

# Guide Specifications

## Strategos™ Rooftop Units

May 18, 2017



This specification specifies ***[Lennox' SG and SC High efficiency]*** packaged rooftop units. ***[These products are manufactured by Lennox Industries Inc.]*** Revise section number and title below to suit project requirements, specification practices and section content. Refer to CSI *MasterFormat* for other section numbers and titles.

Optional text and text that requires a decision are indicated by **bold brackets [ ]** and proprietary information is indicated by ***bold-italic brackets[ ]***; delete text that is not needed in final copy of specification. Specifier Notes typically precede specification

text; delete notes in final copy of specification. Trade/brand names with appropriate symbols typically are used in Specifier Notes; symbols are not used in specification text. Metric conversion, where used, is soft metric conversion.

**SECTION 15730**  
**PACKAGED, OUTDOOR, HEATING AND COOLING MAKEUP AIR-CONDITIONERS**

**PART 1 GENERAL**

PART 1.01 SUMMARY

A. Section Includes:

1. CAV (Constant Air Volume) System: 3, 5, 10 and 20 ton packaged gas/electric and electric/electric rooftop units
2. MSAV (Multi-Stage Air Volume) supply fan option: 10 and 20 ton packaged gas/electric and electric/electric rooftop units

**Specifier Note: Revise paragraph below to suit project requirements. Add section numbers and titles per CSI *MasterFormat* and specifier's practice.**

B. Related Sections:

**Specifier Note: Article below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain Reference Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This article does not require compliance with standard, but is merely a listing of references used. Article below should list only those industry standards referenced in this section. Retain only those reference standards to be used within the text of this Section. Add and delete as required for specific project.**

PART 1.02 REFERENCES

A. Agency Listings

1. Environmental Testing Laboratories (ETL) a division of Intertek Testing Laboratories
2. Canadian Standards Association (CSA)

- B. Heating efficiency certifications:
  - 1. Gas Appliance Manufacturers Association (GAMA), if applicable
  - 2. Canadian Standards Association (CSA)
- C. Safety Standards:
  - 1. Underwriters Laboratories Inc. (UL)
  - 2. Underwriters' Laboratories of Canada (ULC)
  - 3. National Electrical Code (NEC)
  - 4. Canadian Electrical (CE) Code
- D. Cooling efficiency certifications or ratings:
  - 1. ARI 210/240 – 2005, if applicable
  - 2. ARI 340/360 – 2004, if applicable
- E. Units to be Energy Star qualified
- F. Exceed ASHRAE Standard 90.1-2004
- G. Manufactured in ISO 9000:2001 compliant facility

Specifier Note: Article below should be restricted to statements describing design or performance requirements and functional (not dimensional) tolerances of a complete system. Limit descriptions to composite and operational properties required to link components of a system together and to interface with other systems.

PART 1.03 SYSTEM DESCRIPTION, PERFORMANCE REQUIREMENTS:

- A. 3, 5, 10 and 20 ton capacity
- B. Gas/Electric Efficiencies
  - 1. 3 ton capacity at 400 CFM/ton:
    - a. 14.3 EER (CAV)
      - 1) 16.1 SEER (CAV)
    - b. 5 ton capacity at 330 CFM/ton:
      - 1) 12.8 EER (CAV)
      - 2) 15.5 SEER (CAV)
    - c. 10 ton capacity at 370 CFM/ton:
      - 1) 12.3 EER (CAV)/ 12.1 EER (MSAV (multi-stage air volume) supply fan option)
      - 2) 13.2 IPLV (CAV)/ 15.0 IPLV (MSAV (multi-stage air volume) supply fan option)
    - d. 20 ton capacity at 325 CFM/ton:
      - 1) 12.6 EER (CAV)/ 12.6 EER (MSAV (multi-stage air volume) supply fan option)
      - 2) 14.4 IPLV (CAV)/ 16.2 IPLV (MSAV (multi-stage air volume) supply fan option)
- C. Electric / Electric or Cooling Only Efficiencies
  - 1. 3 ton capacity at 400 CFM/ton:
    - a. 14.3 EER (CAV)
      - 1) 16.1 SEER (CAV)
    - b. 5 ton capacity at 330 CFM/ton:

