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Cooling only/electric heat packaged rooftop

HVAC guide specifications

Size range: **15 and 20 nominal tons**

Carrier Model Number: **50TCQD17,24**

Part 1 — (23 06 80) Schedules for decentralized HVAC equipment

1.01 (23 06 80.13) Decentralized Unitary HVAC Equipment Schedule

A. (23 06 80.13.A.) Rooftop unit schedule

1. Schedule is per the project specification requirements.

Part 2 — (23 07 16) HVAC equipment insulation

2.01 (23 07 16.13) Decentralized, Rooftop Units:

A. (23 07 16.13.A.) Evaporator fan compartment:

1. Interior cabinet surfaces shall be insulated with a minimum $^{1}/_{2}$-in. thick, minimum $1^{1}/_{2}$-lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

Part 3 — (23 09 13) Instrumentation and control devices for HVAC

3.01 (23 09 13.23) Sensors and Transmitters

A. (23 09 13.23.A.) Thermostats

1. Thermostat must
   a. energize both “W" and “G" when calling for heat.
   b. have capability to energize 2 different stages of cooling, and 2 different stages of heating.
   c. include capability for occupancy scheduling.

Part 4 — (23 09 23) Direct-digital control system for HVAC

4.01 (23 09 23.13) Decentralized, Rooftop Units:

A. (23 09 23.13.A.) PremierLink™ controller

1. Shall be ASHRAE 62-2001 compliant.
2. Shall accept 18-32 VAC input power.
3. Shall have an operating temperature range from –40°F (–40°C) to 158°F (70°C), 10% to 95% RH (non-condensing).
4. Shall include an integrated economizer controller to support an economizer with 4 to 20 mA actuator input and no microprocessor controller.
5. Controller shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire shutdown, enthalpy, fan status, remote time clock/door switch.
6. Shall accept a CO_2 sensor in the conditioned space, and be Demand Controlled Ventilation (DCV) ready.
7. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/exhaust/reversing valve/dehumidify/occupied.
8. Unit shall provide surge protection for the controller through a circuit breaker.
9. Shall be Internet capable, and communicate at a Baud rate of 38.4K or faster.

10. Shall have an LED display independently showing the status of activity on the communication bus, and processor operation.
11. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks* plug-in communications card.
12. Shall have built-in Carrier Comfort Network® (CCN) protocol, and be compatible with other CCN devices, including ComfortVIEW controllers.
13. Shall have built-in support for Carrier technician tool.
14. Software upgrades will be accomplished by local download. Software upgrades through chip replacements are not allowed.
15. Shall be shock resistant in all planes to 5G peak, 11ms during operation, and 100G peak, 11ms during storage.
16. Shall be vibration resistant in all planes to 1.5G at 20-300 Hz.
17. Shall support a bus length of 4000 ft (1219 m) max, 60 devices per 1000 ft (305 m) section, and 1 RS-485 repeater per 1000 ft (305 m) sections.

B. (23 09 23.13.B.) RTU Open protocol, direct digital controller:

1. Shall be ASHRAE 62-2001 compliant.
2. Shall accept 18-30VAC, 50-60Hz, and consume 15VA or less power.
3. Shall have an operating temperature range from –40°F (–40°C) to 130°F (54°C), 10% to 90% RH (non-condensing).
4. Shall include built-in protocol for BACnet† (MS/TP and PTP modes), Modbus** (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.

* LonWorks is a registered trademark of Echelon Corporation.
† BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
** Modbus is a registered trademark of Schneider.

5. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers
6. Baud rate Controller shall be selectable using a dip switch.
7. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
8. Shall accept the following inputs: space temperature, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, compressor lock-out, fire shutdown, enthalpy switch, and fan status/filter status/ humidity/remote occupancy.
9. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/ exhaust/reversing valve.
10. Shall have built-in surge protection circuitry through solid-state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the “trip" condition clears.
11. Shall have a battery backup capable of a minimum of 10,000 hours of data and time clock retention during power outages.
12. Shall have built-in support for Carrier technician tool.
13. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks communications card.
14. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

Part 5 — (23 09 33) Electric and electronic control system for HVAC

5.01 (23 09 33.13) Decentralized, rooftop units:

