Packaged Outdoor HVAC Equipment

Guide Specifications

E-Series Rooftop Units

October, 2012

Note: This specification specifies **Allied Commercial Rooftop Units**. Revise specification section number and title below to suit project requirements, specification practices and section content. Refer to CSI MasterFormat for other section numbers and titles.

This specification utilizes the Construction Specifications Institute (CSI) Manual of Practice, including MasterFormat®, SectionFormat® and PageFormat®. Optional text and text requiring a decision is indicated by bolded brackets **[ ]**; delete text not required 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.

Packaged Outdoor HVAC Equipment

SECTION 23 74 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged rooftop units and commercial packaged, gas/electric and electric/electric

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

1.2 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.

1.3 REFERENCES

A. Agency Listings:
    1. Intertek ETL
    2. Canadian Standards Association (CSA).
B. Safety Standards:
    1. Underwriters Laboratories (UL).
    2. Underwriters Laboratories of Canada (ULC).
    3. National Electric Code (NEC).
    4. Canadian Electric Code (CEC).
C. Air-Conditioning, Heating and Refrigeration Institute (AHRI):
    1. AHRI 340/360 Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
    2. AHRI 370 Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.
    3. AHRI 210/240 Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment.
D. All models are ASHRAE 90. 1-2010 compliant
E. ISO 9001, Manufacturing Quality Systems

F. Some units are ENERGY STAR® certified

G. VAV models meet California Code of Regulations, title 24 requirements for staged airflow

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.

1.4 PERFORMANCE REQUIREMENTS

Specifier Note: Article below should be restricted to E-Series (LG) gas/electric packaged roof top units or E-Series (LC) electric/electric packaged roof top units.

A. **[** 3, 4, 5, 6, 7.5, 8.5, 10, 12.5, 13, 15, 17.5, 20, 25,and 30**]** ton capacity

B. Electrical Characteristics

1. 60 Hz

Specifier Note: 208/230 volt-single phase is optional only for the 3, 4 and 5 ton high efficiency ECM models. All 3 Phase voltages are available on 3-50 ton E-Series RTU's.

2. **[**208/230 v – 1 Phase**] [**208/230 v – 3 Phase**] [**460 v – 3 Phase**] [**575 v – 3 Phase**]**

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.

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures

B. Product Data: Submit product data for specified products

C. Shop Drawings:

1. Submit shop drawings in accordance with Section **[**01 33 00 - Submittal Procedures**]**
2. Indicate:
    a. Equipment, piping and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections
    b. Piping, valves and fittings shipped loose showing final location in assembly
    c. Control equipment shipped loose, showing final location in assembly
    d. Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads
    e. Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers
    f. Fan performance curves
    g. Details of vibration isolation
    h. Estimate of sound levels to be expected across individual octave bands in db

i. Type of refrigerant used
j. Plan view, front view end view, back view and 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

Specifier Note: Coordinate paragraph below with Part 3 Field Quality Requirements Article herein. Retain or delete as applicable.

E. Manufacturer's Field Reports: Manufacturer's field reports specified herein
F. Closeout Submittals: Submit the following:
   1. Warranty: Warranty documents specified herein
   2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance. Include names and addresses of spare part suppliers
   3. Provide brief description of unit, with details of function, operation, control and component service
   4. Provide equipment inspection report and equipment operation test report
   5. Commissioning Report: Submit commissioning reports, report forms and schematics in accordance with Section **[**01 81 00 – Commissioning**]**

1.6 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. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings).

1.7 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

1.08 PROJECT CONDITIONS

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

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

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions
B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

Specifier Note: Coordinate paragraph below with manufacturer's warranty requirements.

C. Warranty Bond: Commencing on Date of Installation

Specifier Note: "Aluminized Heat Exchanger" and "Stainless steel Heat Exchanger" limited warranty is only available on E-Series (LG) Gas/Electric models. "Compressor" and "Other System Components" are covered on all E-Series units.

1. **[**Limited 10 years Aluminized Heat Exchanger**]**
2. **[**Limited 15 years optional Stainless Steel Heat Exchanger**]**
3. Limited 5 years on compressors
4. Limited 3 years on Eco-last™ Coil System
5. Limited 3 years on Intelli-guide™ Unit Controller
6. Limited 1 year all other covered components

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.

