

**SPECIFICATIONS - DIVISION 23 - HVAC (CONTINUED)**

**SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES**

**PART 1 - GENERAL**  
1.1 SECTION REQUIREMENTS

- A. SUBMITTALS:
  1. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED, INCLUDING COLOR CHARTS FOR FACTORY FINISHES.
- PART 2 - PRODUCTS
- 2.1 DIFFUSERS, REGISTERS, AND GRILLES:
  - A. REFER TO SCHEDULES FOR FINISH TYPE, COLOR, MATERIAL, AND MOUNTING.
- PART 3 - EXECUTION
- 3.1 INSTALLATION
  - A. INSTALL DIFFUSERS, REGISTERS, AND GRILLES LEVEL AND PLUMB.
  - B. CEILING-MOUNTED OUTLETS AND INLETS: DRAWINGS INDICATE GENERAL ARRANGEMENT OF DUCTS, FITTINGS, AND ACCESSORIES. MAKE FINAL LOCATIONS WHERE INDICATED, AS MUCH AS PRACTICAL. FOR UNITS INSTALLED IN LAY-IN CEILING PANELS, LOCATE UNITS IN THE CENTER OF PANEL UNLESS OTHERWISE INDICATED. WHERE ARCHITECTURAL FEATURES OR OTHER ITEMS CONFLICT WITH INSTALLATION, NOTIFY ARCHITECT FOR A DETERMINATION OF FINAL LOCATION.
  - C. AFTER INSTALLATION, ADJUST DIFFUSERS, REGISTERS, AND GRILLES TO AIR PATTERNS INDICATED, OR AS DIRECTED, BEFORE STARTING AIR BALANCING.

END OF SECTION 233713

**SECTION 237413 - PACKAGED ROOFTOP UNITS**

- 1.1 SUMMARY
  - A. THIS SECTION INCLUDES PACKAGED, ROOFTOP UNITS WITH THE FOLLOWING COMPONENTS AND ACCESSORIES:
    1. DIRECT-EXPANSION COOLING.
    2. GAS FURNACE.
    3. ECONOMIZER OUTDOOR-AIR DAMPER SECTION.
    4. INTEGRAL SPACE TEMPERATURE CONTROLS.
    5. ROOF CURBS.
- 1.2 SECTION REQUIREMENTS
- A. SUBMITTALS:
  1. PRODUCT DATA: INCLUDE MANUFACTURER'S TECHNICAL DATA FOR EACH RTU, INCLUDING RATED CAPACITIES, DIMENSIONS, REQUIRED CLEARANCES, CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.
  2. WARRANTY: SPECIAL WARRANTY SPECIFIED IN THIS SECTION.
  3. CLOSEOUT SUBMITTALS
  - A. OPERATION AND MAINTENANCE DATA: FOR RTUS TO INCLUDE IN EMERGENCY, OPERATION, AND MAINTENANCE MANUALS.
  4. MAINTENANCE MATERIAL SUBMITTALS
  - A. FURNISH EXTRA MATERIALS DESCRIBED BELOW THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
    1. FAN BELTS: ONE SET FOR EACH BELT-DRIVEN FAN.
    2. FILTERS: ONE SET OF FILTERS FOR EACH UNIT.
  - B. SPECIAL WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPLACE COMPONENTS OF RTUS THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.
    1. WARRANTY PERIOD FOR COMPRESSORS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN 5 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
    2. WARRANTY PERIOD FOR GAS FURNACE HEAT EXCHANGERS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN 10 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
    3. WARRANTY PERIOD FOR SOLID-STATE IGNITION MODULES: MANUFACTURER'S STANDARD, BUT NOT LESS THAN 3 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
    4. WARRANTY PERIOD FOR CONTROL BOARDS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN 3 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
    5. WARRANTY PERIOD FOR ALL OTHER PARTS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN 1 YEAR FROM DATE OF SUBSTANTIAL COMPLETION.

