**Price High-Capacity Heating/Cooling Terminal**

**Division 23 – Heating, Ventilating, and Air Conditioning**

**Section 23 37 13 – Diffusers, Registers, and Grilles**

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

**PART 1 – GENERAL**

* 1. **Summary**
1. This section includes the following:
2. High-Capacity Heating/Cooling Terminal

**1.02 Related Documents**

1. Section 01 30 00 – Administrative Requirements
2. Section 01 40 00 – Quality Requirements
3. Section 01 60 00 – Product Requirements
4. Section 01 74 19 – Construction/Demolition Waste Management and Disposal
5. Section 01 78 00 – Closeout Submittals
6. Section 01 79 00 – Demonstration and Training
7. Section 23 30 00 – HVAC Air Distribution
8. Section 23 32 00 – Air Plenums and Chases
	1. **Reference Standards**
9. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
10. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy
11. ASHRAE Standard 62.1 – Standards for Ventilation and Indoor Air Quality
12. ASHRAE Standard 70 – Method of Testing the Performance of Air Outlets and Air Inlets
13. ASTM Standard D610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
14. ASTM Standard D714 – Standard Test Method for Evaluating Degree of Blistering of Paints
15. ASTM Standard D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
16. ASTM Standard D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
17. ASTM Standard D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
18. ASTM Standard E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
19. NFPA Standard 70A, Article 100 – National Electrical Code
20. UL 1995 – UL Standard for Heating and Cooling Equipment

**1.04 Administrative Requirements**

A. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

**1.05 Submittals**

1. See Section 01 30 00 – Administrative Requirements for submittal procedures.
2. Product Data:
	1. Provide data indicating configuration, general assembly, materials used in fabrication, rated capacities, and furnished specialties and accessories.
	2. Include drawings indicating size, profiles and dimensional requirements of the linear floor grilles that are based on the specific system indicated.
	3. Include catalog performance ratings that indicate airflow volume, initial pressure drops, sound performance, and throw, as tested in accordance with ASHRAE 70.
3. Shop Drawings: For each type of product indicated, include the following:

1. Equipment assemblies and indicated dimensions.

2. Required clearances.

3. Method of field assembly.

4. Revit models.

1. Coordination Drawings:
	1. Include floor plans, and other details, drawn to scale, on which the following items are shown and coordinated based on input from installers:
	2. Floor or underfloor-mounted items including:
		* 1. Floor structure (floor tiles, concrete, etc.)
			2. Floor finishing (carpet, tile, etc.)
			3. Access panels
			4. Electrical components
			5. Plumbing
			6. Networking components
			7. Terminal Units and other HVAC components
2. Operation and Maintenance Data: Include manufacturer’s descriptive literature, operating instructions, maintenance schedules and repair data, and parts lists.

**1.06 Quality Assurance**

1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.
2. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
3. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

**1.07 Warranty**

1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
2. Provide 18 month manufacturer warranty from date of shipment for grilles and registers.

