions and perform the following:

1. Verify that controls and control enclosure are accessible.

2. Verify that control connections are complete to control valves as needed.

3. Verify that any identification tags are visible.

4. Verify that controls respond to inputs as specified.

5. Removal of protective film coating before system startup.

6. Release of stabilization profiles on panel edges.

**3.03 Connections**

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicated general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to radiant panels to allow for service and maintenance.

C. In addition to Division 23 Section “Hydronic Piping”, connect copper tubing to supply with shut-off valve, strainer, control valve, and union or flange, and to return with balancing valve and union or flange.

**3.04 Field Quality Control**

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, fill water tubes and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to conform to proper unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

**3.05 Cleaning and Protection**

A. Remove protective film coating before startup of the system.

B. Clean all visible surfaces of equipment; touch up as required.

C. Protect all units before, during and after installation. Damaged materials due to improper protection shall be cause for rejection.