**PART 2 - PRODUCTS**

- 2.1 CASING
  - A. GENERAL FABRICATION REQUIREMENTS FOR CASINGS: FORMED AND REINFORCED INSULATED PANELS, FABRICATED TO ALLOW REMOVAL FOR ACCESS TO INTERNAL PARTS AND COMPONENTS, WITH JOINTS BETWEEN SECTIONS SEALED.
  - B. EXTERIOR CASING MATERIAL: GALVANIZED STEEL WITH FACTORY-PAINTED FINISH, WITH PITCHED ROOF PANELS AND KNOCKOUTS WITH GROMMET SEALS FOR ELECTRICAL AND PIPING CONNECTIONS AND LIFTING LUGS.
    1. CASING THICKNESS: 1/2 INCH THICK.
  - C. CASING INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A.
    1. MATERIALS: ASTM C 1071, TYPE I.
    2. THICKNESS: 1/2 INCH.
    3. LINER MATERIALS SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.
    4. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.
  - D. UNIT SHALL HAVE A THRU-THE-BASE GAS AND ELECTRICAL CONNECTIONS.
- 2.2 FANS
 

OPTION A OR B:

  - A. DIRECT-DRIVEN SUPPLY-AIR FANS: DOUBLE WIDTH, BACKWARD INCLINED, CENTRIFUGAL; WITH PERMANENTLY LUBRICATED, MOTOR RESILIENTLY MOUNTED IN THE FAN INLET, ALUMINUM OR PAINTED-STEEL WHEELS, AND GALVANIZED- OR PAINTED-STEEL FAN SCROLLS.
  - B. BELT-DRIVEN SUPPLY-AIR FANS: DOUBLE WIDTH, FORWARD CURVED, CENTRIFUGAL; WITH PERMANENTLY LUBRICATED, SINGLE-SPEED MOTOR INSTALLED ON AN ADJUSTABLE FAN BASE RESILIENTLY MOUNTED IN THE CASING, ALUMINUM OR PAINTED-STEEL WHEELS, AND GALVANIZED- OR PAINTED-STEEL FAN SCROLLS.
- C. CONDENSER-COIL FAN: DIRECT DRIVE, PROPELLER, MOUNTED ON SHAFT OF PERMANENTLY LUBRICATED MOTOR WITH THERMAL OVERLOAD PROTECTION.
- D. POWER EXHAUST: FORWARD CURVED, SHAFT MOUNTED ON PERMANENTLY LUBRICATED MOTOR.

**2.3 COILS**

- A. SUPPLY-AIR REFRIGERANT COIL:
  1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
  2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
  3. CATHODIC EPOXY COATING.
  4. CONDENSATE DRAIN PAN: GALVANIZED STEEL WITH CORROSION-RESISTANT COATING FORMED WITH PITCH AND DRAIN CONNECTIONS.
- B. OUTDOOR-AIR REFRIGERANT COIL:
  1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
  2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
  3. CATHODIC EPOXY COATING.
- C. HOT-GAS REHEAT REFRIGERANT COIL (OPTIONAL):

