

Combat[®] IDF Series

DRAFT

Equipment Specifications

1-800-828-7450

EQUIPMENT SPECIFICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Indirect-fired air handler
- B. Controls

1.2 REFERENCES

- A. American Society for Testing Materials (ASTM):
 - 1. Standard A653/653M; Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process
- B. ETL Testing Laboratories, Inc. (ETL):
(Nationally recognized testing laboratory certifies code conformance.)
 - 1. Requirements applicable to product labeling and listing in the Directory of ETL Listed Products.
- C. Factory Mutual Insurance (FM):
(Certifies gas manifold to owner's insurance carrier.)
- D. Industrial Risk Insurance (IRI):
(Certifies gas manifold to owner's insurance carrier.)
- E. National Electrical Manufacturers Association (NEMA):
 - 1. Standard 250; Enclosures for Electrical Equipment (1000 V Maximum)
- F. National Fire Protection Association (NFPA):
(Establishes fire prevention standards.)
 - 1. Article 54; National Fuel Gas Code
 - 2. Article 70; National Electric Code
 - 3. Article 31; Standard for Installation of Oil-Burning Equipment
 - 4. Article 33; Standard for Spray Application Using Flammable or Combustible Materials
 - 5. Article 86; Standard for Ovens and Furnances
- G. National Roofing Contractors Association (NRCA):
 - 1. The NRCA Roofing and Waterproofing Manual, Second Edition
- H. Occupational Safety and Health Administration (OSHA):
(Enforces air quality standards and safety in the workplace.)
- I. Underwriters Laboratories, Inc. (UL):
(Nationally recognized testing laboratory certifies code conformance, product labeling and listing.)
 - 1. Standard UL727 Standard for Oil-Fired Central Furnances
 - 2. Standard UL731 Standard for Oil-Fired Unit Heaters
 - 3. Standard UL795 Standard for Commercial-Industrial Gas Heating Equipment

1.3 SUBMITTALS FOR REVIEW

- A. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data and wiring diagrams.
- B. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data and wiring diagrams.

1.4 SUBMITTALS FOR INFORMATION

- A. Manufacturer's Instructions: Indicate rigging, assembly and installation instructions.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Project Record Documents: Record actual locations of remote sensors, control panels and other components.
- B. Operation and Maintenance Data: Include manufacturer's operating instructions, installation instructions, maintenance data, and parts listing.
- C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in owner's name and registered with the manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section (proportional, building pressure controlling, modulating indirect-fired air handler/air turnover unit) with a minimum of ten years documented experience. Equipment shall be the standard product of the manufacturer and shall have complete cataloged data.
- B. Installer Qualifications: All installation and service of direct fired air handlers must be performed by a contractor qualified in the installation and service of said products with proof of a minimum of three years documented experience.
- C. Factory Testing: Each air handler shall be factory-tested. Testing shall consist of checking all circuits for continuity, operability of all valves, control motors, fan speed, linkages, switches and burner. Each air handler shall be test-fired for minimum and high fire conditions. See "Fan and Motor" for additional fan testing requirements.

1.7 REGULATORY REQUIREMENTS

- A. Conform to the National Fuel Gas Code (NFPA 54 / ANSI Z223.1).
- B. Conform to required or specified insurance specifications (FM, IRI, etc.) for the gas manifold construction.

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1.8 WARRANTY

- A. Limited warranty of twenty-four (24) months from the date of purchase by Buyer or twenty-seven (27) months from date of shipment by Seller, whichever occurs first. For all deliverables (other than replacement parts) that require installation and start-up, the otherwise applicable warranty period shall be extended by an additional four (4) months if (1) the installation and start-up is performed by a contractor on Seller's current list of contractors who have successfully completed Seller's current installation course for that deliverable and (2) full details of the installation and start-up are provided to Seller at or prior to the time any warranty claim is made.

1.9 MAINTENANCE SERVICE

- A. Provide service and maintenance for each air handler for one year from Date of Substantial Completion.

PART 2: PRODUCTS

2.1 MANUFACTURERS

- A. COMBAT® by Roberts-Gordon IDF Series which can incorporate one of the following air control schemes:
- 100% outdoor air
 - Manual modulation of 0% - 100% outdoor air
 - Automatic modulation of 0% - 100% outdoor air

2.2 MANUFACTURED UNITS

- C. Unit: Constant volume [outdoor] [indoor] indirect-fired air handler.

