Section 15700 (CSI 23 74 33) **I-Series Drum & Tube** (04/23/10)
Indirect-Fired Heating & Ventilating

Note: Optional items and/or items requiring a choice, will be shown between brackets and/or parentheses with selections separated by a forward slash, i.e.[a / b / c], or with (opt) indicated.

Part 1: GENERAL

1.1 Section Includes:

A. Indirect Gas-Fired Heaters
B. Controls
C. Equipment Schedule

1.2 Related Sections:

A. Section 01655: Starting up mechanical system
B. Section 15070: Pipe and pipe fittings
C. Section 15100: Valves
D. Section 15120: Piping Specialties
E. Section 15400: Plumbing System
F. Section 15990: Testing, adjusting and balancing
G. Section 16050: Basic electrical materials and methods

1.3 References:

A. **American National Standards Institute (ANSI)**: Establishes requirements applicable to certifying indirect gas-fired heaters in the USA.

B. **Canadian Standards Association (C.S.A.):** Establishes requirements applicable to certifying indirect gas-fired heaters in Canada.

C. **ETL Testing Laboratories**: Independent testing facility certifies standards conformance.

D. **Occupational Safety & Health Administration (OSHA)**: Enforces air quality standards and safety in the work place.

E. **National Electric Code (NEC)**: Establishes electrical standards.

F. **Underwriters Laboratory (UL)**: Independent testing facility certifies component conformance to appropriate standards.

G. **National Fire Protection Agency (NFPA)**: Establishes fire prevention standards.

H. **Factory Mutual Insurance (FM)**: Certifies gas manifold to owners insurance carrier.

I. **Sheet Metal & Air Conditioning Contractors National Association (SMACNA):** Covers sheet metal fabrication and insulation standards.

1.4 Quality Assurance:

Manufacturer shall:

A. Provide indirect gas-fired heating equipment built in conformance to NFPA-54 with duct furnace section(s) certified to C.S.A. design certification for use in both the U.S. and Canada to the ANSI Z83.8 – latest revision, standard for "Gas Unit Heater and Gas-Fired Duct Furnaces" for safe operation, construction, and performance.

B. Furnish proof, satisfactory to the owner or his representative, of having manufactured gas-fired space heating systems for a minimum of 10 years.

C. Make its facility available to owner or his representative for quality control audit, without prior notification.

1.5 Submittals:

A. Manufacturer shall submit product data - including dimensions, duct & service connections, accessories, controls with schematics and sequence of operation, electrical nameplate data, wiring diagrams, fan curves and burner & filter data.

B. Manufacturer shall furnish rigging, assembly, and installation instructions.

C. Manufacturer shall furnish Operation & Maintenance Manuals, including descriptive literature, operation instructions, maintenance and repair data, and parts listing.

2.1 Acceptable Manufacturers:

AbsolutAire, Inc. (Kalamazoo, MI) (269) 382-1875

2.2 Indirect-Fired Heaters:

A. Manufacturer shall provide an indirect gas-fired [indoor / outdoor] horizontal heater with [(O) 100% OA / (B) 2-Position OA/RA / (F) Fixed OA/RA / (M) Modulating OA/RA / (R) 100% RA / (V) 100% OA Variable Volume] capability.

B. **Unit Casing:** shall be a minimum 18 gauge [aluminized / galvanized] steel. All exterior casing seams shall be 100% weather-tight. All interior and exterior surfaces will be cleaned of all oil & grease and painted exterior will consist of a high-quality catalyzed primer coat and a finish coat of machine enamel with rust inhibitors. Color selected by owner.