- 1) 12.8 EER (CAV)
- 2) 15.5 SEER (CAV)
- c. 10 ton capacity at 370 CFM/ton:
  - 1) 12.5 EER (CAV)/ 12.3 EER (MSAV (multi-stage air volume) supply fan option)
  - 2) 13.5 IPLV (CAV)/ 15.2 IPLV (MSAV (multi-stage air volume) supply fan option)
- d. 20 ton capacity at 325 CFM/ton:
  - 1) 12.8 EER (CAV)/ 12.8 EER (MSAV (multi-stage air volume) supply fan option)
  - 2) 14.8 IPLV (CAV)/ 16.4 IPLV (MSAV (multi-stage air volume) supply fan option)
- D. Sound levels:
  1. 76 dB for 3 ton unit
    - a. 78 dB for 5 ton unit
    - b. 88 dB for 10 ton unit
    - c. 92 dB for 20 ton unit
- E. Electrical Characteristics:
  1. 60 Hz
    - a. 3-phase
    - b. **[208/230 V] [460 V] [575 V]**

**Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.**

#### PART 1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of Contract and Division 1 Submittal Procedures
- B. Product Data:
  1. Submit product data
  2. Include manufacturer's product data sheets
- C. Shop Drawings:
  1. Submit shop drawings in accordance with Section **[01330 - Submittal Procedures]**
  2. Indicate:
    - a. Equipment
    - b. Piping and connections
    - c. Recommended ancillaries
    - d. Dimensions
    - e. External construction
    - f. Recommended method of installation
    - g. Mounting curb details
    - h. Sizes and location of mounting bolt holes
    - i. Include mass distribution drawings showing point loads.
    - j. Wiring diagrams for control systems
    - k. Pump and fan performance tables

- l. Type of refrigerant used
- m. Dimensions:
  - 1) Plan view
  - 2) Front view
  - 3) Side view
  - 4) Curb detail with dimensions
- D. Quality Assurance:
  - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
  - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - 3. Manufacturer's Instructions: Manufacturer's installation instructions
- E. Closeout Submittals: Submit following:
  - 1. Warranty: Warranty documents specified
  - 2. Operation and Maintenance Data:
    - a. Operation and maintenance data
      - 1) Include methods for maintaining installed products
      - 2) Precautions against cleaning materials
      - 3) Methods detrimental to finishes and performance
      - 4) Include names and addresses of spare part suppliers
  - 3. Provide brief description of unit
  - 4. Provide
    - a. Equipment inspection report
      - 1) Equipment operation test report
  - 5. Commissioning Report: Submit commissioning reports, report forms and schematics in accordance with Section 01810 - Commissioning.

PART 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
  - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

**Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Repetitive statements should be avoided. Current data on building code requirements and product compliance may be obtained from filter manufacturer technical support specialists**

- B. Pre-installation Meetings:
  - 1. To verify project requirements
  - 2. Follow Manufacturer's installation instructions
  - 3. Adhere to manufacturer's warranty requirements
  - 4. Comply with Division 1 Project Management and Coordination

PART 1.06 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirements
- B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays
- C. Packing, Shipping, Handling and Delivery
  - 1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact
  - 2. Ship, handle and unload units according to manufacturer's instructions
- D. Storage and Protection:
  - 1. Store materials protected from exposure to harmful weather conditions
  - 2. Factory shipping covers to remain in place until installation

PART 1.07 PROJECT CONDITIONS

- A. Installation location: **[Confirm design conditions and temperature.]**

**Specifier Note: Coordinate article below with Conditions of the Contract and with Division 1 Closeout Submittals (Warranty).**

PART 1.08 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions
- B. Warranty:
  - 1. Commencing on Date of Installation
  - 2. Aluminized Heat Exchangers: 10 years (limited) (non-residential applications)
  - 3. Stainless Steel Heat Exchangers: 15 years (limited) (non-residential applications)
  - 4. Compressors: 5 years (limited) (non-residential applications)
  - 5. Integrated Modular Controller (IMC): 3 years (limited) (non-residential applications)
  - 6. High Performance Economizers: 5 Years (limited)(non-residential applications)
  - 7. Other System Components: 1 year (limited) (non-residential applications)

**PART 2 PRODUCTS**

**Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as "or equal" or "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.**

