Indirect Fired Bent Tube Module Specification

TYPICAL SPECIFICATIONS

Model: **Indirect Fired Bent Tube Module**

Description: An Indirect-fired gas heating and ventilating unit(s), as indicated on the drawings shall be furnished. Orientation shall be Horizontal (Down) (Side) (Up) discharge. Unit(s) shall be factory assembled, tested and shipped as a complete packaged assembly, for indoor or outdoor mounting, consisting of the following:

1. gas furnace;
2. motor starter with thermal overload protection;
3. motor and drive assembly;
4. fuel burning and safety equipment;
5. temperature control system, and
6. gas piping.

Approvals: Unit(s) assembly shall be tested in accordance with Standard, ANSI Z83.8-2006 and CSA 2.6-2006 and shall bear the ETL label. The duct furnace shall be certified by the American Gas Association and approved by the Canadian Gas Association.

Construction:

Housing Standard

Unit housing shall be constructed of 20 Gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet-metal screws or rivets, which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner. Housing construction should be suitable for outdoor or indoor installation.

All doors and at least one side of every sheet metal surface of the unit separating two air-masses of different air temperatures shall be faced with properly secured 1" aluminum-faced insulation for condensation prevention. The discharge of the unit (Down/Side/Up) shall be internal to the heating module containing the furnaces.

All electrical controls on the control board shall be mounted in an isolated, fully enclosed and insulated vestibule, completely separated from any combustion air, but accessible for servicing needs.

All furnace exhaust flues shall be of double-wall construction. All furnace exhaust flue connections and roof-penetration seams shall be sealed with High-Temp Fire-Barrier 2000+ type silicone caulking.

All unit housings, sizes 1-3, shall be equipped with Internal Air Distribution Screens on the upstream side of each furnace heat-exchanger.

All gas valves and electrical safety-limits shall be mounted within the burner vestibule; wiring to these components shall be properly secured and away from all high temperature metal surfaces. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.

If an outdoor unit, high wind rain caps shall be installed at the termination of the furnace discharge flues.

The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.

Housing Optional

1. The unit shall have double-wall construction consisting of at least two layers of 20 gauge G-90 galvanized steel.
2. The unit shall have a duct connection(s) with an area equal to or greater than that of the total area of all exhaust flues for the introduction of dedicated combustion air to the burner vestibule.

Burner & Heat Exchanger

The gas burner shall be an indirect-fired, push-through type, sized to provide an output of _____ BTU/hr using (natural) (LP) gas at an inlet-supply pressure to the unit of _____ inches water column (7" w.c. minimum Nat. Gas, 11" w.c. minimum LP Gas).

The burner shall be capable of heating the entire air supply from _____F° to _____F° (_____ degrees F temperature rise). Burner shall be a tubular in-shot fired design capable of using natural or LP type gas. Each burner ignition shall be of the direct-spark design with remote flame sensing at inlet of the last firing tube of the gas manifold. Each burner ignition module shall be pre-programmed with a ignition sequence comprised of a 1 minute pre-purge, 1 min inter-purge, 2 minute post-purge, 15 second ignition, 3 trials for ignition, and 60 min lockout.

Direct-sparking sequence shall last through the complete during of the trial for ignition period for guaranteed light-off. Burner shall always be lit at maximum gas flow and combustion airflow for guaranteed light-off. Each burner ignition module shall have LED indicators for troubleshooting and a set of exposed prongs for testing flame indication signal.

All furnaces shall be controlled by an electronic vernier-type fully modulating control system capable of achieving 80% combustion efficiency over the entire gas firing range of the unit.

Each furnace shall have:

- A minimum turndown ratio of 6:1 for natural gas and 5:1 for LP gas.
- Each furnace heat exchanger shall be a bent-tube style design made entirely of type 409 stainless steel.
- Each furnace shall include a blocked vent safety airflow switch with high temperature silicone tubing operating off of absolute pressure measured inside of the power-vent blower housing.
- Each furnace shall include a high temperature auto-recycling limit with a maximum non-adjustable set-point of 200F.
- Each furnace shall include a manual reset high temperature flame roll out switch with a non-adjustable set-point of 325F.
- Each Furnace shall be accessible from both sides of unit.
- Each Furnace shall include a power-vent assembly for exhausting flue gases with a type PSC type motor that is securely mounted with rubber vibration isolators and easily accessible/removable for service.
- Every heat-exchanger shall have a manufacturer-backed 10-year pro-rated warranty.
- Every power-vent blower motor and housing shall have a standard 2-year manufacturer-backed warranty.