C. **Furnace(s) section:** with 80% minimum efficiency, provided by an indirect-fired heat exchanger with dimpled tube pattern for efficient heat transfer.

a. ***Venting Arrangements:***

i. **Power Outdoor (PO) Vented:** the unit shall be a power exhausted arrangement. The unit shall be tested to insure proper ignition when the unit is subjected to 40 mile per hour wind velocities.

ii. **Power Indoor (PI) Vented:** the unit shall be a power vented with side vent connection access. Vent piping to outside provided by others.

b. The Duct furnace modules are listed for outdoor installation and indoor installation for Category I and Category III venting without the need for additional power ventilation.

c. Heat exchanger is a multi-pass design with a primary firing drum and tubular secondary. Materials for primary and secondary heat exchanger are (304 SS, 409SS). The primary heat exchanger, collector boxes and headers are constructed of 16 gauge (.057) minimum thickness. Secondary heat exchanger is constructed of 18 gauge (.047) minimum material. Tubing used for heat exchanger shall comply with (ASTM A268 for 409SS, ASTM 249 for 304SS). Tubes are swaged into panels and welded to provide an air tight assembly.

d. Additionally heater assembly shall employ:

- An 11 gauge (.112) minimum formed channel base support frame for heat exchanger with provision for guided expansion and contraction of the heat exchanger assembly
- Insulated front shroud constructed of 18 gauge (.047) minimum G90 and having two (2) inch thick insulation rated to 850 oF
- 304SS drain fitting connection for attachment of condensate drain lines when mounted downstream of cooling system or with modulating burners with a turndown greater than 5:1.
- A Listed (UL/FM) circulating air flow proving switch mounted to the front shroud and piped into the air stream for detection of airflow. Switch shall be wired into the safety control circuit.
- A Listed (UL/FM) manual reset high limit control with adjustable set point mounted to the front shroud. The capillary sensing bulb shall be mounted to a bracket within the air stream and the limit wired into the safety control circuit.
- <u>For Indoor applications ONLY</u> - A Listed (UL/FM) blocked vent safety switch connected to the vent discharge and wired into the safety control circuit.

e. The gas power burner shall be:

- Listed by a NRTL (ei. UL, CSA,ETL, etc.) and labeled.
- Forced draft flame retention type burner with stainless steel combustion head
- Sized and orificed for the specified input range
- Equipped with an approved primary safety control to monitor burner operation
- Equipped with a gas control train that meets UL and FM requirements including modulating controls to provide (10:1, 20:1) turndown capability.
- Equipped with an approved Low Gas Pressure Switch on the gas inlet and set at 5.0”” w.c.
- Equipped with an air proving switch to prove combustion air
- Controlled to provide a combustion air blower pre purge period sufficient to complete a minimum of four (4) air changes prior to burner start-up
- Provided with printed installation and maintenance instructions, burner operating and maintenance instructions, piping and wiring diagrams and Installation Start-up data sheet.

f. Duct Furnace module and burners provided are suitable for use on Natural or Propane gases as specified at the time of order.

g. Ignition system is high-voltage spark ignition. Electric ignition may be spark to pilot or direct spark based on burner input rating and type.

h. Controls are provided complete with flame rod or ultra-violet scanner to monitor the pilot and main burner flame as required by the specified controls.

i. Available Supply Voltage is 115 VAC, 1Φ, 60 Hz to 480V, 3Φ, 60 Hz as specified at time of order.

j. Control voltage is 120 VAC, 1Φ, 60 Hz.

k. Heater Assembly shall have a Rating label mounted on the front shroud indicating the type of gas for which the heater is equipped, gas orifice size, maximum and minimum Btu input ratings, maximum and minimum gas supply pressures, output at maximum input, supply voltage, maximum amp rating and standard under which furnace module is listed.

l. The completed heater assembly shall be factory fire tested prior to shipment.

m. Heater shall be accompanied by printed instructions for proper installation, start-up, operation and maintenance.

n. Initial on sight start-up must be completed by an authorized (or factory trained) burner technician. A Start-up data sheet is provided for recording operating data and the final burner adjustments. A portion of the Start-up data sheet must be returned to Heatco to validate factory warranty.

o. Burner and components are warranted for one year from date of installation or 18 months from date of manufacture. Heat exchanger is warranted for ten (10) years on a pro-rated basis. See Heatco Standard Warranty for full details.

p. Automatic reset high limit switch (optional manual reset high limit switch).