PART 2.01 PACKAGED ROOFTOP UNITS

- A. Manufacturer: **[Lennox Industries Inc.]**
  - 1. Contact: **[2100 Lake Park Blvd., Richardson, TX 75080; Telephone: (800) 453-6669; website: [www.lennox.com](http://www.lennox.com) Products/Systems: [Lennox' SG and SC high efficiency] Packaged Rooftop Unit (RTU).]**
- B. **[Proprietary]**
- C. Manufacturer is to do all the following at the factory:
  - 1. Run test units before shipping

2. Assemble units
  3. Wire and pipe units
  4. Install **[IMC]** unit controller
- D. Information plate:
1. Material can be any of the following:
    - a. Stamped metal plate
      - 1) Polyester with an overlay product to protect from fading
      - 2) Mylar with an overlay product to protect from fading
  2. Located on outside of unit
  3. Information on the plate shall contain:
    - a. Name of manufacturer
      - 1) Serial number
- E. Plastic or rubber bushings to be used wherever wiring runs through sheet metal
- F. RTU's to include the following equipment:
1. Cabinet:
    - a. Interior panels:
      - 1) 18 or 20 ga. thickness
      - 2) G-90 Galvanized steel
    - b. Exterior panels:
      - 1) Heavy gauge
      - 2) G90 Galvanized steel
      - 3) Two layer, pre-painted baked enamel finish
      - 4) Corrosion resistant paint
        - a) Salt spray resistance of 1,000 hours, ASTM B117
        - b) Adhesion: ASTM D3359
        - c) Impact resistance: ASTM 2794
        - d) Humidity resistance: ASTM 2247
        - e) Abrasion resistance: ASTM 4060
        - f) Flexibility: ASTM D522 (NCCAI-19)
        - g) Pencil hardness: ASTM D3363 (H-2H)
    - c. Base rails:
      - 1) Full perimeter
      - 2) Gauge:
        - a) 3 and 5 ton shall be 14 gauge
        - b) 10 and 20 ton shall be 12 gauge
      - 3) G-90 Galvanized steel
      - 4) Unpainted
      - 5) To have rigging holes on all 4 corners
      - 6) Shall have forklift slots: on at least 2 sides
        - a) 3 and 5 ton shall have slots on 2 sides
        - b) 10 and 20 ton shall have slots on 3 sides
    - d. Vertical supply and return airflow configuration

- e. Access Panels:
  - 1) Hinged:
    - a) Full length within 1" of door length
    - b) Piano style
  - 2) Include tie-backs or prop rods on panels or Prop Rods!!
  - 3) Air/water seals
  - 4) Quarter-turn latching handles
    - a) Factory supplied
    - b) Field installed
  - 5) Provide access to:
    - a) Economizer/filter section
    - b) Blower section
    - c) Compressors/control/heat section
- f. Condenser section access panel:
  - 1) Hinged
  - 2) 12" X 12" panel size, minimum
- g. Openings:
  - 1) Unit base access for electrical **[and gas]** lines
  - 2) Horizontal access knockouts for electrical **[and gas]** lines
  - 3) 1" Raised edges around duct and power entry openings
  - 4) Base pan:
    - a) One piece for 3, 5 and 10 ton units
    - b) Three piece base pan for 20 ton unit
- h. Insulation:
  - 1) Panels adjacent to conditioned air insulated with non-hygroscopic fiberglass insulation
  - 2) Unit base fully insulated
  - 3) To serve as air seal to the roof curb
- i. Grille guards between outdoor coils and main cabinet
- j. **[Cabinet option: Condenser coil corrosion protection]**
  - 1) **Polymeric epoxy coating**
    - a) **Electrocoat process**
    - b) **Pre-painted corrosion protection on blower assembly**
    - c) **Pre-painted corrosion protection on evaporator base assembly**
    - d) **Pre-painted corrosion protection on blower support walls**
    - e) **Factory installed]**
- k. **[Cabinet option: Evaporator coil corrosion protection]**
  - 1) **Polymeric epoxy coating**