- 1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
- 2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
- 3. CATHODIC EPOXY COATING.
- 2.4 REFRIGERANT CIRCUIT COMPONENTS
  - A. NUMBER OF REFRIGERANT CIRCUITS: TWO
  - B. COMPRESSOR: HERMETIC, SCROLL, MOUNTED ON VIBRATION ISOLATORS; WITH INTERNAL OVERCURRENT AND HIGH-TEMPERATURE PROTECTION, INTERNAL PRESSURE RELIEF AND CRANKCASE HEATER.
  - C. REFRIGERATION SPECIALTIES:
    1. REFRIGERANT: R-410A
    2. EXPANSION VALVE WITH REPLACEABLE THERMOSTATIC ELEMENT.
    3. REFRIGERANT FILTER/DRYER.
    4. MANUAL-RESET HIGH-PRESSURE SAFETY SWITCH.
    5. AUTOMATIC-RESET LOW-PRESSURE SAFETY SWITCH.
    6. MINIMUM OFF-TIME RELAY.
    7. AUTOMATIC-RESET COMPRESSOR MOTOR THERMAL OVERLOAD.
    8. BRASS SERVICE VALVES INSTALLED IN COMPRESSOR SUCTION AND LIQUID LINES.
    9. LOW-AMBIENT KIT HIGH-PRESSURE SENSOR.
    10. HOT-GAS REHEAT SOLENOID VALVE WITH A REPLACEABLE MAGNETIC COIL.
- 2.5 AIR FILTRATION
  - A. PROVIDE 2" THROW-AWAY FIBERGLASS FILTERS.
- 2.6 GAS FURNACE
  - A. BURNERS: IN-SHOT TYPE CONSTRUCTED OF ALUMINUM-COATED STEEL.
    1. FUEL: NATURAL GAS.
    2. IGNITION: DIRECT SPARK IGNITION (DSI).
  - VERIFY AVAILABILITY OF HIGH-ALTITUDE FEATURE WITH MANUFACTURERS.
  3. HIGH-ALTITUDE KIT: FOR PROJECT ELEVATIONS MORE THAN 2,000 FEET ABOVE SEA LEVEL.
  - B. HEAT-EXCHANGER AND DRAIN PAN: STAINLESS STEEL.
  - C. INDUCED DRAFT COMBUSTION BLOWER.
  - D. SAFETY CONTROLS:
    1. GAS CONTROL VALVE: TWO STAGE.
    2. GAS TRAIN: SINGLE-BODY, REGULATED, REDUNDANT, 24-V AC GAS VALVE ASSEMBLY CONTAINING PILOT SOLENOID VALVE, PILOT FILTER, PRESSURE REGULATOR, PILOT SHUTOFF, AND MANUAL SHUTOFF.
- 2.7 DAMPERS
  - A. OUTDOOR AND RETURN AIR MIXING DAMPERS: PARALLEL OR OPPOSED-BLADE GALVANIZED-STEEL DAMPERS MECHANICALLY FASTENED TO CADMIUM PLATED FOR GALVANIZED-STEEL OPERATING ROD IN REINFORCED CABINET. CONNECT OPERATING RODS WITH COMMON LINKAGE AND INTERCONNECT LINKAGES SO DAMPERS OPERATE SIMULTANEOUSLY.
    1. DAMPER MOTOR: MODULATING WITH ADJUSTABLE MINIMUM POSITION.
    2. RELIEF AIR DAMPER: GRAVITY ACTUATED, WITH BIRD SCREEN AND HOOD.
- 2.8 ELECTRICAL POWER CONNECTION
  - A. PROVIDE FOR SINGLE CONNECTION OF POWER TO UNIT WITH UNIT-MOUNTED DISCONNECT SWITCH ACCESSIBLE FROM OUTSIDE UNIT AND CONTROL CIRCUIT TRANSFORMER WITH BUILT-IN OVERCURRENT PROTECTION.
- 2.9 CONTROLS
  - A. BASIC UNIT CONTROLS:
    1. CONTROL-VOLTAGE TRANSFORMER.
    2. WALL-MOUNTED THERMOSTAT OR SENSOR WITH THE FOLLOWING FEATURES:
      - a. HEAT-COOL-OFF SWITCH.
      - b. FAN ON-AUTO SWITCH.
      - c. FAN-SPEED SWITCH.
      - d. AUTOMATIC CHANGEOVER.