Each furnace module gas inlet shall be equipped with a 0-35" w.c. gas pressure gauge. A 0-10" w.c. gas pressure gauge shall be installed on the gas manifold of each furnace.

GAS EQUIPMENT

Standard

All gas equipment shall conform to local-Code requirements

Components:

1. modulating-gas valve	5. main-gas regulator
2. on/off redundant gas valve	6. two solenoid valves
3. burner	
4. main-gas shut-off valve	

All gas manifold components shall be piped and wired at the factory.

Optional

High Gas Pressure Regulator

SAFETY CONTROLS

Standard

1. motor starter with adjustable overloads	7. main-gas regulator
2. main air-flow safety switch	8. two solenoid valves
3. electronic flame-safety relay	9. modulating-gas valve
4. high-temperature limit switch	10. burner
5. non-fused disconnect	11. combustion air-proving switch.
6. flame roll-out switch	

Optional

1. High gas-pressure switches to open circuit to electronic flame-safety relay, if gas pressure is too high.
2. Low gas-pressure switch to open circuit to electronic flame safety relay, if gas pressure is too low.
3. Adjustable low temperature blower-safety control with bypass timer to shut down unit, if discharge temperature drops below setting.

TEMPERATURE CONTROL SYSTEMS

Discharge Temp Control: For building exhaust-air replacement to maintain a constant discharge temperature of supply air. The burner flame modulates to compensate for outdoor temperatures. The adjustable dial controller serves is used for set-point adjustment. Supplied with optional remote-control panel with temperature selector dial and SUMMER/OFF/WINTER selector.

Space Temp Control: For building-exhaust air replacement and auxiliary-space heating to maintain a constant space temperature. An adjustable dial controller with an internal thermostat is used for set-point adjustment to maintain room temperature. Optional SUMMER/OFF/WINTER selector switch and exhaust-system interlock to control heater-blower operation. Supplied with optional remote-control panel with temperature-selection dial and SUMMER/OFF/WINTER selector switch.

BAS (Building Automation System) Control: For building exhaust-air replacement with modulated temperature control based off of BAS supplied 0-10 Vdc or 4-20mA input signal. Auxiliary contacts and relays provided for contractor in the field.

VAV OPTIONS

VAV (Static Pressure Control): A factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled by a field wired Static Pressure Controller which measures building pressure and closes and opens contacts on the VFD to accelerate of decelerate the blower speed to maintain the building pressure set on the Static Pressure Controller. Factory supplied automatic dampers maintain the burner profile pressure drop as the blower speed is varied.

VAV (Manual Potentiometer): A factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled by a field wired Manual Potentiometer which is manual adjusted to set the speed of the blower. Factory supplied automatic dampers maintain the burner profile pressure drop as the blower speed is varied.

VAV (Speed Switch): A factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled by a field wired speed switch, which manually switches the VFD between pre-set blower speeds. Factory supplied automatic dampers maintain the burner profile pressure drop as the blower speed is varied.

OTHER OPTIONS

Operating lights mounted in a remote-control panel to indicate: power, burner ON and blower ON.

WIRING AND ELECTRICAL

Standard

The control circuit voltage shall be 24 volts.
A control transformer shall be provided.
Unit shall have standing 120 Vac power.
The control wiring shall be carried in wire channel or conduit.
Wiring in control enclosures shall be in accordance with the National Electrical Code and the local code, as it may affect the installation.
Motor starter shall be provided.
Starter shall be line voltage, definite purpose type.
Unit(s) shall be complete with all items such as relays, starters, switches, safety controls, conduit and wire as previously mentioned, and as required for proper operation.
All factory-mounted controls shall be factory prewired to the unit control panel.

Optional

1. Single point electrical connection shall be supplied.
2. Blower-on delay timer to pre-heat the heat-exchanger prior to energizing the main blower.
3. Convenience outlet shall be provided on the control board with 120 Vac service.
4. Freeze-stat shall be provided with adjustable dials for time and temperature settings to shut down the main blower in case of burner failure.
5. Fire stat with adjustable set-point temperature.
6. Dirty filter airflow switch with LED indicator light on remote panel.

7. Cabinet heater strip with thermostat.
8. Variable Frequency Drive for main blower motor.

FACTORY TESTED

Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory. Adjustable, or fixed sheaves shall be set for proper RPM at specified conditions. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure.

SERVICE AND PARTS

The supplier shall furnish gas piping schematics, **as built** wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit(s). Service manuals, showing service and maintenance requirements, shall be provided with each unit.