**PART 2 – PRODUCTS**

**2.01 General**

1. Basis of Design: Price Industries, Inc.
2. Power and Control Module [PCM]
3. High-Capacity Heating/Cooling Terminal [Price Model LCT]
4. General Product Information:
5. Furnish and install Price model LCT and linear floor grilles of the sizes and capacities indicated on the drawings or outlet schedule.
6. Unit sizes shall be selected in accordance with ASHRAE guidelines and manufacturer’s literature.
7. Manufacturers shall demonstrate that they have successfully supplied and installed underfloor HVAC products, as well as the computer modeling thereof for a minimum of 10 years.
8. Manufacturers must be pre-qualified to bid based on the completion of a minimum of [xx] jobs in similar climates.
9. Manufacturers shall provide a list of completed jobs and references.
10. Underfloor Air System Controls:
	1. Air Grilles and diffusers specified for underfloor service shall incorporate the following requirements:
	2. Damper construction shall include an integral flow-modulation damper and motor (air valve) that is specifically designed for low static pressure air distribution.
	3. Air dampers shall not include fast acting actuators that require high life cycle ratings.
	4. Airflow and throw heights shall decrease in response to lower space demands with flow-modulation of constant temperature plenum air. The flow-modulation technique shall be implemented to maximize stratification, leading to energy savings and increased thermal comfort.
	5. Modulation by timed duty cycle of fully open and closed periods shall not be acceptable. This type of modulation can greatly reduce stratification, removing potential energy savings. Timed duty cycle modulation also increases the possibility of creating stagnant zones and starving buoyancy driven flow. Any use of this type of modulation shall be modified in order to demonstrate stratification to the project team prior to being considered acceptable.
	6. Plenum Rated Cables: Color-coded plug-and-play plenum rated cables with [RJ12] or [RJ45] connectors shall be used between devices.
	7. Terminal block type plugs shall not be acceptable.
	8. Plug-and-play cables shall carry both the power and control signal to each device and connect to a single port on the device control board.
	9. Cable types shall be limited to no more than one type and connector per device to reduce complexity in wiring and future modifications.
	10. Cables shall be stranded wire to increase flexibility in the wires, to improve ease of installation, and reduce damage during installation.
	11. Cables shall have six wires with redundant wires to provide a more robust system and protection against damage, and to allow the current for multiple devices to be controlled through a single cable. Solid wires shall not be acceptable.
	12. The Power and Control Module shall include a transformer to supply both power and control signals to air devices.
	13. The DDC controller and water valves shall be provided by the Controls Contractor
	14. The PCM shall be supplied by the mechanical contactor

**2.02 Power and Control Module with Zone Controller**

1. Description:
2. Furnish and install Price model PCM, with the voltage, wiring, and configurations indicated on the plans and controllers schedule. All components shall be factory wired, calibrated and pre-tested to ensure a fully functional unit.
3. The PCM shall accept a 0-10VDC analog cooling damper, heating damper and/or heater input signal.
4. The digital control package shall include a controller board that shall be calibrated to maintain the ninety second drive time between full open and full close of the Moduflex devices
5. The controller shall modulate the ModuFlex devices based on the 0-10VDC input analog signal through a series of plug-and-play connectors
6. The controller shall have [Two dedicated RJ12 ports] or [Five dedicated RJ12 ports] or [Three RJ12 and Two dedicated RJ45 ports] to control a max of [12] or [30] ModuFlex devices with a maximum of six units per chain.
7. The PCM shall be provided with an integral [96VA] or [50VA] transformer, and the controller shall have LED display lights to indicate, status, availability of control power, and the direction of damper movement.
8. All components shall be factory wired, calibrated and pretested to ensure a fully functional unit. The PCM shall be ETL listed to UL 873 and CSA C22.2 #24.
9. The PCM shall include a modulation controller capable of accepting a 0-10V input signal from DDC controller or thermostat by others. The DDC controller by others is to be installed in the PCM by the Controls Contractor. The PCM shall be mounted in the underfloor plenum, and shall have the following technical specifications:
	* + - 1. Inputs: 0-10VDC analog input (x3)
				2. Outputs: 24 VAC Binary (x5 or x2)
				3. Transformer: 96 VA or 50VA
				4. Ambient Ratings: 32 to 131 degrees Fahrenheit (0 to 55 degrees Celsius), 10 to 90 percent relative humidity (non-condensing)
				5. Technology: 8-bit microprocessor
				6. Connections: [2 RJ12] or [5 RJ12] or [3 RJ12, and 2 RJ45 connectors]
				7. Wiring: Class II
				8. Size (including housing): 3.8 x 15.5 x 8.5 inches (97 x 394 x 216 millimeters)
				9. Weight: 15 pounds (6800 grams)
10. Enclosure: All control components shall be mounted inside a protective metal enclosure.