**a) Electrocoat process**

**b) Factory installed]**

2. Cooling System:

- a. Operating range of 0 degrees F - 125 degrees F (-18 - 52 degrees C) with **[IMC unit controller]**
- b. Refrigerant:
  - 1) R-410A
  - 2) Factory charged
- c. Compressors:
  - 1) Scroll Type
  - 2) Rubber grommet vibration isolation
  - 3) Thermostatically controlled crankcase heaters
  - 4) High pressure switch
  - 5) Low pressure switch
  - 6) To be located in separate compartment, not in airflow
  - 7) Compressor Controls
    - a) For 3 phase units, minimum compressor on time of 240 seconds (60-510 seconds adjustable)
    - b) For 1 phase units, minimum compressor off time of 300 seconds (60-510 adjustable)
    - c) Compressors:
      - (1) Lock out setpoint at 55 F (13 C)
      - (2) Outdoor air temperature (adjustable from -30 F (-34 C) to 80 F (27 C).
    - d) High pressure controls lock out compressors and activate digital output for service if high pressure switch trips 3 times during one cooling or dehumidification cycle (1-8 times adjustable). Record error, nonvolatile memory.
    - e) Low pressure controls lock out compressors and activate digital output for service if low pressure switch trips 3 times during one cooling or dehumidification cycle (1-8 times adjustable). Record error, nonvolatile memory.
    - f) Freezestats shut off compressors if freezestat trip occurs.
    - g) Freezestats lock out compressors if freezestat trip occurs 3 times during cooling demand (1-4 times adjustable)
- d. Thermal expansion valves with removable element head
- e. Filter/driers
  - 1) Solid core
    - a) Molecular sieve liquid line
    - b) To be located in condenser compartment
    - c) Easily accessible for replacement
- f. Freezestats
- g. Coil Construction:
  - 1) Factory leak tested
  - 2) Copper tube construction
  - 3) Rippled-edge aluminum fins

- 4) Flared shoulder tubing connections
- 5) Silver solder
- h. Evaporator Coil:
  - 1) Face-split (constant air volume)
  - 2) Row-split (variable air volume)
  - 3) Cross flow circuiting
  - 4) Rifled copper tubing
- i. Condenser Coils:
  - 1) Slab design
    - a) No Channel to sit on
- j. Outdoor Coil Fan Motors:
  - 1) Thermal overload protection
  - 2) Totally enclosed
  - 3) Permanently lubricated ball bearings
  - 4) Shaft up
  - 5) Wire basket mount
- k. PVC coated outdoor coil fan guard, factory supplied
- l. Condensate Drain Pan:
  - 1) Galvanized steel
  - 2) Painted
  - 3) 2" minimum depth
  - 4) Width to be approximately 2" wider than coil
  - 5) 1/8" pitch toward drain opening
  - 6) Drain connection
    - a) Extends outside unit, but no more than 1"
    - b) NPT threads with factory installed cap
- 3. Heating System:
  - a. Gas:
    - 1) Type: **[Natural gas] [and]/[or] [Liquid propane (LPG)]**
    - 2) Aluminized steel inshot burners
    - 3) Direct-spark ignition
    - 4) Electronic flame sensor
    - 5) Combustion air inducer
    - 6) Redundant gas valve:
      - a) Automatic
      - b) Single or dual stage
      - c) Manual shutoff
    - 7) Heat Exchanger:
      - a) Aluminized steel and/or **[stainless steel]**
      - b) Dimple-design
      - c) Life cycle tested
      - d) Tubular design

- e) Factory installed
- 8) Limit Controls:
  - a) Factory installed
  - b) Fixed temperature setting
- 9) Safety Switches:
  - a) Manual flame rollout switch
  - b) Flame sensor and combustion air inducer proving switch
  - c) Monitored by **[IMC unit controller]**
- 10) Controls:
  - a) Turn supply fan on 40 seconds after heating demand is received (8-60 seconds adjustable)
  - b) Turn off supply fan 120 seconds after heating demand has ended (80-300 second adjustable)
  - c) 30 second time delay between 1st and 2nd stage (low and high) fire gas valve system (30-160 second adjustable)
  - d) Stop gas heat 100 seconds after thermostat heating demand has ended (30-300 seconds adjustable)
  - e) Turn off heat and keep supply fan running if overheat limit occurs
  - f) Turn off unit after overheat limit trips 3 times in one heating cycle (1-15 trips adjustable)
  - g) Report overheat limit error, stored in nonvolatile memory
  - h) Turn off unit if flame rollout occurs. Requires manual reset. Report error, stored in nonvolatile memory
  - i) Turn off heat if induced airflow pressure is too low. Report error, stored in nonvolatile memory
  - j) Turn off unit if low induced airflow pressure trips 3 times during one heating cycle (1-6 trips adjustable)
  - k) Report gas valve not energized 2 minutes after heating demand fault. Identify specific gas valve (if multiple)
  - l) Turn off gas valve if flame not sensed. Report error, stored in nonvolatile memory
  - m) Turn off unit if gas valve is energized with no demand for heat. Report error, stored in nonvolatile memory
- 11) **[Fresh air tempering kit:**
  - a) **Field installed**
  - b) **[Supply air temperature sensor]**
- b. Electric:
  - 1) Helix wound nichrome elements
  - 2) Time delay for element staging
  - 3) Individual element limit controls

