SECTION 235513 – INDIRECT GAS-FIRED DUCT FURNACE(S)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- This section includes indirect gas-fired duct furnace(s).

1.3 ACTION SUBMITTALS

- Product Data: For each type of indirect gas-fired duct furnace(s) indicated. Include rated capacities, operating characteristics, and accessories.
- Shop Drawings: For indirect gas-fired duct furnace(s). Include plans, elevations, sections, details, and attachments to other work.
    - Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - Wiring Diagrams: Signal and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- Coordination Drawings: Plans, elevations, 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:
    - Structural members to which equipment will be attached.
- Items penetrating roof and the following:
    - Duct, vent, and gas piping rough-ins and connections.
- Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- Field quality-control test reports.
- Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- Operation and Maintenance Data: For indirect gas-fired duct furnace(s) to include in installation, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- 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.
- ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 WARRANTY

- Burner and components to be warranted for two years from date of installation. Heat exchanger is warranted for ten (10) years on a pro-rated basis.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

- Provide RenewAire Indirect Gas-Fired Duct Furnace(s) models listed by Intertek Testing Services (ITS / ETL), a Nationally Recognized Testing Laboratory (NRTL), to the current edition of ANSI Z83.8 / CSA 2.6 Standard for Gas-Fired Duct Furnace(s) for installation on the positive pressure side of the circulating air blower only and provide a minimum combustion efficiency of 80%.
- Indirect Gas-Fired Duct Furnace(s) shall be listed for [indoor] [outdoor] installation in accordance with Category I and Category III venting systems.
- Indirect Gas-Fired Duct Furnace(s) provided shall have a tubular heat exchanger constructed of [Type 409 Stainless Steel (.044 min. wall thickness) produced to ASTM A268] [Type 304L stainless tubes (.047 min. wall thickness) produced to ASTM A249]. Heat exchanger tubes shall be mechanically secured to vestibule panels and design shall be suitable to withstand 3.0" w.c. total external static pressure.
- Indirect Gas-Fired Duct Furnace(s) shall be listed for application downstream of energy recovery ventilators or refrigeration and cooling systems and shall provide means for removal of condensate that occurs in the heat exchanger tubes during cooling operation. Heat exchanger tubes shall have (integral formed dimpled restrictors; formed turbulators) to provide for an unobstructed drainage path and tubes shall be formed to provide a positive pitch to promote condensate drainage. Drainage shall be configured so that burners are not exposed to condensate.
- The Indirect Gas-Fired Duct Furnace(s) shall employ:
    - A 20 gauge galvanized steel cabinet
    - 1 inch thick, minimum 1 ½ lb/cu.ft. density thermal insulation for exterior cabinets
    - Inshot gas burners, with integral carryovers
    - Combustion air pressure switch to prove air supply for combustion
    - Direct spark ignition of the gas burners with remote flame sensor to prove carryover across all burners
    - Listed Combination Gas Valve incorporating redundant (two) electric safety shut-off valves, manual shut-off, and gas regulator which regulates gas pressure to burner supply manifold.
    - An automatic reset type high limit switch to limit maximum outlet air temperature to less than 250 F
    - Manual reset flame rollout switch(es).
    - A Class II step down transformer to provide 24 VAC control voltage at selected supply voltage
    - Indirect Gas-Fired Duct Furnace(s) shall incorporate a Direct Spark Ignition control module that is design certified by a NRTL to ANSI Z21.20 and CAN/CSA-C22.2. The control shall provide:
        - 100% safety shut-off
        - A minimum 15 second pre-purge to provide a minimum of four (4) air changes
        - A maximum 0.8 second flame failure response time
        - Two additional ignition retrials preceded by an inter-purge period
        - A minimum 30 second post-purge
        - An automatic reset after one hour should a lockout occur
        - A LED indicator light to provide a flash code to identify operating condition of control
        - An alarm capable contact
    - A 1/8" NPT tapped test gauge connection in the gas manifold for measuring gas pressure
    - A union fitting downstream of gas control to facilitate installation and service
    - Provision for attachment of a vent system to exhaust flue gases to outdoors.
    - A circulating air flow switch to prove that sufficient air flow is present
- All electrical components shall be listed or recognized by a NRTL (ETL, UL, CSA, etc.).
- Indirect Gas-Fired Duct Furnace(s) and burners provided are listed for use on [Natural Gas] [Propane Gas] as specified at the time of order.
- Ratings listed in Submittal Tables are for installations between 0 and 2000 feet (0 to 610m). For installations above 2000 feet, unit must be de-rated in accordance with National Standards. Consult Factory.
- The fully assembled Indirect Gas-Fired Duct Furnace(s) shall be factory fire tested prior to shipment.
- Indirect Gas-Fired Duct Furnace(s) shall be accompanied by wiring diagrams for the control system supplied and printed instructions for proper installation, start-up, operation and maintenance.
- Initial on-site start-up must be completed by qualified installation and service agency. A start-up data sheet is provided for recording operating data and the final furnace(s) adjustments. The indicated portion of the start-up data sheet must be returned to RenewAire to validate factory warranty.
- Type of Venting: An induced-draft combustion air blower to provide for positive venting of flue gases.
    - [Indoor Installation – Field Installed]
    - [Outdoor Installation – Direct Discharge]
    - Vertical Vent – Category I – B Vent - Size per ANSI Z223.1 / NFPA 54
    - Horizontal Vent – Category III – Maximum Vent length - 50 equivalent feet
    - Use approved Cat. III venting materials.
    - Refer to Installation Instructions for vent pipe diameter