2.1 E-SERIES PACKAGED ROOFTOP UNITS

A. Manufacturer: Lennox Industries
   1. Contact: 215 Metropolitan Dr., West Columbia, SC; 1-800-738-4000
      Website: www.allied-commercial.com

B. General:
   1. Capacity
      a. **[** 3-6**]**, **[**7.5-12.5**]**, **[**13-25**]**, **[**20-30**]** tonnages

C. Proprietary Products/Systems:
   1. Cabinet:
      a. Heavy gauge steel panels
      b. Pre-painted steel panels
      c. Full perimeter heavy gauge galvanized steel base rail
      d. Rigging holes on all four corners
      e. Forklift slots (on three sides, not directly below condenser coil) on base rail
      f. Raised or flanged edges around duct and power entry openings

Specifier Note: "Downflow" is the standard configuration that all E-Series units are shipped.
Specifier Note: "Horizontal Flow" is an option for all E-Series models.

      g. Airflow Choice:
         1. 3 to 12.5 ton units are shipped in downflow, configuration can be field converted to horizontal air flow with optional Horizontal Discharge Kit
         2. 20 to 30 ton units are available in downflow or horizontal return air flow configuration
            a. Horizontal airflow requires Horizontal Roof Curb
            b. Horizontal Return Air Panel Kit is also required if converting a downflow configuration into horizontal

Specifier Note: Add the **[**and gas lines**]** only if using an E-Series (LG) gas/electric model.

      h. Electrical lines **[**and gas lines**]** can be brought through the base of the unit or through horizontal knockouts
      i. Insulation:
         1. All panels adjacent to conditioned air are fully insulated with non-hygroscopic fiberglass insulation
         2. Unit base is fully insulated

3. Unit base insulation also serves as air seal to the roof curb

j. Access Panels: Hinged for compressor/controls/heating areas, blower access and air filter/economizer access; and, sealed with quarter-turn latching handles and tight air and water seal

k. Exterior panels constructed of heavy-gauge galvanized steel with two layer enamel paint finish

l. Corrosion resistant double sloped condensate Drain Pan

m. **[**Stainless steel drain pan**]** (20T VAV, 25T High efficiency, 25T VAV, all 30T models only)

n. Service Valves

Specifier Note: "Factory Installed Options" are options that can be selected for the E-Series rooftop units. The "Factory Installed Options" are installed at the Lennox manufacturing facility.

Specifier Note: "Field Installed Accessories" are options that can be selected for the E-Series roof top units. The "Field Installed Accessories" are shipped separately and installed in the field.

2. Cooling System:

a. Refrigerant type: R-410A

b. Capable of operating from 0 to 125^{o} F (-18 to 52^{o} C) without installation of additional controls

c. Compressors:

1. Scroll Type
2. Resiliently mounted on rubber mounts for vibration isolation
3. Overload Protected
4. Internal excessive current and temperature protection
5. Isolated from condenser and evaporator fan air streams
6. Refrigerant cooled

d. Crankcase heaters

e. Thermal Expansion Valve

f. High capacity filter/driers

g. High pressure switches

h. Low pressure switches

i. Freezestats

3. Coil Construction:

a. Tube and fin condensing/evaporator coil general construction:

1. Aluminum Rippled and Lanced fins
2. Copper tube construction

3. Aluminum fins mechanically bonded to copper tubes
4. All coils are high pressure leak tested at manufacturing facility

b. Eco-last^{tm} condensing coil general construction:
   1. Aluminum/Aluminum construction
   2. Aluminum Lanced fins
   3. Aluminum fins thermally bonded to aluminum flat tube
   4. All coils are high pressure leak tested at manufacturing facility

c. Evaporator Coils:
   1. With balanced port thermal expansion valves, freeze protection on each compressor circuit, pressure and leak tested to 500 psi
   2. Each compressor circuit on coil divided across face of coil and active through full depth of coil 3-25 ton constant air volume models. Each compressor circuit on coil divided by rows that are active across the entire surface area of the supply air on 20-30 ton variable air volume models
   3. **[**With flexible immersed coating electrodeposited by dry film process, meets standards: Military Specification MIL-P-53084, ASTM B117 and ASTM 1153**]**

d. Condenser Coils:
   1. **[**E-Coat- flexible immersed coating electrodeposited by dry film process, meets standards: Military Specification MIL-P-53084, ASTM B117 and ASTM 1153**]**

4. Wiring:
   a. Keyed and labeled field connections, color coded and continuously marked wire to identify point-to-point component connections
   b. Not in contact with hot-gas refrigerant lines or sharp metal edges

Specifier Note: E-Series units with Gas Heating Systems are LG models.