- 4) Wiring harness
  - 5) May be four-stage controlled in zone sensor mode
  - 6) Controls:
    - a) Turn off supply fan 20 seconds after heating demand has ended (0-300 seconds adjustable)
    - b) Time delay of 12 seconds between 1st and 2nd stage heat (low and high), (12-60 second adjustable)
    - c) Turn off heat and keep supply fan running if overheat limit occurs
    - d) Turn off unit if overheat limit trips 3 times during one thermostat cycle (1-15 trips adjustable)
    - e) Generate error code if overheat limit trips, stored in nonvolatile memory
4. Indoor Air Quality:
- a. Air filters
    - 1) Disposable
    - 2) MERV 7
      - a) 2 inch
      - b) 14 pleats per foot
  - b. Filter rack to be adjustable (2" to 4")
  - c. **[CO<sub>2</sub> sensor:**
    - 1) Factory supplied**
    - 2) Shipped separate**
    - 3) Field installed]**
5. Blower:
- a. Motor:
    - 1) Overload protected
    - 2) Ball bearings
  - b. Supply Air Blower
    - 1) Forward curved blades
    - 2) Blower wheel to be statically and dynamically balanced
    - 3) Constant air volume applications will use adjustable pulleys
      - a) Available on 3, 5, 10 and 20 ton units
      - b) Adjustable pulleys to set airflow
    - 4) Multi-stage air volume applications:
      - a) Available on 10 and 20 ton units
      - b) Use a variable frequency drive (VFD) to control fan speed
      - c) Change fan speed according to mode of operation (cooling operation according to number of compressors in operation, heating operation, ventilation operation and smoke detector mode)
      - d) Customizable fan speeds per each mode of operation (through the IMC)

- e) 10 ton features five separate supply fan speeds (compressor number one operation, compressor number two operation, gas or electric heat, ventilation operation and smoke detector mode)
- f) 20 ton features seven separate supply fan speeds (compressor number one operation, compressor number two operation, compressor number three operation, compressor number four operation, gas or electric heat, ventilation operation and smoke detector mode)
- c. Controls:
  - 1) Turn on blower 0 seconds after cooling demand has been received (0-60 seconds adjustable)
  - a) Turn off blower 0 seconds after cooling demand has ended (0-240 seconds adjustable)
- d. Ground and polished shafts
- 6. Integrated Modular Controller (IMC) unit controller:
  - a. Solid-state microprocessor control board
  - b. 24V control voltage
  - c. Transformer with built in circuit protection
  - d. Control modes:
    - 1) Capable of controlling unit operation via third party device (thermostat or DDC)
    - 2) Capable of controlling unit operation via Integrated Modular Controller and unit sensors
  - e. Display, diagnostics and configuration
    - 1) Control parameters
      - a) 200 control parameters
      - b) Field changeable
      - c) Built in factory defaults
      - d) Customizable delays, cooling stages, heating stages, deadbands and setpoints
    - 2) Unit diagnostics
      - a) 100 diagnostic codes
      - b) Codes stored through power failure
    - 3) User interface
      - a) Three digit display
      - b) Push button and DIP switch allows changes in the field
      - c) LED display to indicate control system transmit and receive
      - d) LED display to indicate thermostat input status
    - 4) Displays the following:
      - a) Control parameters
      - b) Diagnostic codes
      - c) Unit temperature sensor information (return air, supply air, outdoor air)
      - d) Remote temperature sensor information (CO<sub>2</sub>, temperature, relative humidity)
    - 5) Network capable
      - a) Daisy chained to other IMC equipped units or L Connection Network controllers
      - b) Requires twisted wire pair