A. (23 09 33.13.A.) General:

1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.
2. Shall utilize color-coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, and low and high pressure switches.
4. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.
5. Shall include integrated defrost system to prevent excessive frost accumulation during heating duty, and shall be controlled as follows:
    a. Defrost shall be initiated on the basis of time and coil temperature.
    b. A 30,60,90,120 minute timer shall activate the defrost cycle only if the coil temperature is low enough to indicate a heavy frost condition.
    c. Defrost cycle shall terminate when defrost thermostat is satisfied and shall have a positive termination time of 10 minutes.
6. Defrost system shall also include:
    a. Defrost Cycle Indicator LED.
    b. Dip switch selectable defrost time between 30, 60, 90 and 120 minutes. Factory set at 30 minutes.
    c. Molded plug connection to ensure proper connection.

B. (23 09 33.23.B.) Safeties:

1. Compressor over-temperature, over-current.
2. Loss of charge switch.
    a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 loss of charge switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
    b. Loss of charge switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. High-pressure switch.
    a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
    b. High-pressure switch shall use different color wire than the low-pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
4. Freeze protection thermostat, evaporator coil.
5. Automatic reset, motor thermal overload protector.

Part 6 — (23 09 93) Sequence of operations for HVAC controls

6.01 (23 09 93.13) Decentralized, Rooftop Units:

A. (23 09 93.13.A.) INSERT SEQUENCE OF OPERATION

Part 7 — (23 40 13) Panel air filters

7.01 (23 40 13.13) Decentralized rooftop units:

A. (23 40 13.13.A.) Standard filter section

1. Shall consist of factory-installed, low velocity, disposable 2-in. thick fiberglass filters of commercially available sizes.
2. Unit shall use only one filter size. Multiple sizes are not acceptable.
3. Filters shall be accessible through a dedicated, weather tight panel.
4. 4-in. filter capabilities shall be capable with pre-engineered and approved Carrier filter track field-installed accessory. This kit requires field furnished filters.

Part 8 — (23 81 19) Self-contained air conditioners

8.01 (23 81 19.13) Medium-Capacity Self-Contained Air Conditioners (50TCQD17,24)

A. (23 81 19.13.A.) General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
3. Unit shall use Puron® (R-410A) refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. (23 81 19.13.B.) Quality Assurance

1. Unit meets ASHRAE 90.1-2016 and IECC*-2015 minimum efficiency requirements.
2. Unit shall be rated in accordance with AHRI Standard 340/360.
3. Unit shall be designed to conform to ASHRAE 15.
4. Unit shall be ETL-tested and certified in accordance with ANSI Z21.47 Standards and ETL-listed and certified under Canadian standards as a total package for safety requirements.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit casing shall be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 5000-hour salt spray.
8. Roof curb shall be designed to conform to NRCA Standards.
9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
10. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
12. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
13. High Efficiency Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).

C. (23 81 19.13.C.) Delivery, storage, and handling

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Lifted by crane requires either shipping top panel or spreader bars.
3. Unit shall only be stored or positioned in the upright position.

D. (23 81 19.13.D.) Project conditions

As specified in the contract.

E. (23 81 19.13.E.) Operating characteristics

1. Unit shall be capable of starting and running at 115°F (46°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 340/360 at ± 10% voltage.
2. Compressor with standard controls shall be capable of operation down to 30°F (–1°C), ambient outdoor temperatures. Accessory kits are necessary if mechanically cooling at ambient temperatures below 30°F (–1°C).
3. Unit shall discharge supply air horizontally as shown on contract drawings.
4. Unit shall be factory configured and ordered for vertical or horizontal supply and return configurations.
5. Unit shall be factory furnished for horizontal configuration without the use of special conversion kits. No field kit conversion is possible.
6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.

F. (23 81 19.13.F.) Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

* IECC is a registered trademark of International Code Council, Inc.

