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Lennox Industries
 2100 Lake Park Blvd.
 Richardson, TX 75080
 Phone: (800) 453-6669
www.lennox.com

This specification is for [**Lennox Industries T-Class™**] 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.

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 23 74 33 UNITARY AIR CONDITIONING EQUIPMENT

PART 1 GENERAL

PART 1.01 SUMMARY

- A. Section Includes: Packaged rooftop units and commercial packaged, gas/electric, electric/electric and electric/heat pumps.

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. 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 and Refrigerating Institute (ARI):
1. ARI 340/360 Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
 2. ARI 370 Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.
 3. ARI 210/240 Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- D. American Society for Testing and Materials (ASTM):
1. ASTM B117 – Standard Practice for Operating Salt Spray.

- 2. ASTM 1153 – Standard Method for Methyl Isobutyl Ketone.
- E. ISO 9001, Quality Management Systems.
- F. Meet Military Specification MIL-P-53084

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

- A. Performance Requirements:

Specifier Note: Article below should be restricted to T-Class (TH), heat pumps packaged roof top units only.

- 1. [2, 2.5, 3, 4, 5, 6, 7.5, 8.5, 10, 12.5, 15 and 20 ton capacity.]

Specifier Note: Article below should be restricted to T-Class (TG) gas/electric packaged roof top units or T-Class (TC) electric/electric packaged roof top units.

- 2. [2, 2.5, 3, 4, 5, 6, 7.5, 8.5, 10, 12.5, 15, 17.5, 20 and 25 ton capacity.]

- 3. Electrical Characteristics:
 - a. 60 Hz

Specifier Note: 208/230 volt 1 phase is only available on 2, 2.5, 3, 4 and 5 ton standard efficiency models. All other voltages are available on 3-25 ton T-Class RTU's.

- b. [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.

PART 1.04 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 01330 - 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.

- F. Closeout Submittals: Submit following:

- 1. Warranty: Warranty documents specified.
- 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



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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 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.

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. 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: "Aluminized Heat Exchanger" and "Stainless steel Heat Exchanger" limited warranty is only available on T-Class (TG) Gas/Electric models. "Compressor" and "Other System Components" are covered on all T-Class units.

C. Warranty: Commencing on Date of Installation.

1. Compressors: 5 years (limited).
2. Other Covered System Components: 1 year (limited).
3. **[Aluminized Heat Exchangers: 10 years (limited).] [Stainless Steel Heat Exchangers: 15 years (limited).]**

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 ROOFTOP UNITS

A. Manufacturer: Lennox Industries.

1. Contact: 2100 Lake Park Blvd., Richardson, TX 75080; Telephone: (800) 453-6669; website: www.lennox.com.

B. Proprietary Products/Systems: Lennox T-Class Packaged Rooftop Units, including the following equipment:

1. Cabinet:
 - a. Heavy gauge steel panels.
 - b. Pre-painted steel panels.

- c. 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: “Down Flow” is the standard configuration that all T-Class units are shipped as.

Specifier Note: “Horizontal Flow” is an option for all T-Class models. T-Class TH, TG and TC models of tonnages 2, 2.5, 3, 4, 5 and 6 can be converted, in the field, to horizontal flow without the need of a conversion kit. If applied horizontally with an economizer, a conversion kit is required.

Specifier Note: “Horizontal Flow” is an option for all T-Class models. T-Class TH, TG and TC models of tonnages 7.5, 8.5, 10 and 12.5 can be converted, in the field, with a separate to Horizontal Conversion Kit.

Specifier Note: “Horizontal Flow” is an option for all T-Class models. T-Class TH, TG and TC models of tonnages 15, 17.5, 20 and 25 require a roof curb that allows for horizontal air flow. A Horizontal Air Panel Kit is also required if converting a down-flow configured unit to horizontal air flow.

- g. **[Down-Flow] [Horizontal] Air Flow configuration**

Specifier Note: add the “and gas lines” only if using a T-Class (TG) 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 a roof curb seal.
- j. Access Panels:
 - 1) Provided for economizer/filter section.
 - 2) Provided for Heating/blower section.
- k. Condensate Drain Pan.

Specifier Note: “Factory Installed Options” are options that can be selected for the T-Class roof top units. The “Factory Installed Options” are installed at the Lennox manufacturing facility.

- l. **[Factory Installed Options:]**
 - 1) **[Corrosion Protection, meets standards:**
 - a) **Military Specification MIL-P-53084.**
 - b) **ASTM B117**
 - c) **ASTM 1153]**
 - 2) **[Hinged Access panels]**
 - 3) **[GFI Service Outlets (field wired)]**

Specifier Note: “Field Installed Accessories” are options that can be selected for the T-Class roof top units. The “Field Installed Accessories” are shipped separately and installed in the field.