- f. Safety, reliability and serviceability
  - 1) Strike three protection
    - a) Ends unit operation due to critical alarms
    - b) Terminates operation after three alarms during a single thermostat cycle
    - c) Number of alarms that will trigger unit shut down is adjustable at IMC
    - d) Critical alarms include low pressure trip, high pressure trip, heat limit trip or freeze stat trip
  - 2) Smoke alarm mode
    - a) Eight smoke alarm choices
    - b) Unit off
    - c) Blower on, exhaust fan off, outdoor air damper open (positive pressure)
    - d) Blower on, exhaust fan on, outdoor air damper closed (negative pressure)
    - e) Blower on, exhaust fan on, outdoor air damper open (purge)
    - f) Blower off, exhaust fan on, outdoor air damper closed (negative pressure)
    - g) Blower on, exhaust fan on, outdoor air damper closed (negative pressure)
    - h) Blower on, exhaust fan on, outdoor air damper open (purge)
    - i) Blower off, exhaust fan on, outdoor air damper closed (negative pressure)
  - 3) Minimum compressor run time
  - 4) Thermostat bounce delay
  - 5) Safety switch input
    - a) Normally closed digital input that will respond to an external safety switch trip
    - b) Will shut down unit operation
  - 6) Low ambient control down to 0 F
  - 7) Service relay output
    - a) Digital output that can communicate to external device when an error occurs
    - b) Can be configured to operate based on relative humidity, indoor air quality, outdoor air temperature, unit operation
- g. Comfort, efficiency and indoor air quality
  - 1) Staging
    - a) Up to 2 heat and 2 cool in thermostat mode
      - (1) 3 ton = 1 heat, 1 cool
      - (2) 5 ton = 1 heat (E/E), 2 heat (G/E), 1 cool
      - (3) 10 and 20 ton = 2 heat, 2 cool
    - b) Up to 4 heat and 4 cool in zone sensor mode
      - (1) 3 ton = 1 heat, 1 cool
      - (2) 5 ton = 2 heat, 1 cool
      - (3) 10 ton = 2 heat, 2 cool
      - (4) 20 ton = 4 heat, 4 cool
  - 2) Economizer control

**Specifier Note: Single and Differential Enthalpy are NOT Approved for California Title 24**

- a) Single Enthalpy
- b) Differential Enthalpy
- c) Global input
- b) Can lock out mechanical cooling when in economizer mode (adjustable in IMC)
- c) Will modulate to 55 F supply air temperature during economizer only operation (adjustable in IMC)
- 3) Fresh air tempering
  - a) Provides heating and cooling as necessary to maintain the supply air temperature within a comfort range
  - b) Operates when there is no thermostat demand for heating or cooling
  - c) Requires field installed sensor
- 4) Warm-up mode delay
  - a) Keeps the economize damper closed during morning warm up
  - b) Adjustable time through IMC
- 5) Indoor air quality input
  - a) Provides demand control ventilation capability
  - b) Two operation modes:
    - (1) Setpoint mode: opens the economizer dampers to set position when CO2 setpoint level is reached
    - (2) Proportional mode: opens the economizer dampers at the first setpoint and gradually increase it as the Co2 level increases until the second setpoint is reached
- 6) Exhaust fan control
- 7) Load shedding
- 8) Night setback mode
- 9) Return air temperature limit control
- 10) Gas valve time delay between first and second stage
- h. [Factory installed option: Smoke Detector**
  - 1) Option of either supply, return or both**
  - 2) Photo-electric type**
  - 3) Requires 115v external power source]**
- i. [Factory option or field installed accessory**
  - 1) Novar ETM 2024**
  - 2) Danfoss RTC**
  - 3) CPC Multiflex 810-3062 ]**
- j. System integration:**
  - 1) Direct integration to third party control systems