G. (23 81 19.13.G.) Unit cabinet

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F): 60, Hardness: H to 2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standard 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum $^{1}/_{2}$-in. thick, 1-lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.
4. Base of unit shall have a minimum of four locations for thru-the-base electrical connections. Connections shall be internal to the cabinet to protect from environmental issues.
5. Base rail
   a. Unit shall have base rails on a minimum of 2 sides.
   b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
   c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
   d. Base rail shall be a minimum of 16-gauge thickness.
6. Condensate pan and connections:
   a. Shall be a sloped condensate drain pan made of a non-corrosive material.
   b. Shall comply with ASHRAE Standard 62.
   c. Shall use a $^{3}/_{4}$-in. to 14 NPT drain connection, at the end of the drain pan. Connection shall be made per manufacturer's recommendations.
7. Top panel:

   Shall be a multi-piece top panel linked with water tight flanges and interlocking systems.
8. Electrical connections
   a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
   b. Thru-the-base capability.
      1) Thru-the-base provisions / connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
      2) No basepan penetration, other than those authorized by the manufacturer, is permitted.
9. Component access panels (standard)
   a. Cabinet panels shall be easily removable for servicing.
   b. Unit shall have one factory-installed, removable, filter access panel.

c. Panels covering control box and filter shall have molded composite handles while the blower access door shall have an integrated flange for easy removal.

d. Handles shall be UV modified, composite, permanently attached, and recessed into the panel.

e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.

f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

H. (23 81 19.13.H.) Coils

1. Standard aluminum/copper coils: on all models.

a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.

c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

2. Optional Pre-coated aluminum fin condenser coils: on all models.

a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.

b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.

c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

3. Optional copper-fin evaporator and condenser coils on all models.

a. Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets.

b. Galvanized steel tube sheets shall not be acceptable.

c. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan.

4. Optional E-coated aluminum-fin evaporator and condenser coils: on all models.

a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.

b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.

c. Color shall be high gloss black with gloss per ASTM D523-89.

d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.

e. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.

f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).

g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92).

h. Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.

I. (23 81 19.13.I.) Refrigerant components

1. Refrigerant circuit shall include the following control, safety, and maintenance features:

a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.

b. High capacity refrigerant filter drier on each refrigerant circuit.

c. Service gauge connections on suction and discharge lines.

d. Pressure gauge access through a specially designed screen on the side of the unit.

e. Precision-sized suction line accumulator on each refrigerant circuit shall protect from oil being removed from the scroll compressor rotating orbiter and plate during the activation of the defrost mode and switching back and forth from cooling and heating operations.

2. Compressors

a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.

b. Models shall be available with 2 compressor/2-stage cooling.

c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.

d. Compressors shall be internally protected from high discharge temperature conditions.

e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

f. Compressor shall be factory mounted on rubber grommets.

g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

h. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

J. (23 81 19.13.J.) Filter section

1. Filters access is specified in the unit cabinet section of this specification.

2. Filters shall be held in place by a preformed, slide-out filter tray, facilitating easy removal and installation.

3. Shall consist of factory-installed, low velocity, throw-away 2-in. thick fiberglass filters.

4. Filters shall be standard, commercially available sizes.

5. Only one size filter per unit is allowed.

6. 4-in. filter capability is possible with a field-installed pre-engineered slide out filter track accessory. 4-in. filters are field-furnished.

K. (23 81 19.13.K.) Evaporator fan and motor

1. Evaporator fan motor:

a. Shall have inherent automatic-reset thermal overload protection or circuit breaker.

b. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.

2. Belt-driven evaporator fan:

a. Belt drive shall include an adjustable-pitch motor pulley and belt break protection system.

b. Shall use rigid pillow block bearing system with lubricant fittings at accessible bearing or lubrication line.

c. Blower fan shall be double-inlet type with forward-curved blades.

d. Shall be constructed from steel with a corrosion resistance finish and dynamically balanced.

L. (23 81 19.13.L.) Condenser Fans and Motors.

1. Condenser fan motors:

a. Shall be a totally enclosed motor.

b. Shall use permanently lubricated bearings.

c. Shall have inherent thermal overload protection with an automatic reset feature.

d. Shall use a shaft-down design.

2. Condenser fans:

a. Shall be a direct-driven propeller type fan.

b. Shall have aluminum blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.

M. (23 81 19.13.M.) Special features, options and accessories

1. Staged Air Volume System (SAV™) for 2-stage cooling models only:

   a. Evaporator fan motor:
      1) Shall have permanently lubricated bearings.
      2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
      3) Shall be Variable Frequency duty and 2-speed control.
      4) Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.

   b. Variable frequency drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
      1) Shall be installed inside the unit cabinet, mounted, wired and tested.
      2) Shall contain Electromagnetic Interference (EMI) frequency protection.
      3) Insulated Gate Bi-polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
      4) Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.
      5) RS485 capability standard.
      6) Electronic thermal overload protection.
      7) 5% swinging chokes for harmonic reduction and improved power factor.
      8) All printed circuit boards shall be conformal coated.