D. **Supply blower and motor section:** containing a single supply blower & motor that is supported from the bottom to prevent the blower flanges supporting the weight of the motor. The blower, motor, and drive package shall be isolated with (standard) rubber-type grommet vibration isolators (optional rubber-in-shear or spring). The isolators will be installed by the manufacturer for blower and motor isolation from the unit housing. The isolator design shall be deflection specific for the blower and motor load. Includes a flexible gasket connection between the fan housing discharge and the unit supply air opening.

a. The supply blower shall be a double-width, double-inlet, centrifugal design, belt driven for the required air capacity with:

i. Spider ball bearings.
ii. (opt) Heavy duty, pillow block ball bearings.
iii. (opt) extended grease lines which include external zerk fittings for applying grease.

b. The motor type shall be:

i. Single-speed, open drip proof (ODP)
ii. Single-speed, totally enclosed fan cooled (TEFC)
iii. Single-speed, ODP, high efficiency
iv. Single-speed, TEFC, high efficiency
v. Variable-speed, Inverter Capable ODP, high efficiency
vi. Variable-speed, Inverter Capable TEFC, high efficiency
vii. Two-speed, ODP, 1800/900 rpm
viii. Two-speed, ODP, 1800/1200 rpm
ix. Two-speed, TEFC, 1800/900 rpm
x. Two-speed, TEFC, 1800/1200 rpm

c. The motor shall be rated for:

i. 115V / 1 Ph / 60 Hz
ii. 208V / 1 Ph / 60 Hz
iii. 230V / 1 Ph / 60 Hz
iv. 208V / 3 Ph / 60 Hz
v. 230V / 3 Ph / 60 Hz
vi. 460V / 3 Ph / 60 Hz
vii. 575V / 3 Ph / 60 Hz

d. The motor shall be provided with an adjustable motor sheave to allow for minor adjustment of the blower rpm at the job site.

e. The motor shall have a 1.30 service factor, suitable for continuous service at 120° F ambient temperature, and shall be wired for the specified voltage, as well as be controlled by a time delay relay and:

i. Motor starter w/overload protection
ii. (opt) Variable frequency drive (vfd)

f. The blower, motor, and drive shall be factory tested to ensure the specified air delivery (per ANSI) at the design total static pressure. The blower shaft shall be connected to the motor shaft by a V-belt drive, capacity designed for 30% over the motor nameplate horsepower. The blower shaft shall be a turned, ground and polished solid shaft. A protective coating shall be applied to the shaft to minimize oxidation. Blower shall have ball bearings, and shall be designed for a minimum L10 life of 100,000 hours.

E. **Access door panels:** shall consist of positive latching lift out type, with rustproof handles, hardware, and full gasket.

F. **Controls:**

a. **Main control panel** shall be NEMA 3R and contain all standard electrical components, [non] fused disconnect switch, motor starter, 120-volt and/or 24-volt control transformers, control circuit fuses, color coded wires, and an ignition module to lockout the flame in abnormal conditions. The complete control and safety system as well as the burner and gas manifold shall be factory tested prior to shipment.

b. **Temperature Controls** shall be a solid-state system located in the main control panel. It shall have a sensor located in the supply air stream which controls the supply air temperature (maximum and minimum) in response to heating requirements.

c. **Remote Control Panel** shall be provided and includes a summer-off-winter switch, a fan on indicator light, and a heat on indicator light. The unit serial number and customer tag number will be on the panel face. The following optional items are included which are specific to this application and specification:

i. (opt) Discharge temperature set point dial
ii. (opt) Space temperature set point dial
iii. (opt) Unoccupied space temperature set point dial
iv. (opt) Mechanical [electronic programmable] 7-day time clock
v. (opt) A remote manual positioner for controlling the percentage of fresh and return air on units provided with modulating damper actuators.
vi. (opt) Low temperature alarm light
vii. (opt) Dirty filter light [and/or alarm horn]

d. **High Temperature Limit Switch** turns the burner off when the discharge air temperature exceeds 150° F. This switch must then be manually reset at the heater.