2.3 FABRICATION

- A. Casing and Components: Units to have an electrically welded steel frame. All frames to be suitably reinforced and braced to permit the loading, shipping, unloading and rigging to the unit location and general handling of the completed sections without damage to external or internal components or misalignment of factory assembled components due to normal handling techniques. The casing shall be constructed of a minimum of 16 gauge, cold rolled steel and the panels shall be fabricated into self-framing, standing seam type construction. The panels shall form a self-framing casing or properly supported with welded structural angle, channel and tubular steel framework. All joints shall be caulked airtight with a non-silicone sealant. Roof panels shall have a minimum of 1" standing seams, caulked and sealed. Each standing seam of the roof deck shall be securely fastened at intervals not exceeding 24". Roof panels shall be pitched on outdoor applications (optional on IDF35 - IDF125; standard on IDF150 - IDF450). The exterior roof panels shall be a minimum of 16 gauge, CRS steel. The top wearing surface of the floor of each section shall be a minimum of 16 gauge, cold rolled steel. The floor shall sustain the equipment loading and normal maintenance loading for the unit. Where holes are provided in the floor for duct and pipe, they shall be carefully cut. Closures around all components, such as coils, dampers and filters, shall be provided and made airtight. Closures shall be G-90 galvanized steel and shall provide solid close-off inside of the unit housing walls.

No air bypass or leakage around the components will be allowed. Housing wall penetrations shall be provided with a finished cover plate on the interior of the unit casing.

- B. Lifting Points: The lifting channels/tubes shall be provided on the base on the corners of each section of the air unit.
- C. Outdoor weatherproofing (Optional): The unit shall be completely weatherized and a service vestibule shall encase the unit control panel, power burner and gas train. The vestibule shall have weatherproof louvered door(s) to allow for combustion air
- D. Insulation (Optional): shall be 1", 1.5 lb. per sq. ft. rigid, rot-proof, non-combustible glass fiber insulation. Mount insulation in roof, sides, floors and interior partitions as required and in all service doors. Insulation shall be matt faced when in single wall application.
- E. Access Doors: Doors in the unit housing shall be provided to permit ready access to all internal components. The access doors shall be of 16 gauge cold rolled steel. The doors shall be designed to swing out. The doors shall be provided with a hinge. The door shall be framed by the wall panels of the unit casing. A replaceable gasket shall be provided around the full perimeter of the door frame which shall provide an air-tight seal.
- F. Drain Pan Construction (Optional): The cooling coil drain pans shall be designed to extend the entire length of the coil, including headers and return bends. The depth of the drain pans shall be at least 1 1/2" and shall pitch [toward the side of the unit] [drain through bottom of unit]. Drain pans shall be a minimum of 304 SS gauge and shall extend beyond the coil a minimum of 24". An intermediate condensate drip pan shall be provided on all coils over 54" high and the intermediate drip pan shall extend a minimum of 6" in the downstream direction of the airflow. Each intermediate drain pan shall be piped to within 2" of the bottom drain pan. All cooling coils shall be installed in a vertical position, perpendicular to the airflow to minimize condensate carry-over.
- G. Observation Port: A permanent observation port shall be provided in the burner to allow observation of both the pilot and main flame.
- H. Finish: Unpainted galvanized or white air dry enamel are standard finishes.

2.4 FANS AND MOTORS

- A. Blower: The blower(s) shall consist of centrifugal, [forward curved] [backward inclined or air foil] double width, double inlet blower wheels and scrolls. The wheels shall be supported by (two), (three), or (four) outboard bearings which shall be of a self-aligning, ball bearing type and shall be designed for at least 100,000 hours average life. The blower assembly shall be dynamically balanced. The motor and drives are to be mounted outside the airstream. Blowers shall have the capacity, class, and arrangement as indicated. Optional - Internally isolated blower, motor, and drive assembly shall be mounted on a heavy duty steel frame support. The frame shall be mounted on spring isolators designed for a minimum of 90 percent isolation efficiency. The isolation springs shall have a non-skid acoustical pad, locking screw and adjusting leveling bolt. The springs shall have a [1" nominal deflection], [2" nominal deflection], [3" nominal deflection], [earthquake provisions], [thrust restraints]. The isolation base shall be shipped with wood blocking to hold it in a rigid position for shipping. Optional - On the discharge of the

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blower shall be a minimum of 6" flexible ducting, fastened to the blower and the blower discharge closure.