2. Standard Integrated Economizers:

   a. Integrated, gear driven parallel modulating blade design type capable of simultaneous economizer and compressor operation.

   b. Independent modules for vertical or horizontal return configurations shall be available. Vertical and horizontal return modules shall be available as a factory-installed option.

   c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.

   d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.

   e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

   f. Standard models shall be equipped with low-leakage dampers, not to exceed 2% leakage at 1 in. wg pressure differential. Economizer controller on electromechanical units shall be Honeywell W7212 that provides:
      1) Combined minimum and DCV maximum damper position potentiometers with compressor staging relay.
      2) Functions with solid state analog enthalpy or dry bulb changeover control sensing.
      3) Contain LED indicates for:
         A) When free cooling is available
         B) When module is in DCV mode
         C) When exhaust fan contact is closed.

   g. Ultra-low leak EconoMi$er X system shall be available on models with SAV 2-speed Variable Frequency Drive (VFD) systems. Only available on 2-speed indoor fan motor systems with electromechanical controls or RTU Open.
      1) Maximum damper leakage rate to be equal to or less than 4.0 cfm/sq ft at 1.0 in. wg, meeting or exceeding ASHRAE 90.1-2016 and IECC-2015 requirements. Economizer controller on electromechanical units shall be Honeywell W7220 that provides:
      2) 2-line LCD interface screen for setup, configuration and troubleshooting
      3) On-board fault detection and diagnostics
      4) Sensor failure loss of communication identification
      5) Automatic sensor detection
      6) Capabilities for use with multiple-speed indoor fan systems
      7) Utilize digital sensors: Dry bulb and Enthalpy

   h. Shall be capable of introducing up to 100% outdoor air.

   i. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air.

k. Dry bulb outdoor air temperature sensor shall be provided as standard. Outdoor air sensor set point shall be adjustable and shall range from 40 to 100°F (4 to 38°C). Additional sensor options shall be available as accessories.

l. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.

m. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy. A remote potentiometer may be used to override the damper set point.

n. Dampers shall be completely closed when the unit is in the unoccupied mode.

o. Economizer controller shall accept a 2-10 Vdc CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

p. Compressor lockout sensor shall open at 35°F (2°C) and close closes at 50°F (10°C).

q. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.

r. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.

3. Two-Position Damper:

a. Damper shall be a 2-position damper. Damper travel shall be from the full closed position to the field adjustable %-open set point.

b. Damper shall include adjustable damper travel from 25% to 100% (full open).

c. Damper shall include single or dual blade, gear driven dampers and actuator motor.

d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.

e. Damper will admit up to 100% outdoor air for applicable rooftop units.

f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.

g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.

h. Outside air hood shall include aluminum water entrainment filter.

i. Not available with Staged Air Volume (SAV™) models.

4. Manual damper:

a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25% outdoor air for year round ventilation.

b. Not available with Staged Air Volume (SAV™) models.

5. Head pressure control package:

a. Controller shall control coil head pressure by condenser-fan speed modulation or condenser-fan cycling and wind baffles.

b. Shall consist of solid-state control and condenser-coil temperature sensor to maintain condensing temperature between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to –20°F (–29°C).

6. Condenser coil hail guard assembly:

a. Shall protect against damage from hail.

b. Shall be louvered style design.

7. Unit-mounted, non-fused disconnect switch:

a. Switch shall be factory-installed, internally mounted.

b. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.

c. Shall be accessible from outside the unit.

d. Shall provide local shutdown and lockout capability.

8. Convenience outlet:

a. Powered convenience outlet.
   1) Outlet shall be powered from main line power to the rooftop unit.
   2) Outlet shall be powered from line side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be ETL certified and rated for additional outlet amperage.
   3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
   4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
   5) Voltage required to operate convenience outlet shall be provided by a factory-installed step-down transformer.
   6) Outlet shall be accessible from outside the unit.
   7) Outlet shall include a field-installed “Wet in Use" cover.

b. Factory-installed non-powered convenience outlet.
   1) Outlet shall be powered from a separate 115/120v power source.
   2) A transformer shall not be included.
   3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
   4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
   5) Outlet shall be accessible from outside the unit.
   6) Outlet shall include a field-installed “Wet in Use" cover.