      - e. ADJUSTABLE DEADBAND.
      - f. EXPOSED SET POINT.
      - g. EXPOSED INDICATION.
      - h. DEGREE F INDICATION.
      - i. UNOCCUPIED-PERIOD-OVERRIDE PUSH BUTTON.
      - j. DATA ENTRY AND ACCESS PORT TO INPUT TEMPERATURE AND HUMIDITY SETPOINTS, OCCUPIED AND UNOCCUPIED PERIODS, AND OUTPUT ROOM TEMPERATURE AND HUMIDITY SUPPLY TEMPERATURE, OPERATING MODE, AND STATUS.
    3. WALL-MOUNTED HUMIDISTAT OR SENSOR WITH THE FOLLOWING FEATURES:
      - a. EXPOSED SET POINT.
      - b. EXPOSED INDICATION.
    4. REMOTE WALL-MOUNTED CONTROLS PANEL WITH KEYPAD ACCESS FOR EACH UNIT:
      - a. LIGHTS TO INDICATE POWER ON, UNIT ABNORMAL OR FAILURE, SMOKE DETECTION.
  - B. DDC CONTROLS:
    1. CONTROLLER SHALL HAVE LOCAL AND REMOTE MEMORY BACKUP.
    2. SAFETY INTERLOCK OPERATION:
      - a. SMOKE DETECTOR STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SMOKE IS DETECTED. PROVIDE ADDITIONAL CONTROLS FOR ALARM INTERFACE TO FIRE ALARM CONTROL PANEL.
      - b. FIRE ALARM CONTROL PANEL INTERFACE WHERE APPLICABLE.
      - c. LOW-DISCHARGE TEMPERATURE: STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SUPPLY AIR TEMPERATURE IS LESS THAN 40°F.
      - d. RETAIN FIRST SUBPARAGRAPH BELOW FOR AIR-TO-AIR HEAT-PUMP FEATURE.
      - e. DEFROST CONTROL FOR CONDENSER COIL: PRESSURE DIFFERENTIAL SWITCH TO INITIATE DEFROST SEQUENCE.
- 3. UNIT SHALL BE CAPABLE OF DIRECT COMMUNICATION WITH GENERIC OPEN PROTOCOL SUCH AS BACNET MS/TP, LON/TALK, OR MODBUS. THIS WILL ALLOW THE UNIT TO INTEGRATE WITH A FACILITY ENERGY MANAGEMENT SYSTEM.
- 4. SCHEDULED OPERATION: OCCUPIED AND UNOCCUPIED PERIODS ON SEVEN-DAY CLOCK WITH A MINIMUM OF FOUR PROGRAMMABLE PERIODS PER DAY.
- 5. UNOCCUPIED PERIOD:
  - a. HEATING SETBACK: 10°F.
  - b. COOLING SETBACK: SYSTEM OFF.
  - c. OVERRIDE OPERATION: TWO HOURS.
- 6. SUPPLY FAN OPERATION:
  - a. OCCUPIED PERIODS: RUN FAN CONTINUOUSLY.
  - b. UNOCCUPIED PERIODS: CYCLE FAN TO MAINTAIN SETBACK TEMPERATURE.
- 7. REFRIGERANT CIRCUIT OPERATION:
  - a. OCCUPIED PERIODS: CYCLE OR STAGE COMPRESSORS, AND OPERATE HOT-GAS BYPASS TO MATCH COMPRESSOR OUTPUT TO COOLING LOAD TO MAINTAIN ROOM TEMPERATURE AND HUMIDITY. CYCLE CONDENSER FANS TO MAINTAIN MAXIMUM HOT-GAS PRESSURE. OPERATE LOW-AMBIENT CONTROL KIT TO MAINTAIN MINIMUM HOT-GAS PRESSURE.
  - b. UNOCCUPIED PERIODS: CYCLE COMPRESSORS AND CONDENSER FANS FOR HEATING TO MAINTAIN SETBACK TEMPERATURE.
- 8. HOT-GAS REHEAT-COIL OPERATION (OPTIONAL):
  - a. OCCUPIED PERIODS: HUMIDISTAT OPENS HOT-GAS VALVE TO PROVIDE HOT-GAS REHEAT, AND CYCLES COMPRESSOR.
  - b. UNOCCUPIED PERIODS: REHEAT NOT REQUIRED.
- 9. GAS FURNACE OPERATION:

