

## SECTION 23 83 16

### RADIANT HEATING AND COOLING PANELS

#### PART 1 – GENERAL

##### 1.1 SUMMARY

A. Section Includes: Furnish and install a ceiling-mounted, modular radiant hydronic heating and cooling panel system to provide sensible thermal conditioning (heating and cooling) independent of ventilation and humidity control.

B. System shall integrate with a dedicated Energy Recovery Ventilator (ERV) and dehumidification system for latent load (humidity) control and fresh air ventilation.

C. System shall support heat recovery from dehumidification equipment through a hydronic heat exchanger where applicable.

##### 1.2 RELATED SECTIONS

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 19 – Meters and Gauges for HVAC Piping

C. Section 09 29 00 – Gypsum Board (for drywall finish)

D. Section 23 09 00 – Instrumentation and Control for HVAC

E. Section 23 72 00 – Air-to-Air Energy Recovery Equipment

F. Section 23 81 00 – Unitary HVAC Equipment (as applicable for heat pump/chiller integration)

##### 1.3 REFERENCES

A. ICC Evaluation Service (ICC-ES) PMG Product Certificate PMG-1788 for Therma-HEXX ThermaPANEL Modular Hydronic Radiant Heating and Cooling Panel System (includes ASTM E84 compliance for surface burning characteristics in finished assemblies)

B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials

C. Manufacturer's installation and engineering guidelines

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide sensible radiant heating and cooling via ceiling panels, with no forced air distribution required for temperature control.
- B. Prevent surface condensation during cooling mode through active dew-point monitoring and control (system fluid temperature maintained 4° F above room air dew point).
- C. Operate efficiently with low-temperature heating supply water (e.g., 80–120°F / 27–49°C typical for heat pump compatibility) and high-temperature cooling supply water (e.g., 55–65°F / 13–18°C chilled water, adjusted above dew point).
- D. Achieve 60 Btu/hr/sq ft heat transfer capability via integrated micro-channels and turbulent flow in PE-RT panels.
- E. Support zoning for multiple spaces or areas within a space.
- F. Ceiling finish assembly (including 5/8-inch Type X gypsum board) shall comply with ASTM E84 for surface burning characteristics (Class A: flame spread index  $\leq 25$ , smoke-developed index  $\leq 450$ ) per ICC-ES PMG-1788.

#### 1.5 SUBMITTAL

- A. Product Data: Manufacturer's technical data sheets, performance ratings (heating/cooling capacity per panel or sq ft), material descriptions, dimensions, ICC-ES PMG-1788 compliance (including ASTM E84 for finished assembly), and integration details.
- B. Shop Drawings: Detailed panel layout, zoning, tubing/piping connections, mounting (ThermaTRAK or grid), coordination with ceiling penetrations (lights, sprinklers, diffusers), and drywall attachment/finishing.
- C. Control Sequences: Description of operative temperature control, dew-point interlocks, dehumidifier/ERV coordination, and zoning logic.
- D. Certificates: Manufacturer's certification of compliance with performance requirements, ICC-ES PMG-1788 (including ASTM E84), and warranty.
- E. Operation and Maintenance Manuals: Startup, testing, adjustment, troubleshooting, and maintenance procedures.

## 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years' experience in modular hydronic radiant heating/cooling systems. Basis of Design: Therma-HEXX – ThermaCEILING™ (ThermaPANEL with ThermaTRAK).

B. Installer Qualifications: Experienced in hydronic radiant ceiling installations, trained by manufacturer if required.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer's written warranty covering radiant panels against defects in materials and workmanship for minimum twenty-five (25) years from date of substantial completion.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURER

A. Basis of Design: Therma-HEXX Corporation – ThermaCEILING™ (ThermaPANEL modular panels with ThermaTRAK mounting system).

B. Substitutions: Submit for approval per Section 01 25 00. Approved substitutions shall provide equivalent modular, integrated hydronic panel design with comparable or superior performance (e.g., heat transfer efficiency, bidirectional heating/cooling capability, and condensation prevention). Tube-and-aluminum-plate systems (or similar non-integrated designs) are not acceptable due to performance limitations in heat transfer uniformity, efficiency, and system integration.

### 2.2 RADIANT PANELS

A. Type: Modular, ceiling-mounted radiant hydronic panels capable of bidirectional sensible heating and cooling.

B. Construction: Thermoformed panels made from Dow Hypertherm PE-RT (bimodal polyethylene of raised temperature resin, a blend of LLDPE and HDPE engineered for high-temperature hydronic fluids, rigid with low crack propagation); integrated channels for even,

turbulent hydronic fluid distribution; insulated backing (e.g., EPS foam) to minimize heat loss upward; thin profile (approximately 1.4–1.5 inches installed depth including insulation).

C. Mounting: Compatible with standard ceiling grid systems or direct mount to joists/framing via patented aluminum ThermaTRAK snap-together strut/track system; modular design allows flexibility around lights, sprinklers, diffusers, and other fixtures; supports direct screw attachment of 5/8-inch Type X gypsum board (drywall) finish for ASTM E84 compliance and finished ceiling appearance.

D. Finish: Conductive surface suitable for direct exposure or integration with ceiling finishes; where exposed or in occupied spaces, finish with minimum 5/8-inch Type X gypsum board secured to ThermaTRAK system to achieve ASTM E84 Class A surface burning characteristics per ICC-ES PMG-1788.

E. Fluid: Compatible with water or inhibited propylene glycol solutions (per manufacturer recommendations for freeze protection and corrosion inhibition).

## 2.3 CONTROLS

A. Control Strategy: Loxone air and humidity temperature-based control for occupant comfort in each space. 3-way valve control for dew point control.

B. Safety Features: Dew-point sensors / monitors with automatic 3-way valve to maintain supply water temperatures 40 F above room dew point; coordination with dehumidifier / ERV to maintain indoor humidity levels suitable for radiant cooling (e.g., 50–60% RH max). 3-way valve to be close on fail.

C. Integration: Interface with building automation system (BAS) or dedicated controls (e.g., compatible with systems like Loxone or Chiltrix) for zoning, scheduling, and fault monitoring.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's detailed instructions, custom engineering drawings, approved shop drawings, and ICC-ES PMG-1788 requirements.

B. Coordinate with other ceiling trades (lighting, sprinklers, diffusers, grid systems) to ensure proper panel placement, support, and access.

C. Mount panels securely using ThermaTRAK aluminum strut system or approved method; connect hydronic tubing/piping with manufacturer-recommended fusion-welded or compatible fittings.

D. Where required for fire performance or finished appearance, install 5/8-inch Type X gypsum board directly to ThermaTRAK system per manufacturer guidelines and ASTM E84 assembly compliance; tape, mud, and finish drywall as specified in Section 09 29 00.

E. Insulate exterior piping to heat pump(s) and piping outside of humidity-controlled spaces as required to prevent condensation and energy loss.

### 3.2 FIELD QUALITY CONTROL

A. Pressure test hydronic circuits per manufacturer requirements and ICC-ES PMG-1788: Hydrostatically test to 50 psi and hold for a minimum duration as specified by manufacturer. No leakage or pressure loss permitted. Test shall be performed after manifold connections and prior to system charging/flushing.

B. Flush and clean system wye and spin down filters prior to final connection to panels and commissioning.

### 3.3 COMMISSIONING

A. Hydronic balance and flow verification.

B. Verify controls, safeties (including dew-point shutdown), and integration with dehumidifier/ERV.

C. Demonstrate system performance in both heating and cooling modes; adjust as needed for even surface temperatures and no condensation risk.

END OF SECTION