5. Gas Heating System:
   a. Induced draft
   b. Natural gas fired system with direct spark ignition
   c. Electronic flame sensors
   d. Flame rollout switches
   e. High heat limit switches
   f. Induced draft failure switch and capable of operating to altitude of 2000 feet (610 m) with no derate to manifold pressure
   g. Service access for controls, burners and heat exchanger
   h. Heat Exchanger:
      1. Tubular Design
      2. **[**Aluminized steel**] [**Stainless steel**]**
   i. Gas piping system tight and free of leaks when pressurized to maximum supply pressure

j. Gas Valve: redundant type gas heat valve with manual shutoff

k. **[**Single stage gas heating**] [**Two stage gas heating, available on 4 to 30 ton models only**]**

l. Gas Burners: Aluminized steel inshot-type gas burners

m. Direct spark pilot ignition

n. Fan and Limit Control

o. Safety Switches

p. Gas piping system tight and free of leaks

q. **[**Low NOx 3-6 ton**]**

Specifier Note: "Field Installed Accessories" are options that can be selected for the E-Series LG Gas/Electric models. The "Field Installed Accessories" are shipped separately and installed in the field.

r. Field Installed Accessories:

1. **[**Combustion Air Intake Extensions**]**
2. **[**Vertical Vent Extension Kit**]**
3. **[**LPG/Propane Kit**]**
4. **[**Low Temperature Vestibule Heater**]**

Specifier Note: The "Electric Heating System" is an option for E-Series (LC), electric/electric models only. The "Electric Heating System" is only available for factory or field installation.

6. Electric Heating System:
   a. Electrical resistance heater
   b. Reset thermal limit protection
   c. Single point power supply
   d. Heater Element:
      1. Nickel chromium wire
      2. Individually fused
   e. Electric heater slides out of unit for service
7. Heating Controls:

Specifier Note: 2 stages of heating control are only available on E-Series (LG) gas/electric models of tonnages 4-30, on two stage units.

   a. Support 2 stages of heating control from thermostat or DDC
   b. Delay time of 30 seconds between low and high heat stages
8. Supply Air Fan Motor and Drives:

Specifier Note: Direct drive ECM motors available on 3-5 tons only.

   a. **[**Direct Drive ECM**] [**Belt drive**]**
   b. Permanently lubricated ball bearings (for belt drive motors)
   c. Thermal overload protected motors with automatic reset
   d. Adjustable sheaves on belt drive motors for blower speed adjustment

e. Optional low and high static motor/drive combinations and optional drive kits

f. **[**Auto Blower Belt Tensioner: Factory**]**

g. **[**Single Zone Variable Air Volume (VAV): Factory w/ VFD and phase protection on 7.5-30 ton**]**

h. **[**Variable Air Volume (VAV): Factory w/VFD 20, 25 and 30 ton**]**

9. Supply Air Fan:
   a. Double inlet type, galvanized steel with forward curved blades
   b. Statically and dynamically balanced
   c. Continuous or automatic control for occupied periods
10. Supply Air Filters:
   a. Disposable 2 inch
   b. **[**2" MERV 13 Filters: **[**Field**] [**Factory**]]**
   c. **[**2" MERV 8 Filters: **[**Field**] [**Factory**]]**
11. Condenser Fan Motor:
   a. ECM motors on 3-5 ton high efficiency models. PSC motors on 3-5 ton standard efficiency and 6-30 ton models.
   b. Direct drive with permanently lubricated ball bearings.
   c. Watertight with thermal overload protection and automatic reset
   d. Motor mount isolated from fan safety guard
12. Condenser Fans:
   a. Corrosion resistant propeller type
13. Unit Controller:
   a. Solid state control board to operate unit
   b. Scrolling digital display
   c. Push button navigation
   d. Guided menu setup
   e. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 Energy Standard
   f. Shall provide and display alarms, alarm history and system status
   g. Component and cooling/heating mode run test capability
   h. Shall accept input from a CO_2 sensor
   i. Economizer control
   j. Blower on/off delay
   k. 2-stage heat/4-stage cool compatible
   l. Warm-up mode