**2.03 High-Capacity Heating/Cooling Terminal**

1. Description:
2. Furnish and install Price model LCT High Capacity Heating/Cooling Terminal in the sizes, configurations and capacities indicated on the plans and air outlet schedule.
3. Performance:
	1. The manufacturer of the high-capacity heating/cooling terminal shall provide performance data for air volume, initial pressure drop, and sound levels.
	2. Air shall be delivered to the space without the use of nozzles.
	3. All data must be tested in accordance with the most recent publication of ASHRAE 70.
4. Construction:
	1. The plenum shall be constructed of minimum 18 gauge steel
	2. The LCT shall be supplied complete with a 24 volt AC floating point actuator furnished with two modular jacks for system connections and modular plug-in control cable.
5. The CFLEX cable shall be [15 feet], [25 feet] or [35 feet] in length and shall be plenum rated.
6. Each cable shall have two (2) modular male plugs to interface with type RJ45 jacks for plug-and-play system connections.
7. The CFLEX cable shall be constructed of eight (8) individually insulated wires wrapped in an insulated jacket.
8. Each wire shall be constructed of stranded copper fibers; solid core copper is not acceptable.
	1. The air valves shall have gasket to close off airflow when closed to minimize energy consumptions. Dampers without gaskets or some type of seal should not be used.
	2. The plenum shall be pedestal supported
	3. Pedestal support brackets shall be constructed from 16 gauge steel
9. Heater:
10. The unit shall be supplied with a water coil for Cooling and Heating:
	1. All water coils shall be rated and certified in accordance with the current edition of AHRI 410
	2. All cooling and heating coils shall optimize rows and circuits to meet the specified capacity
	3. The hydronic heater shall be constructed with integral hydronic copper tube and aluminum fin element mounted
	4. The hydronic heater shall be supplied with a 0.625 inch outside diameter, ½ inch nominal sweat connection.
	5. All standard coils are 10 FPI.
	6. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin.
	7. All coils shall be hydrostatically tested at 390 pounds per square inch minimum air pressure, and rated for a maximum of 300 pounds per square inch working pressure at 200 degrees Fahrenheit
	8. Drain Pans
11. All units with cooling coils shall be supplied with a drain pan with single wall, galvanized steel for corrosion resistance
12. The drain pan shall extend under the entire cooling coil and heating coils as well
13. Drain pans shall be of one-piece construction and be positively slopped for condensate removal
14. **(Optional)** Provide drain pan with type 304 stainless steel constructions for superior corrosion resistance
15. **(Optional)** Provide an overflow safety switch on a drain pan
16. Mounting/Fastening:
	1. The plenums shall be supplied with pedestal support brackets attached to the units
	2. Support pedestals shall be positioned without the use of tools
	3. Pedestal and pedestal heads shall be provided by others

**PART 3 – EXECUTION**

**3.01 Examination**

A. Verify that conditions are suitable for installation.

B. Verify that field measurements are as shown on the drawings.

## 3.02       Manufacturer’s Field Services

* + 1. The manufacturer shall provide the services of an underfloor air systems specialist. This engineer shall make at a minimum the following trips to the site with construction and design personnel.
			1. The first trip to the job shall occur right before the raised access floor is being installed. The engineer will inspect all plenum penetrations and construction to see that proper methods are being used. Any deficiencies found shall be brought to the general contractor's attention on site that day. Site observation report shall be made and emailed to the HVAC engineer for approval. If approved they shall forward the report to the construction team as appropriate.
			2. The second trip to the job shall occur during the building commissioning process. Communication shall occur with all associated trades to solve any problems that prevent contract completion. The engineer shall assist with system testing and verify proper functioning of the UFAD system. Any deficiencies found shall be brought to the general contractor's attention on site that day. Site observation report shall be made and emailed to the HVAC engineer for approval. If approved they shall forward the report to the construction team as appropriate.

**3.03 Installation**

1. Install linear floor grilles level and plumb.
2. Complete installation and startup checks according to manufacturer’s instructions and perform the following.

1. Verify that inlet duct connections are as recommended by manufacture to achieve proper performance.

2. Verify that any identification tags are visible.

3. Verify locations of thermostats, humidistats, and other exposed control sensors with drawings and room details before installation.

1. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.
2. See drawings for the size(s) and locations of linear floor grilles.
3. Connect to ductwork in accordance with Section 23 31 00.

**3.04 Adjusting**

1. Balance outlets according to manufacturer’s recommendations.
2. Verify that field measurements are as shown on the drawings.

**3.05 Field Quality Control**

1. See Section 01 40 00 – Quality Requirements for additional requirements.

**3.06 Cleaning**

1. See Section 01 74 19 – Construction Waste Management and Disposal for additional requirements.

**3.07 Closeout Activities**

1. See Section 01 78 00 – Closeout Submittals for closeout documentation requirements.
2. See Section 01 79 00 – Demonstration and Training for additional requirements.