- a. OCCUPIED PERIODS: STAGE BURNER TO MAINTAIN ROOM TEMPERATURE.
- b. UNOCCUPIED PERIODS: CYCLE BURNER TO MAINTAIN SETBACK TEMPERATURE.
- 10. FIXED MINIMUM OUTDOOR-AIR DAMPER OPERATION:
  - a. OCCUPIED PERIODS: OPEN TO 25 PERCENT.
  - b. UNOCCUPIED PERIODS: CLOSE THE OUTDOOR-AIR DAMPER.
- 11. ECONOMIZER OUTDOOR-AIR DAMPER OPERATION:
  - a. OCCUPIED PERIODS: OPEN TO 25 PERCENT FIXED MINIMUM INTAKE, AND MAXIMUM 100 PERCENT OF THE FAN CAPACITY TO COMPLY WITH ASHRAE CYCLE B. CONTROLLER SHALL PERMIT AIR-SIDE ECONOMIZER OPERATION WHEN OUTDOOR AIR IS LESS THAN 60 °F. USE MIXED-AIR TEMPERATURE AND SELECT BETWEEN OUTDOOR-AIR AND RETURN-AIR ENTHALPY TO ADJUST MIXING DAMPERS DURING ECONOMIZER CYCLE OPERATION. LOCK OUT COOLING.
  - b. UNOCCUPIED PERIODS: CLOSE OUTDOOR-AIR DAMPER AND OPEN RETURN-AIR DAMPER.
- 2.10 ACCESSORIES
  - A. DUPLEX, 115-V, GROUND-FAULT-INTERRUPTER OUTLET WITH 15-A OVERCURRENT PROTECTION. INCLUDE TRANSFORMER IF REQUIRED.
  - B. LOW-AMBIENT KIT STAGED DOWN TO 0°F.
  - C. FILTER DIFFERENTIAL PRESSURE SWITCH WITH SENSOR TUBING ON EITHER SIDE OF FILTER. SET FOR FINAL FILTER PRESSURE LOSS.
  - D. HAIL GUARDS OF GALVANIZED STEEL, PAINTED TO MATCH CASING.
  - E. DUCT MOUNTED SMOKE DETECTOR IN RETURN AIR STREAM CAPABLE OF SHUTTING DOWN THE UNIT IN THE PRESENCE OF SMOKE DETECTION.
- 2.11 ROOF CURBS
  - A. MATERIALS: GALVANIZED STEEL WITH CORROSION-PROTECTION COATING, WATERTIGHT GASKETS, AND FACTORY-INSTALLED WOOD NAILER; COMPLYING WITH NRCA STANDARDS.
    1. CURB INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A OR NFPA 90B.
      - a. MATERIALS: ASTM C 1071, TYPE I OR II.
      - b. THICKNESS: 1-1/2 INCHES.
    2. APPLICATION: FACTORY APPLIED WITH ADHESIVE AND MECHANICAL FASTENERS TO THE INTERNAL SURFACE OF CURB.
      - a. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.
      - b. MECHANICAL FASTENERS: GALVANIZED STEEL, SUITABLE FOR ADHESIVE ATTACHMENT, MECHANICAL ATTACHMENT, OR WELDING ATTACHMENT TO DUCT WITHOUT DAMAGING LINER WHEN APPLIED AS RECOMMENDED BY MANUFACTURER AND WITHOUT CAUSING LEAKAGE IN CABINET.
      - c. LINER MATERIALS SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.
      - d. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.
  - B. CURB HEIGHT: 14 INCHES TYPICAL. PROVIDE 24 INCH CURB AREAS WITH EXPOSED HEAVY SNOE WALL.

