

# Guide Specifications

## Landmark<sup>®</sup> Rooftop Units

April 14, 2014



**Note:** This specification specifies **Lennox Industries Landmark<sup>®</sup> 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<sup>®</sup>, SectionFormat<sup>®</sup> and PageFormat<sup>®</sup>. 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.

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## Packaged Outdoor HVAC Equipment

### SECTION 23 74 00

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Packaged rooftop units, heat pumps 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. MSAV models meet California Code of Regulations, Title 24 and ASHRAE 90.1-2010 section 6.4.3.10 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 Landmark® (KG) gas/electric packaged roof top units, Landmark® (KC) electric/electric packaged roof top units, or Landmark® (KH) heat pump packaged rooftop units.

- A. [2, 2.5, 3, 4, 5, 6, 7.5, 8.5, 10, 12.5, 15, 17.5, 20, and 25] ton capacity
- B. Electrical Characteristics
  - 1. 60 Hz

Specifier Note: 208/230 volt 1 phase is the only voltage and phase available for the 2 and 2.5 ton models. 208/230 volt 1 phase is an optional voltage and phase for the 3, 4 and 5 ton models. All 3 Phase voltages are available on 3-25 ton Landmark 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

## 1.8 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).

## 1.9 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 Landmark (KG) Gas/Electric models. "Compressor" and "Other System Components" are covered on all Landmark 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 the Lennox Environ™ Coil System]
5. [Limited 5 years on the High Performance Economizers]
6. Limited 1 year all other covered components

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## 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 LENNOX LANDMARK® PACKAGED ROOFTOP UNITS

- A. Manufacturer: Lennox Industries
  - 1. Contact: 2140 Lake Park Blvd., Richardson, TX 75080; Telephone: (800) 453-6669; Website: [www.lennoxcommercial.com](http://www.lennoxcommercial.com)

- B. General:
  - 1. Capacity
    - a. [ 2-7.5], [7.5-12.5], [15-25] 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 Landmark units are shipped.

Specifier Note: “Horizontal Flow” is an option for all Landmark® models.

- g. Airflow Choice:
  - 1. 2 to 12.5 ton units are shipped in downflow, configuration can be field converted to horizontal air flow with optional Horizontal Discharge Kit
  - 2. 15 to 25 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 [and gas lines] only if using a Landmark (KG) 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 are provided for compressor/controls/heating areas, blower access and air filter/economizer access;
- k. Exterior panels constructed of heavy-gauge galvanized steel with two layer enamel paint finish
- l. [Corrosion Protection – Factory installed]
  1. [Military Specification MIL-P-53084]
  2. [ASTM B117]
  3. [ASTM 1153]
- m. [Hinged Access Panels – Factory installed: sealed with quarter-turn latching handles and tight air and water seal]
- n. [GFI Service Outlets (field wired)]
- o. [Disconnect Switch (up to 80 amps for KG model, up to 150 amps for KC models)]

Specifier Note: Of the selections below, [Coil Guards] [Hail Guards], only one can be selected.

- p. [Hail Guards – Field installed]
- q. [Coil Guards – Field installed]

Specifier note: Following two options are for Landmark 7.5 to 12.5-ton models only.

- r. [Horizontal Discharge Kit]
- s. [Return Air Adaptor Plate]

Specifier note: Following option is for Landmark 15 to 25-ton models only.

- t. [Horizontal Return Air Panel Kit]

Specifier Note: “Factory Installed Options” are options that can be selected for the Landmark 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 Landmark 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 30 to 125°F (-1 to 52°C) without installation of additional controls
  - c. Compressors:
    1. Scroll Type
    2. Resiliently mounted on rubber grommets for quiet operation
    3. Overload Protected
    4. Internal excessive current and temperature protection
    5. Isolated from condenser and evaporator fan air streams

6. Refrigerant cooled

d. Thermal Expansion Valve

Specifier Note: Thermal Expansion Valve is on following models:

1. 2 to 7.5-ton standard models
2. 7.5 to 10-to high efficiency models
3. 15 to 25-ton standard models

e. High capacity filter/driers

f. High pressure switches

g. Freezestats

Specifier Note: Include following 2 articles for Landmark® (KH) packaged heat pumps models.

h. Reversing Valves: Four-way interchange reversing valve

i. Defrost Control

Specifier note: Crankcase heater is standard feature on 072, 090, 150, 180, 210, 240 and 300 KC models only, and it is a field-installed option on 024, 060, 092, 102 and 120 KC models.

j. [Crankcase heaters]

3. Coil Construction:

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

1. Copper tube construction
2. Rippled-edge aluminum fins
3. Flared shoulder tubing connections
4. Silver soldered construction for improved heat transfer
5. Factory leak tested at manufacturing facility

b. 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. [With flexible immersed coating electrodeposited by dry film process]

c. Condenser Coils:

1. [Flexible immersed coating electrodeposited by dry film process] on corrosion hardened units only
  - a. Tube and Fin coils on Landmark 2 to 7.5-ton models
  - b. Environ coil on Landmark 7.5 to 12.5-ton models
  - c. Tube and Fin angled, slab design on Landmark 15 to 25-ton models

d. Condensate Drain Pan:

1. Plastic pan, sloped to meet drainage requirements of ASHRAE



2. Side or bottom drain connections

Specifier note: Following option is for Landmark 2 to 12.5-ton models only.

3. Reversible to allow connection at back of unit

- e. Outdoor coil fan motors:

1. Thermal overload protected
2. Shaft up, wire basket mount

Specifier note: Landmark 2 to 4-ton models have Sleeve Bearings; all other models have Ball Bearings.

3. Permanently lubricated [Ball bearings]/[Sleeve bearings]

- f. Outdoor coil fans: PVC coated fan guard furnished

Specifier note: Followings are field-installed options/accessories for Landmark models.

- g. [Condensate Drain Trap : available in copper or PVC]
- h. [Drain Pan Overflow Switch]
- i. [Low Ambient Kit]

Specifier Note: Landmark units with Gas Heating Systems are KG models.

4. 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 (610m) 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: Two-stage, redundant type gas heat valve with manual shutoff
- k. Gas Valve: Single-stage
- l. Gas Burners: Aluminized steel inshot-type gas burners
- m. Direct spark pilot ignition
- n. Fan and Limit Controls
- o. Safety Switches
- p. Gas piping system tight and free of leaks when
- q. [Low NOx]

Specifier Note: "Field Installed Accessories" are options that can be selected for the Landmark KG 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 Landmark (KH), heat pump, and Landmark (KC), electric/electric models only. The “Electric Heating System” is only available for field installation.

- 5. **Electric Heating System:**
  - a. Electrical resistance heater
  - b. **[Field]** installed.
  - c. **[Field]** installed Fuse Block.
  - d. Reset thermal limit protection.
  - e. Single point power supply
  - f. Heater Element:
    - 1. Nickel chromium wire
    - 2. Individually fused.
  - g. Electric heater slides out of unit for service
- 6. **Heating Controls:**

Specifier Note: 2 stages of heating control are only available on Landmark (KG) gas/electric models of tonnages 4-6, on two stage units

- a. Support 2 stages of heating control from thermostat or DDC
  - b. With delay time of 30 seconds between low and high heat stages
- 7. **Supply Air Fan (Blower)**

Specifier Note: Belt drive motors are offered on all models, Direct Drive Motors are offered on Landmark 2 to 5-ton models only.

- a. **Motor**
  - 1. Overload protected
  - 2. Equipped with **[ball bearings (belt drive)]** or **[sleeve bearings (direct drive)]**
- b. **Supply Air Blower**
  - 1. Forward curved blades
  - 2. Wheel is statically and dynamically balanced
  - 3. Equipped with ball bearings and/or adjustable pulley for speed change
  - 4. Blower assembly slides out of unit for servicing

Specifier Note: Following blower options are available on Landmark 7.5 to 25-ton models only.