m. DDC compatible

n. Indoor air quality input

o. Low ambient control down to 0°F

p. Component runtime and cycle count data collection

q. Blower proving switch strike 3

Specifier Note: Phase/voltage protection standard on VAV models.

r. **[**Phase/voltage monitoring/protection: Factory**]**

s. Real time clock (timestamps)

t. USB interface with profiles and firmware upgrade capability

u. Controls Options:

1. **[**CO2 Sensor: Field Mounted**]**
2. **[**Dirty Filter Switch: **[**Field**] [**Factory**]]**
3. **[**Blower Proving Switch: **[**Field**] [**Factory**]]**
4. **[**Phase/Voltage Monitoring Protection: Factory**]**
5. **[**BACnet: **[**Field**] [**Factory**]]**
6. **[**LonTalk: **[**Field**] [**Factory**]]**
7. **[**Novar ETM-2051: **[**Field**] [**Factory**]]**
8. **[**Novar LSE: Factory**]**
9. **[**CPC Direct Interface: Factory**]**
10. **[**Fresh Air Tempering Sensor: **[**Field**] [**Factory**]]**
11. **[**Smoke detector supply: **[**Field**] [**Factory**]]**
12. **[**Smoke detector return: **[**Field**] [**Factory**]]**

14. Accessories:

a. **[**Economizer downflow**] [**Economizer horizontal**]**: Hoods provided **[**Field**] [**Factory**]]**

b. **[**Economizer control: Single Sensible: Field**]**

c. **[**Economizer control: Differential Dual Sensible: **[**Field**] [**Factory**]]**

d. **[**Economizer control: Global (field provided sensor): Factory**]**

e. **[**Economizer control: Single Enthalpy: **[**Field**] [**Factory**]]**

f. **[**Economizer control: Differential Dual Enthalpy: **[**Field**] [**Factory**]]**

g. **[**Motorized Outdoor Air Damper: **[**Field**] [**Factory**]]**

h. **[**Manual Outdoor Air Damper: Hood provided **[**Field**] [**Factory**]]**

i. **[**Dehumidification system with secondary coil 3-25 ton: Factory**]**

Specifier Note: Barometric relief damper is included with field installed economizer.

j. **[**Power exhaust fan: **[**Field**]** Factory**]]**

k. **[**Roof curb: Field**]**

l. **[[**Barometric relief damper downflow**] [**Barometric relief damper horizontal**]**: hoods provided Field**]**

m. **[**Energy Recovery System: Field Mounted**]**

n. **[**Ceiling Diffuser: Field**] [**Flush**] [**Step down**]**

o. **[**Transition: Field**] [**Supply**] [**Return**]**

p. **[**UVC lamps: **[**Field**] [**Factory**]]**

q. **[**Coil Guards: **[**Field**]] [**Hail Guards: **[**Field**]]**

r. **[**Disconnect Switch: **[**Field**] [**Factory**]]**

s. **[**Condensate drain trap plastic: **[**Field**] [**Factory**]] [**Condensate drain trap copper: **[**Field**] [**Factory**]]**

t. **[**GFCI Service Outlets (field wired) **[**Field**] [**Factory**]] [**GFCI Service Outlets (unit powered, available on 13 to 25 ton models only): Factory**]**

u. **[**HACR Circuit breaker: Factory**]**

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.

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

Specifier Note: Article below is an addition to the CSI *SectionFormat*. 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 manufacturer's specification data sheets.

3.2 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.

3.3 INSTALLATION

A. Install **[**Packaged rooftop units**] [**And**] [**Commercial packaged, gas/electric, electric/electric and electric/heat pumps**]** in accordance with manufacturer's instructions **[**On roof curbs provided by manufacturer**] [**As indicated**]**.

END OF SECTION