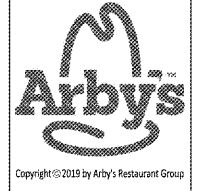
**PART 3 - EXECUTION**

- 3.1 EXAMINATION
  - A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLED DEVICES, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF RTUS.
  - B. EXAMINE ROUGH-IN FOR RTUS TO VERIFY ACTUAL LOCATIONS OF PIPING AND DUCT CONNECTIONS BEFORE EQUIPMENT INSTALLATION.
  - C. EXAMINE ROOFS FOR SURFACE CONDITIONS WHERE RTUS WILL BE INSTALLED.
  - D. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- 3.2 INSTALLATION
  - A. ROOF CURB: INSTALL ON ROOF STRUCTURE, LEVEL AND SECURE. INSTALL RTUS ON CURBS AND COORDINATE ROOF PENETRATION AND FLASHING WITH ROOF CONSTRUCTION. RTUS TO UPPER CURB RAIL, AND SECURE CURB BASE TO ROOF FRAMING OR CONCRETE BASE WITH ANCHOR BOLTS.
- 3.3 CONNECTIONS
  - A. THE FOLLOWING ARE SPECIFIC CONNECTION REQUIREMENTS:
    1. INSTALL DUCTS TO TERMINATION AT TOP OF ROOF CURB.
    2. REMOVE ROOF DECKING ONLY AS REQUIRED FOR PASSAGE OF DUCTS. DO NOT CUT OUT DECKING UNDER ENTIRE ROOF CURB.
- 3.4 COORDINATION
  - A. CONTRACTOR TO COORDINATE WITH KITCHEN EQUIPMENT SUPPLIER TO ENSURE THAT THE RTUS ARE COORDINATED WITH THE KITCHEN EQUIPMENT, PARTICULARLY THE EXHAUST HOODS AND THE MAKE-UP AIR UNIT, TO PROPERLY PRESSURIZE THE BUILDING/SPACE.
  - B. CONTRACTOR TO ENSURE THAT ALL THERMOSTATS AND SENSORS ARE COMPATIBLE WITH THE RTU CONTROLS.
- 3.5 FIELD QUALITY CONTROL
  - A. 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.
  - B. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.
    1. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS, AND TO ASSIST IN TESTING. REPORT RESULTS IN WRITING.
- 3.6 TESTS AND INSPECTIONS:
  1. AFTER INSTALLING RTUS AND AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, TEST UNITS FOR COMPLIANCE WITH REQUIREMENTS.
  2. OPERATIONAL TEST: AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, START UNITS TO CONFIRM PROPER MOTOR ROTATION AND UNIT OPERATION.
  3. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.
  - D. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.
- 3.7 STARTUP SERVICE
  - A. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM STARTUP SERVICE.
  - B. COMPLETE INSTALLATION AND STARTUP CHECKS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND DO THE FOLLOWING:
    1. INSPECT FOR VISIBLE DAMAGE TO UNIT CASING, FURNACE COMBUSTION CHAMBER, COMPRESSOR, COILS, AND FANS.
    2. VERIFY THAT LABELS ARE CLEARLY VISIBLE. CLEARANCES HAVE BEEN PROVIDED FOR SERVICING, CONTROLS ARE CONNECTED AND OPERABLE, AND FILTERS ARE INSTALLED.
    3. CLEAN CONDENSER COIL AND FURNACE AND INSPECT FOR CONSTRUCTION DEBRIS.
    4. REMOVE PACKING FROM VIBRATION ISOLATORS.
    5. VERIFY LUBRICATION ON FAN AND MOTOR BEARINGS.
    6. INSPECT FAN-WHEEL ROTATION FOR MOVEMENT IN CORRECT DIRECTION WITHOUT VIBRATION AND BINDING.
    7. ADJUST FAN BELTS TO PROPER ALIGNMENT AND TENSION.
    8. START UNIT ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
      - a. INSPECT AND RECORD PERFORMANCE OF INTERLOCKS AND PROTECTIVE DEVICES; VERIFY SEQUENCES.
    9. OPERATE UNIT FOR AN INITIAL PERIOD AS RECOMMENDED OR REQUIRED BY MANUFACTURER.
    10. PERFORM THE FOLLOWING OPERATIONS FOR BOTH MINIMUM AND MAXIMUM FIRING. ADJUST BURNER FOR PEAK EFFICIENCY.
      - a. MEASURE GAS PRESSURE ON MANIFOLD.
      - b. INSPECT OPERATION OF POWER VENTS.
      - c. MEASURE SUPPLY-AIR TEMPERATURE AND VOLUME WHEN BURNER IS AT MAXIMUM FIRING RATE AND WHEN BURNER IS OFF. CALCULATE USEFUL HEAT TO SUPPLY AIR.
    11. ADJUST AND INSPECT HIGH-TEMPERATURE LIMITS.
    12. INSPECT OUTDOOR-AIR DAMPERS FOR PROPER STROKE AND INTERLOCK WITH RETURN-AIR DAMPERS.
    13. INSPECT CONTROLS FOR CORRECT SEQUENCING OF HEATING, MIXING DAMPERS, REFRIGERATION, AND NORMAL AND EMERGENCY SHUTDOWN.