c. Field-Installed Non-powered convenience outlet.
   1) Outlet shall be powered from a separate 115-120v power source.
   2) A transformer shall not be included.
   3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
   4) Outlet shall include 20 amp GFI receptacles. This kit provides a flexible installation method which allows code compliance for height requirements of the GFCI outlet from the finished roof surface as well as the capability to relocate the outlet to a more convenient location.
   5) Outlet shall be accessible from outside the unit.
   6) Outlet shall include a field-installed “Wet in Use” cover.

d. Fan/filter status switch:
   1) Switch shall provide status of indoor evaporator fan (ON/OFF) or filter (CLEAN/DIRTY).
   2) Status shall be displayed either over communication bus (when used with direct digital controls) or with an indicator light at the thermostat.

9. Centrifugal power exhaust:

   a. Power exhaust shall be used in conjunction with an integrated economizer.

   b. Independent modules for vertical or horizontal return configurations shall be available.

   c. Horizontal power exhaust shall be mounted in return ductwork.

   d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0-100% adjustable set point on the economizer control.
      1) Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.

   a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
      2) Heater assemblies are provided with integral fusing for protection of internal heater circuits not exceeding 48 amps each. Auto reset thermo limit controls, magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18 ga galvanized steel) attached to end of heater assembly.

   c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

11. Adapter Curb (Vertical):

   a. Full perimeter, fully assembled and welded roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.

   b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.

   c. Permits installation of new 50TCQD17-24 models to past Carrier design curb models: DP, DR, HJ, TM, and TJ. Check with Carrier sales expert of further details and information.

12. High-static indoor fan motor(s) and drive(s):

a. High static motor(s) and drive(s) shall be factory-installed to provide additional performance range.

13. Outdoor air enthalpy sensor:

    a. The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.

14. Return air enthalpy sensor:

    a. The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.

15. Indoor air quality (CO_2) sensor:

    a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.

    b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.

16. Smoke detectors:

    a. Shall be a four-wire controller and detector.

    b. Shall be environmental compensated with differential sensing for reliable, stable, and drift-free sensitivity.

    c. Shall use magnet-activated test/reset sensor switches.

    d. Shall have tool-less connection terminal access.

    e. Shall have a recessed momentary switch for testing and resetting the detector.

    f. Controller shall include:
        1) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.
        2) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.
        3) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.
        4) Capable of direct connection to two individual detector modules.
        5) Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications.

17. Time guard:

    a. Shall prevent compressor short cycling by providing a 5-minute delay (±2 minutes) before restarting a compressor after shutdown for any reason.

    b. One device shall be required per compressor.

18. Barometric hood (horizontal economizer applications)

    a. Shall be required when a horizontal economizer and barometric relief are required. Barometric relief damper must be installed in the return air (horizontal) duct work. This hood provides weather protection.

19. Electric heat:

    a. Heating section
        1) Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.
        2) Heater assemblies are provided with integral fusing for protection of internal heater circuits not exceeding 48 amps each. Auto reset thermo limit controls, magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18 ga galvanized steel) attached to end of heater assembly.

20. Hinged access panels:

    a. Shall provide easy access through integrated quarter turn latches.

    b. Shall be on major panels of: filter, control box, fan motor and compressor.

21. Display kit for variable frequency drive (VFD):

    a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.

b. Kit contains display module, mounting bracket and communication cable.

c. Display kit can be permanently installed in the unit or used on any SAV™ system VFD controller as needed.

22. Condensate Overflow Switch (for units with electro-mechanical controls and RTU Open controller only):

    a. This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

        1) Indicator light — solid red (more than 10 seconds on water contact — compressors disabled), blinking red (sensor disconnected)
        2) 10 second delay to break — eliminates nuisance trips from splashing or waves in pan (sensor needs 10 seconds of constant water contact before tripping)
        3) Disables the compressor(s) operation when condensate plug is detected, but still allows fans to run for economizer.

23. Horn/Strobe Annunciator:

    a. Provides an audible/visual signaling device for use with factory-installed option of field-installed accessory smoke detectors.

        1) Requires installation of a field-supplied 24-v transformer suitable for 4.2 VA (AC) or 3.0 VA (DC) per horn/strobe accessory.
        2) (Requires field-supplied electrical box, North American 1-gang box, 2-in. (51 mm) x 4-in. (102 mm).
        3) Shall have a clear colored lens.