- B. Blower Shafts: Blower shafts shall be of tubular design. The shafts shall not pass through their first critical speed when the unit comes up to the rated RPM. Shaft shall be coated with a rust inhibitor.
- C. V-Belt Drives: All V-belt drives shall be standard capacity, with reinforced rubber belts. The sheaves shall be of a cast iron type. Motors 10 horsepower and smaller shall have drive sheaves that are adjustable type with a plus or minus seven percent adjustability. The driver sheave shall be selected at the approximate mid-point of the adjustable range. Motors 15 horsepower and larger are to be fixed pitch type. The service factor used for V-belt drive shall be not less than 1.25.
- D. Motor Bases for V-Belt Drives: An adjustable motor base shall provide variation in center distance and shall be readily adjustable by means of screw adjustments. A locking nut, or similar device, shall be provided to secure the base in proper position.
- E. Lubrication: Mount all grease fittings directly on the bearings. Optional - Provide easily accessible tubing extensions to the bearing lubrication fittings.
- F. Motor: shall be [open drip proof], [totally enclosed fan cooled], [explosion proof], [high efficiency], 1800 RPM, _____ V, 3 Ø, 60 Hz Motor horsepower shall be as indicated on the schedule.

2.5 INDIRECT GAS-FIRED FURNACE

- A. Furnace: Indirect gas fired furnace to be furnished for indoor/outdoor application. Heat exchanger drum and front header is to be made entirely from 409 stainless steel. The secondary heat exchange surfaces shall be made from [carbon steel] [stainless steel]. Heat exchanger is to incorporate primary surface drum and secondary surface tubes in a three or four pass design. Baffles are to be utilized to assure proper air distribution on the heat exchanger at low air volumes. The primary surface is to be no less than 16 gauge, the secondary tubes are to be no greater than 3" in diameter and no less than .055" wall thickness. The front and rear headers, as well as the intermediate headers are to be a minimum of 16 gauge. The front and rear collector boxes shall be a minimum of 8" deep. The front and rear collector boxes shall overhang the drum and include an integral directional baffle to direct air to cover the entire box as well as the box to tube joint.

2.6 POWER GAS BURNER AND GAS TRAIN

- A. Burner: Furnish and install one gas burner having a rated capacity to burn _____ MBtu/h of 1000 BTU per cu. ft. of natural gas at a pressure of _____ inches at inlet of the burner gas control train. The burner shall incorporate a stainless steel flame retention type combustion head for long life and efficient operation. Combustion head shall be symmetrically round with internal gas pilot. Primary-Secondary air control shall be a design function of the combustion head. Combustion heads requiring an internal adjustment will not be accepted. OPTIONAL - 8:1 turndown burner shall be provided. The burners are to be equipped with blower housing with integral fan scroll.
- B. Gas Train:
The gas train piping shall include: - a 1/4" NPT pressure tapping

with 1/4" pipe plug upstream and downstream of valve and regulator in the gas train. - One manually operated ball valve upstream of all valves. - One main gas pressure regulator with vent. - One safety shutoff valve which shall be proven closed during preignition by proof of valve closure interlock switch on valve on FM gas trains over 5 million Btu/h input. - Primary and secondary automatic gas safety shutoff valves to operate simultaneously. - Manually operated gas valve which shall be located downstream of both automatic gas valves to permit leakage testing of the valves. Optional - A normally open, fully ported, electrically operated valve shall be provided in a vent line connected between the two safety shut off valves. The vent pipe shall be run outside to atmosphere. Optional - Gas pressure supervision shall be provided by approved pressure switches interlocked to accomplish a nonrecycling safety shutdown in the event of either high or low gas pressure.

Electrical Wiring:

- A. All electrical wiring shall be installed in thin wall EMT (Optional - rigid, hot dipped galvanized) steel conduit. Use of lengths of flexible conduit will be permitted when rigid conduit is not applicable; however, all flexible conduit shall be approved by Underwriters Laboratories and the lengths shall not exceed 24 inches. All work shall conform at the latest National Electric Code.