- 2) Allows third party control system to access diagnostic information and most commonly used setpoints and control information
  - 3) Rooftop unit direct integration to Novar Lingo(R) or Savvy(R) systems
    - a) Integrated through IMC
    - b) Requires use of Logic One System Enhancer (LSE), furnished by Novar
  - 4) Rooftop unit direct integration to CPC Einstein E2BX panel
    - a) Integrated through IMC
    - b) Requires software furnished by CPC requires use of Logic One System Enhancer (LSE), furnished by Novar
7. Electrical:
- a. Single point connection
  - b. Circuit Breakers:
    - 1) HACR type
    - 2) Factory wired and mounted
    - 3) Current sensitive
    - 4) Temperature activated
    - 5) Manual reset
    - 6) Use wire ties to keep wires grouped together
    - 7) All relays, timers, contactors need to be located in one compartment
    - 8) Electric heat contactors located in electric heat compartment, if selected
  - c. GFI Service Outlets:
    - 1) Factory installed
    - 2) 115 V ground fault circuit interrupter
8. Serviceability:
- a. ***[IMC unit controller diagnostic codes]***
  - b. Refrigerant circuits to be marked and color coded
  - c. Electrical plugs for common accessories
  - d. Common parts throughout tonnage range
  - e. Compressors to be near perimeter of the unit
  - f. Do not need to remove top panel to replace any components (except damaged cabinet parts)
  - g. Do not need to remove to clean coil, condensate pan or blower assembly
  - h. All external and internal screws in the cabinet structure and component mounting screws shall have a 5/16" hex head
9. **[Economizer/Outdoor Air, Factory Installed Options:]**
- a. **[Economizer:**
    - 1) **Parallel gear driven**
    - 2) **Plug in connections to unit**
    - 3) **Nylon bearings**
    - 4) **Neoprene seals**
    - 5) **24 V fully modulating spring return motor**
    - 6) **Adjustable minimum damper position, 0% - 100%**
    - 7) **Slides into RTU**



- 8) To utilize a jack plug
- 9) Includes outdoor air hood accessory
- 10) Includes barometric relief damper accessory
- 11) *IMC unit controller* add-on board for economizer control]

*Specifier Note: Approved for California Title 24*

**b. [High Performance Economizer:**

- 1) Parallel gear driven
- 2) Plug in connections to unit
- 3) Nylon bearings
- 4) Neoprene seals
- 5) 24 V fully modulating spring return motor
- 6) Adjustable minimum damper position, 0% - 100%
- 7) Slides into RTU
- 8) To utilize a jack plug
- 9) Includes outdoor air hood accessory
- 10) Includes barometric relief damper accessory
- 11) *IMC unit controller* add-on board for economizer control
  - a. Mixed Air Temperature sensor error
  - b. CO2 sensor error
  - c. Outside Air Temperature sensor error
  - d. Discharge Air sensor error
  - e. Actuator over voltage
  - f. Actuator under voltage
  - g. Actuator stalled
  - h. Current alarms
  - i. Historic alarms
- 12) Outside (fresh) Air damper Max Leakage Rate: 3 CFM/sq. ft. at 1" w.g.
- 13) Return Air Max Leakage Rate: 3 CFM/sq. ft. at 1" w.g.
- 14) Damper Reliability: 60,000 cycles minimum
- 15) Economizer fault detection and diagnostics]

**c. [Barometric Relief Dampers:**

- 1) Factory installed
- 2) Bird screen
- 3) Hood included]

**d. [Outdoor Air Damper Section:**

- 1) Linked mechanical slide damper
- 2) Factory installed
- 3) Hood included
- 4) Adjustable minimum position, 0% - 25%]

**e. [Power Exhaust Fan:**

- 1) Available for 10 and 20 ton models only
- 2) Internal or external

- 3) Requires Economizer
- 4) Motor is overload protected
- 5) Hood included]

**Specifier Note: Edit Article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.**

PART 2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

**PART 3 EXECUTION**

PART 3.01 MANUFACTURER'S INSTRUCTIONS

**Specifier Note: Article below is an addition to the CSI *SectionFormat* and a supplement to MANU- SPEC. Revise article below to suit project requirements and specifier's practice.**

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and [Lennox Industries Inc.] SPEC-DATA sheets.

PART 3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

PART 3.03 INSTALLATION

- A. Install **[Packaged rooftop units]** in accordance with manufacturer's instructions **[On roof curbs] [provided by manufacturer] [as indicated]**.

**END OF SECTION**

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