- c. **Blower Option**
    - 1. **[Constant Air Volume(CAV)]**
    - 2. **[MSAV® (Multi-Stage Air Volume)].**
- 8. **Supply Air Filters:**

- a. Disposable 2 inch furnished as standard
  - b. [2" MERV 13 Filters: [Field] [Factory]]
  - c. [2" MERV 8 Filters: [Field] [Factory]]
9. Controls:
- a. Unit Control
    - 1. 24V transformer (secondary) with built in circuit breaker protection
  - b. Heat/Cool Staging
    - 1. 2 heat/2 cool staging with a third party DDC control system or thermostat
  - c. Low voltage terminal block
  - d. Night setback mode
  - e. Controls Options:
    - 1. [L Connection® Network]
    - 2. [Thermostat]
    - 3. [Smoke detector supply: [Field] [Factory]]
    - 4. [Smoke detector return: [Field] [Factory]]

Specifier Note: Approved for California Title 24

- 5. [Smart Thermostat]
  - 6. [Fault Detection and Diagnostics]
    - i. Mixed Air Temperature sensor error
    - ii. CO2 sensor error
    - iii. Outside Air Temperature sensor error
    - iv. Discharge Air sensor error
    - v. SYS alarm1
    - vi. Actuator over voltage
    - vii. Actuator under voltage
    - viii. Actuator stalled
    - ix. Current alarms
    - x. Historic alarms
10. Serviceability:
- a. Wiring:
    - 1. Keyed and labeled field connections, color coded and continuously marked wire to identify point-to-point component connections
    - 2. Not in contact with hot-gas refrigerant lines or sharp metal edges
  - b. Electrical Plugs
  - c. Access Panels
  - d. Blower Access
  - e. Technical Expansion Valve Access

- f. Coil Cleaning
- g. Standard Components
- h. Compressor Compartment

11. Accessories:

- a. [Economizer downflow] [Economizer horizontal]: Hoods provided [Field] [Factory]]
- b. [High Performance Economizer downflow] [High Performance Economizer horizontal]: Hoods provided [Field] [Factory]]
  - i. Outside (fresh) Air damper Max Leakage Rate: 4 CFM/sq. ft. at 1" w.g.
  - ii. Return Air Max Leakage Rate: 4 CFM/sq. ft. at 1" w.g.
  - iii. Damper Reliability: 60,000 cycles minimum
  - iv. Economizer fault detection and diagnostics
  - v. W7220 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

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

- a. [Economizer control: Single Enthalpy: [Field] [Factory]]
- b. [Economizer control: Differential Dual Enthalpy: [Field] [Factory]]
- c. [High Performance Economizer control: Dry Bulb Sensor: [Field] [Factory]]
- d. [High Performance Economizer control: Differential Enthalpy: [Field]]
- e. [High Performance Economizer control: Differential Dual Enthalpy: [Field] [Factory]]
- f. [Outdoor Air Damper: Hood provided [Field] [Factory]][Downflow][ Horizontal]

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

- g. [Power exhaust fan: [Field] Factory]]
- h. [Roof curb: Field][Downflow][ Horizontal]
- i. [[Barometric relief damper downflow] [Barometric relief damper horizontal]: hoods provided Field]
- j. [Energy Recovery System: Field Mounted]
- k. [Ceiling Diffuser: Field] [Flush] [Step down]
- l. [Transition: Field] [Supply] [Return]
- m. [UVC lamps: [Field] [Factory]]
- n. [Indoor Air Quality (CO2) Sensors]
- o. [Coil Guards: [Field]] [Hail Guards: [Field]]
- p. [Disconnect Switch: [Field] [Factory]]

- q. [Condensate drain trap plastic: [Field] [Factory]]
- r. [Condensate drain trap copper: [Field] [Factory]]
- s. [GFCI Service Outlets (field wired) [Field] [Factory]]
- t. [VFD Manual Bypass Kit: available on units equipped with MSAV option].

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 SPEC-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**

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