Controls:

- A. The unit shall be provided with an integral weatherproof control panel with 115 volt control transformer, fuses, terminal strip, and motor starter with overload protection. Fan/Blower motor(s) will be wired to the motor starter(s).
- B. Optional - A unit disconnect switch shall be provided on the exterior of the unit for single point wiring connection.
- C. All safety and operating controls shall be provided with the equipment by the unit manufacturer.

2.7 CONTROL SYSTEM

- A. The off-low fire-high fire operation of the burner shall be controlled by means of a temperature control.
- B. An additional temperature high limit safety shall be provided to shutdown the burner. Once cooled down, burner shall be allowed to operate again.
- C. Pre-purge operation of the burner fan shall be provided.
- D. A manual restart of the burner shall be necessary in the event of shutdown due to flame failure.
- E. All three-phase motors shall be controlled and protected by an automatic starter with thermal overload protection. Starter shall be interlocked to prevent burner operation when overload relays are tripped.
- F. Supply a burner mounted diaphragm air flow switch to prevent the energization of the main fuel valves in the event of insufficient combustion air.
- G. A factory prewired control cabinet shall be supplied with the burner. Cabinet is mounted on or near burner. Cabinet to house the flame safeguard control, programming purge timer, burner motor starter, fuses, control switches and relays as specified hereinafter.

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- H. The burner shall be equipped with suitable fuel and air controls to assure smooth main flame ignition.
- I. Electronic safety combustion controls shall be supplied complete with ultra-violet flame scanner or flame rod to monitor the pilot and main flame. A programming relay similar shall be furnished. It shall be so utilized as to provide intermittent type gas electric ignition and pre-ignition purge timer.

2.8 AIR HANDLER OPTIONS AVAILABLE (Select Applicable Options)

- A. Cooling Coils: Coils shall be of the face area, rows and capacity as indicated on the schedule. The [chilled water] [glycol] [direct expansion] cooling coils shall be constructed of [.020" wall], [.025" wall], 5/8" seamless copper tubing expanded into [.006" aluminum plate type fins] [.010" thick fins]. Fins shall have full height die formed collars. The casing shall be a minimum of 16 gauge galvanized steel. The maximum face velocity of the air passing over the cooling coil shall not exceed 550 feet per minute. The coils shall have no more than 14 fins per inch. Tube arrangement shall be of a staggered tube design. Optional- coil coating, baked phenolic for corrosion protection. Coils shall be tested under water at a minimum of 350 PSIG.
- B. Direct Media Recirculating Type Evaporative Coolers: Evaporative cooling media is to be a crossfluted design and manufactured from cellulose paper impregnated with insoluble anti-rot salts and rigid saturates. The evaporative cooler provided with an adjustable bleed-off valve with a rate of up to 15%. Media shall be non-combustible and U.L. 900, Class 2 listed. Media shall be removable for replacement. Media shall be 12" thick for a minimum evaporative efficiency of 87% at 650 FPM velocity and 89% at 500 FPM velocity. Media over 6 feet in height will come with intermediate horizontal support. Sump tank, frame and closures shall be a minimum of 16 gauge stainless steel. The drain pan shall be at least 4" deep and extend under the entire area of the evaporative pad and extend downstream a sufficient distance as required to prevent water carry-over into the downstream section components. All piping shall be schedule 40 NPT galvanized steel, or PVC, and will include recirculation pump, shut-off valves, and sump fill valve. Distribution piping and cover pipe shall be removable and manufactured of schedule 40 or PVC material.
- C. Filter Section(s): The filter section shall contain prefilters and final filters. Prefilters shall be of a 2" thick design, disposable type. Filters shall be held in galvanized steel or cold rolled slide-in tracks in a Vee formation. The velocity through the filters shall not exceed 500 feet per minute. Final Filters shall be of [cartridge type] [bag type]. Each filter shall have a rating of 2500 CFM or less. The initial resistance of the filter bank shall not exceed _____ inches water gauge. The average efficiency of the filter bank shall not be less than _____ percent according to ASHRAE test methods. Each filter shall be complete with an individual filter frame which shall be of a permanent, corrosion resistant type, with suitable gaskets and retaining clips to maintain a positive pressure seal between the frame and the replaceable filter.
- D. Humidifiers: Humidifiers shall be of the steam separator type, with full separation ahead of the control valve and with internal evaporator and steam jacketed distribution to assure the pure, sterile quality of the steam. Steam shall be emitted to the air stream by means of a stainless steel, steam jacketed dispersion tube. The steam discharge opening of the dispersion tube shall be of a size and quantity necessary to provide quiet and uniform distribution of steam. The steam metering valve shall be of [pneumatic], [electric] [electronic] normally closed type, having linear flow characteristics and shall close against the flow of steam. The maximum valve capacity shall be as indicated in the schedule. The humidifier shall be furnished with an inlet strainer, float and thermostatic trap and interlocked temperature switch to prevent the humidifier from operating before start-up condensate is drained. Provide multiple manifolds as indicated on the drawings. Multiple manifolds shall be individually trapped. Humidifiers shall be by Dri-Steam, Armstrong or approved equal. Humidifiers shall have the capacities as indicated on the schedule.
- E. Minimum Volume Dampers: Damper frames shall be a minimum of 16 gauge steel, welded and properly reinforced for rigidity and squareness. The blades shall be a minimum of 16 gauge galvanized steel with a maximum single blade dimension of 6" x 48". Blades shall be of rigid design with minimal twisting, flexing or vibration at the design velocities. Linkage is to be plated and corrosion resistant. Bearings are to be oilite bronze or nylon.
- E. Outside Air, Return Air or Mixing Dampers: Damper frames shall be a minimum of 16 gauge steel, welded and properly reinforced for rigidity and squareness. The blades shall be a minimum of 16 gauge galvanized steel with a maximum single blade dimension of 6" x 48". Blades shall be of rigid design with minimal twisting, flexing or vibration at the design velocities. Linkage is to be plated and corrosion resistant. Bearings are to be nylon. OPTIONAL - Blade seals are to be of an inflatable neoprene. Jamb seals are to be of a durable stainless "arc" seal. Leakage shall not exceed one percent at 4" W.C. differential pressure.
- F. Air Inlet Hoods: Hoods shall be manufactured of a minimum of 16 gauge steel. A galvanized birdscreen is to be supplied. Air velocities at wind resistant angled intake are not to exceed velocities which would approach water carry-over.
- G. Curbs: Curbs shall be knocked down for ease of transporting to roof. Curbs shall be manufactured of minimum 14 gauge galvanized steel with all the hardware for bolt-together assembly. All holes shall be matched before leaving the factory. Curb is to be a minimum of 16" high. Installation drawing shall be included with the hardware. Insulation, cant and counter flashing (if necessary) shall be provided by the installation contractor.