- 23. SIMULATE MAXIMUM COOLING DEMAND AND INSPECT THE FOLLOWING:
  - a. COMPRESSOR REFRIGERANT SUCTION AND HOT-GAS PRESSURES.
  - b. SHORT CIRCUITING OF AIR THROUGH CONDENSER COIL OR FROM CONDENSER FANS TO OUTDOOR-AIR INTAKE.
- 27. VERIFY OPERATION OF REMOTE PANEL INCLUDING PILOT-LIGHT OPERATION AND FAILURE MODES. INSPECT THE FOLLOWING:
  - a. HIGH-TEMPERATURE LIMIT ON GAS-FIRED HEAT EXCHANGER.
  - b. LOW-TEMPERATURE SAFETY OPERATION.
  - c. FILTER HIGH-PRESSURE DIFFERENTIAL ALARM.
  - d. ECONOMIZER TO MINIMUM OUTDOOR-AIR CHANGEOVER.
  - e. RELIEF-AIR FAN OPERATION.
  - f. SMOKE ALARMS.
- 28. AFTER STARTUP AND PERFORMANCE TESTING AND PRIOR TO INSTANTANEOUS COMPLETION, REPLACE EXISTING FILTERS WITH NEW FILTERS.
- 3.7 CLEANING AND ADJUSTING
  - A. OCCUPANCY ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SYSTEM TO SUIT ACTUAL OCCUPIED CONDITIONS. PROVIDE UP TO TWO VISITS TO SITE DURING OTHER THAN NORMAL OCCUPANCY ADJUSTMENTS FOR THIS PURPOSE.
  - B. AFTER COMPLETING SYSTEM INSTALLATION AND TESTING, ADJUSTING, AND BALANCING RTU AND AIR-DISTRIBUTION SYSTEMS, CLEAN FILTER HOUSINGS AND INSTALL NEW FILTERS.

**reed**  
 architecture + planning  
 174 east long street  
 suite 300  
 columbus, ohio 43215  
 tel: 614.487.8770  
 fax: 614.487.8777

NOT FOR CONSTRUCTION, FOR REVIEW ONLY



**ARBY'S RESTAURANT**  
 INSPIRE WORKSMART 2400  
 2385 LEN PATTERSON RD  
 FORT MILL, SC 29708  
 FOR  
 BRUMIT RESTAURANT GROUP, LLC  
 40 SEMINOLE STREET, ASHEVILLE, NC 28803

PROJECT NUMBER: ARF149	
ISSUE	DATE
OWNER REVIEW	AUG 7, 2019

SPECIFICATIONS  
MECHANICAL

SHEET:

**M7.2**