2.3 Optional Accessories (select accessories as desired):

A. **Dampers:** all motorized inlet or discharge dampers shall be Vent Products (or equal) model # 5102-12 with 14 gauge galvanized press formed steel with welded corners frame, 16 gauge galvanized steel with press formed damper blades, and nylon bearings/bushings. Dampers to be rated for a maximum temperature of 250°F and maximum velocity of 2,000 feet per minute (FPM). Dampers to also include:

a. (opt) Blade edge seals (max 200°F)
b. (opt) Spring stainless steel side seals
c. (opt) Stainless steel bearings/bushings
d. (opt) Stainless steel construction

The damper actuator shall be Belimo (or equal) mounted directly to the shaft of the outside air (OA) damper. If return air (RA) dampers are provided, a damper linkage rod may be provided to set the positions of the opposite dampers (varies - based on square footage of damper).

B. **Discharge/Supply Air Plenum:** provide a section at the unit discharge for downward, upward, or side discharge of the supply air.

C. **Inlet Hood:** provide a "knock-down" or field-assembled inlet hood with:

   a. (opt) Expanded Metal Bird Screen
   b. (opt) Flat-bank Aluminum Washable Filters
   c. (opt) Drainable Blade Louver

D. **Filters:** Provide [1" / 2"] [aluminum washable / 30% pleated disposable] filters, accessible at the [inlet hood / side access filter section]. [Provide a clogged filter warning (light / alarm / photohelic gauge) at the main (remote) control panel].

E. **Insulation:** all interior surfaces will be lined with 1 inch thick, 1-1/2 pound density [thermafiber / foil-face] fiberglass insulation. The insulation shall comply with UL standard 181 for erosion and NFPA 90A for fire resistance and will be held in place with [weld pins / adhesive]. **PLEASE NOTE:** entire unit, excluding duct furnace section, can have optional insulation added, as manufacturer of duct-furnace section does not offer insulation as an option.

F. **Roof Curb:** Each heater shall have a full-perimeter, 20" high curb, formed of minimum 18-gauge aluminized steel. Contractor shall shim the curb so that it is level and shall install a cant strip and wood nailer per detail on the plans. Roof curb to ship knocked-down, for field assembly by installing contractor.

G. **Service Platforms**: Heater shall be furnished with a service platform, running the full length of the unit, which shall be constructed of corrosion resistant 16-gauge multi-grip floor plate with an OSHA-compliant handrail and steel safety chains at each end.

H. **Vibration Isolators (for indoor suspended units):** Vibration isolators shall consist of a steel housing and an isolation element, molded entirely of a colored oil-resistant neoprene stock for easy identification of capacity.

   The hangers shall have a deflection of 1/4" or less and will be supplied by the heater manufacturer. Structural steel channels shall support the heater and service platform as one. Hangers and miscellaneous hardware will be sized & furnished by the installing contractor.

I. **Discharge Splash Plates:** Discharge plates shall be provided with heaters, as shown on the plans. These plates are to be constructed of 16-gauge corrosion resistant steel, reinforced with angle iron, painted by the manufacturer. Contractor shall supply all necessary hanger rods and shall install discharge plate in accordance with manufacturer's recommendations.

J. **Discharge Heads:** Manufacturer shall provide double deflection, 180 degree or 360 degree discharge head(s), as detailed on the planes. The head shall be constructed of a minimum of 18-gauge aluminized steel. Adjustable, locking, double deflection blades will be provided to control direction of airflow, both vertically and horizontally. Each discharge head will be properly cleaned and then prime and finish coat painted to match the unit color. 360 degree discharge heads shall be provided with insulation (1", 1-1/2#) installed on the interior floor area for noise reduction.

K. Accessory Control Devices:

a. A mild temperature thermostat used to automatically lock out the gas controls when the outdoor temperature reaches the desired set point.

b. A low profile duct style photo-electronic smoke detector with two DPDT contacts.

c. A smoke detector tube extension for duct widths between:

   i. (opt) 1 to 2 feet.

   ii. (opt) 2 to 4 feet.

   iii. (opt) 4 to 8 feet.

d. A [1-5 / 5-25] psi gas pressure regulator to reduce the inlet gas pressure for the operating controls.