- Internal Casing: Galvanized steel, arranged to contain airflow.
- Heat Exchanger: [409] [304] Stainless Steel
- Burner Material: [409] [304] Stainless Steel
- Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
    - Gas Control Valve: [Single Stage] [Two Stage] [Modulating]
    - [Single Stage On/Off Control with manufacturer provided duct mounted 2 stage VAC thermostat.]
    - [Single Stage On/Off Control with one (1) set 24 VAC contacts.]
    - [Two Stage On/Off Control with manufacturer provided duct mounted 2 stage VAC thermostat.]
    - [Two Stage On/Off Control with two (2) sets 24 VAC contacts.]
    - [5:1 Continuous Electronic Modulation – 0-10 VDC analog input with manufacturer provided duct mounted 24 VAC thermostat.]
    - [5:1 Continuous Electronic Modulation – 0-10 VDC analog input with one (1) set controller analog contacts.]
    - [10:1 Continuous Electronic Modulation – 0-10 VDC analog input with manufacturer provided duct mounted 24 VAC thermostat.]
    - [10:1 Continuous Electronic Modulation – 0-10 VDC analog input with one (1) set controller analog contacts.]
    - Ignition: Electronically controlled electric spark with flame sensor.
    - Fan Thermal Switch: Operates fan on heat-exchanger temperature.
    - Vent Flow Verification: Flame rollout switch.
    - Control transformer.
    - High Limit: Thermal switch or fuse to stop burner.
- Capacities and Characteristics:
    - Gas Service: [Natural Gas] [Propane Gas]
        - [5.0” w.c. Minimum Inlet Pressure – Natural Gas]
        - [11.0” w.c. Minimum Inlet Pressure – Propane Gas]
        - 13.5” w.c. (1/2 PSI) Maximum Inlet Pressure
        - ¾” NPT service connection to gas valve
    - Flue Outlet: Refer to Installation Instructions for vent pipe diameter
    - Input Capacity: [50] [75] [100] [125] [150] [175] [200] [250] [300] [350] [400] MBH
    - Minimum Combustion Efficiency: 80 percent.

PART 3 – EXECUTION

3.1 INSTALLATON

- Install and connect indirect gas-fired duct furnace(s) and associated fuel and vent features and systems according to [NFPA 54] [CAN/CSA B149.1], applicable local codes and regulations, and manufacturer's written installation instructions.
- [Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.]
    - [Spring hangers are specified in Section 230529]

3.2 CONNECTIONS

- Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- Install piping adjacent to indirect gas-fired duct furnace(s) to allow service and maintenance.
- Gas Piping: Comply with Section 231123 "Facility Natural-Gas Piping”. Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
- Vent Connections: Comply with Section 235100 "Breechings, Chimneys, and Stacks."
- Duct Connections: Comply with Section 233113 "Metal Ducts."
- Electrical Connections: Comply with applicable requirements in electrical Sections.
    - Install electrical devices furnished with furnace(s) but not specified to be factory mounted.
    - [115V] [208V] [230V] / 1 Phase / 60 Hz. / Less than 6 amps
- Indirect gas-fired duct furnace(s) shall be provided with a 3/8” diameter 304 stainless steel condensate drain connection.

3.3 FIELD QUALITY CONTROL

- Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- Perform tests and inspections and prepare test reports.
    - Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- Tests and Inspections:
    - Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - Verify bearing lubrication.
    - Verify proper motor rotation.
    - Test Reports: Prepare a written report to record the following:
        - Test procedures used.
        - Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
        - Test results that comply with requirements.
- Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

- Adjust initial temperature set points.
- Adjust burner and other unit components for optimum heating performance and efficiency.

3.5 DEMONSTRATION

- Train owner's maintenance personnel to adjust, operate, and maintain indirect gas-fired duct furnace(s).