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PART 3: Execution

3.1 Installation

- A. The unit shall be started per the Installation, Operation, and Maintenance Manual instructions by the installing contractor. A factory provided field start up form shall be filled out by the contractor and mailed to the manufacturer to validate the warranty. The start-up shall include but not be limited to:
- Verification of proper supply power and fuel.
 - Verification that electrical terminals are secure.
 - Proper Air flow balance.
 - Verification of combustion efficiency and proper burner adjustments
 - Testing of all safety and operating controls.
 - Setting of (High and Low)(Modulation) fire.
- B. One copy of the Installation, Operation, and Maintenance Manual shall be enclosed in the unit control panel. The manual shall consist of recommended installation procedures and guidelines, inspection, initial start-up, operating, maintenance and troubleshooting sections.

Installation Code and Annual Inspections:

All installations and service of ROBERTS GORDON® products must be performed by a contractor qualified in the installation and service of products sold and supplied by Roberts-Gordon and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment. To help facilitate optimum performance and safety, Roberts-Gordon recommends that a qualified contractor annually inspect your ROBERTS GORDON® products and perform service where necessary, using only ROBERTS GORDON® replacement parts.

Further Information: Applications, engineering and detailed guidance on systems design, installation and product performance is available through ROBERTS GORDON® representatives. Please contact us for any further information you may require, including the Installation, Commissioning, Operation and Service Manual.

This product is not for residential use.

This document is intended to assist licensed professionals in the exercise of their professional judgement.

Roberts-Gordon, LLC
1250 William Street
P.O. Box 44
Buffalo, NY 14240-0044 USA
Telephone: 716.852.4400
Fax: 716.852.0854
Toll Free: 800.828.7450

European Office:
Roberts Gordon Europe Limited
Telephone: +44(0) 1902 494425
Fax: +44(0) 1902 403200

www.rg-inc.com

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