- m. **[Field Installed Accessories:]**

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

- 1) **[Coil Guards] [Hail Guards].**
- 2) **[Horizontal Return Air Panel Kit].**

Specifier Note: “Circuit Breakers(up to 175 amps)” is not available on 2-6 ton models.

- 3) **[Circuit Breakers (up to 175 amps)]**
- 4) **[Disconnect Switch (up to 250 amps)]**
- 5) **[Condensate drain trap]**

- 2. Cooling System:
 - a. Capable of operating from 30 - 125 degrees F (-1 - 52 degrees C) without installation of additional controls.
 - b. Compressors:

Specifier Note: The TG/TC036B unit uses a reciprocating compressor instead of a scroll type.

- 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 fan air stream.
- 6) Refrigerant cooled.



- c. TXV
- d. Freezestat
- e. High capacity filter driers

Specifier Note: Include following 2 articles for T-Class (TH) packaged heat pumps models.

- f. Reversing Valves: Four-way interchange reversing valve.
- g. Defrost Control.

Specifier Note: 2-2.5 ton models are only available in Standard efficiency, 3-6 ton models are available in Basic or Standard efficiencies only, and 7.5-20 ton models are available in Standard or High efficiencies only.

Specifier Note: The 12.5 ton model is available in standard efficiency only.

- h. Efficiency: **[Basic] [and]/[or] [Standard] [and]/[or] [High].**
- i. **[Low ambient kit: Field installed]**

Specifier Note: High pressure switch is available to be field installed on all units except the T-Class model TH on tonnages 15-20.

- j. **[High pressure switch: Field installed]**

Specifier Note: Crankcase heater is available to be field installed on all units except the T-Class model TH on tonnages 2-6 and 15-20.

- k. **[Crankcase heater: field installed]**

3. Coil Construction:

a. 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. Evaporator Coils:

- 1) With balanced port thermal expansion valves, freeze protection on each compressor circuit, pressure and leak tested to 500 psi, and maximum 14 fins per inch.
- 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) **[With flexible immersed coating electrodeposited by dry film process] on corrosion hardened units only.**

4. Wiring:

- a. Color coded and continuously marked to identify point-to-point component connections.
- b. Not in contact with hot-gas refrigerant lines or sharp metal edges.

5. Cooling Controls:

- a. Provide minimum compressor on time of 4 minutes.

Specifier Note: “4 Stages of cooling from thermostat” is only available for models that have 4 independent refrigerant circuits. 2-6 ton models have 1 circuit, 7.5-12.5 ton models have 2 circuits, and 15-25 ton models have several models with 4 circuits, see Engineering Handbook for more information.

- b. Support up to 4 stages of cooling from thermostat or external DDC controller. (4 independent refrigerant circuits required.)

Specifier Note: T-Class units with Gas Heating Systems are TG models.

6. 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: Two-stage, redundant type gas heat valve with manual shutoff.

Specifier Note: One Stage Gas valve only available on 2-6 ton models.

- 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.

Specifier Note: Lox NOx is only available for factory installation on the T-Class (TG) Gas/Electric models of tonnages 2 – 5.

- q. **[Low NOx]**

Specifier Note: “Cold Weather Kit” is only available for field mounting on the T-Class (TG) Gas/Electric models of tonnages 15 – 25 or factory mounting on the T-Class (TG) Gas/Electric models of tonnages 7.5 – 12.

- r. **[Cold Weather Kit:] [field] [factory]**

Specifier Note: “Field Installed Accessories” are options that can be selected for the T-Class TG Gas/Electric models. The “Field Installed Accessories” are shipped separately and installed in the field.

- s. **[Field Installed Accessories:]**
 - 1) **[Combustion Air Intake Extensions].**
 - 2) **[Vertical Vent Extension Kit].**
 - 3) **[LPG/Propane Kit].**

Specifier Note: “Low Temperature Vestibule Heater” is only available for the T-Class (TG) Gas/Electric models of tonnages 2, 2.5, 3, 4, 5 and 6.

- 4) **[Low Temperature Vestibule Heater].**

Specifier Note: The “Electric Heating System” is an option for T-Class (TH), heat pump, and T-Class (TC), electric/electric models only. The “Electric Heating System” can be either factory or field installed.

- 7. Electric Heating System:
 - a. Electrical resistance heater.
 - b. **[Factory] [Field]** installed.
 - c. **[Factory] [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.

- 8. Heating Controls:

Specifier Note: 2 stages of heating control are only available on T-Class (TG) 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.
- 9. Supply Air Fan Motor and Drives:
 - a. Permanently lubricated ball bearings (for belt drive motors).
 - b. Thermal overload protected motors with automatic reset.

Specifier Note: Slide out accessibility is only available on T-Class models of tonnages 7.5-25.



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- c. Adjustable sheaves on belt drive motors for blower speed adjustment.
- d. Optional low and high static motor/drive combinations and optional drive kits.
- 10. Supply Air Fan:
 - a. Double inlet type, G90 (Z275) galvanized steel with forward curved blades.
 - b. Statically and dynamically balanced.
 - c. Slide-out accessibility unit for servicing and belt tension adjustment.
 - d. Continuous or automatic control for occupied periods.
- 11. Supply Air Filters:
 - a. Disposable 2 inch.

Specifier Note: Permanent metal frame filters with 2 inch polyester replaceable media are only available on T-Class models of tonnages 15-25 tons.

- b. [Permanent metal frame filters with 2 inch polyester replaceable media].

- 12. Condenser Fan Motor:

Specifier Note: T-Class 2-4 ton models have sleeve bearings.

- a. Direct drive with permanently lubricated ball bearings.
- b. Watertight with thermal overload protection and automatic reset.
- c. Motor mount isolated from fan safety guard.
- 13. Condenser Fans:
 - a. Corrosion resistant propeller type with vertical discharge and finger safety guard.
- 14. Microprocessor Based Unit Controller System:
 - a. Solid state, microprocessor based control board to control unit cooling operations.
 - b. Green blinking LED to indicate normal operation.
 - c. Pushbutton reset.
 - d. Four-position DIP switch to select unit operating mode/unit type.
 - e. Test mode for quick operation checks.
 - f. Up to 2-stage heat/4-stage cool thermostat or DDC capable thermostat operation.
 - g. Digital Inputs:
 - 1) Low cool demand
 - 2) High cool demand
 - 3) Low heat demand
 - 4) Supply fan demand
 - 5) Primary heat limit (2)
 - 6) Flame rollout switch (2)
 - 7) Induced draft motor switch (2)
 - 8) Gas valve sense switch (2)

Specifier Note: T-Class models of tonnages 15-25 have four Freeze protection switches. 7.5 - 12 ton models have two. 2-6 ton models have one.

- 9) Freeze protection switch (2), (4).
- h. Digital Outputs:
 - 1) Supply air fan motor
 - 2) compressor 1
 - 3) compressor 2
 - 4) condenser fans
 - 5) inducer fan motor 1

Specifier Note: T-Class 7.5 - 25 ton models only.

- 6) heat 1
- 7) critical diagnostic fault code occurrence.

i. **[Control Options:]**

- 1) **[Single Enthalpy Control] : [Field] [Factory]**
- 2) **[Differential Enthalpy Control : Field]**

Specifier Note: The factory mounted CO2 sensor is only available T-Class models of tonnages 15 - 25. All other models can be field mounted only.

- 3) **[CO2 Sensor:] [Field] [Factory]**

Specifier Note: Economizer Control: Field is only available for T-Class models of tonnages 7.5 - 25.

- 4) **[Economizer Control: Field]**

15. **[Accessories:]**

- a. **[Economizer]: [Field] [Factory]**

Specifier Note: Motorized outdoor air damper is only available in a field mounted version for the T-Class models of tonnages 2, 2.5, 3, 4, 5 and 6. All other models can be factory or field.

- b. **[Motorized outdoor air damper]: [Field] [Factory]**

Specifier Note: Manual outdoor air damper is only available in a field mounted version for the T-Class models of tonnages 2, 2.5, 3, 4, 5 and 6. All other models can be factory or field.

- c. **[Manual outdoor air damper]: [Field] [Factory]**

Specifier Note: Barometric relief damper is included with factory or field installed economizer on 2-6 ton models. All other models can be factory or field installed separately.

- d. **[Barometric relief damper]: [Field] [Factory]**

Specifier Note: The factory mounted Power Exhaust Fan is only available on the versions of T-Class models of tonnages 15-25. All other models can be field mounted.

- e. **[Power exhaust fan]: [Field] [Factory]**

- f. **[Dirty filter switch: Field]**

Specifier Note: The field mounted Blower Proving Switch is only available on T-Class models of tonnages 7.5-25.

- g. **[Blower proving switch]: [Field] [Factory]**

- h. **[Smoke detectors: Field]**

- i. **[Roof curb: Field]**

- j. **[Outdoor air hood: Field]**

- k. **[Barometric relief damper hood: Field]**

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: 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.

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] [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