



*Marking and Application Guide*

# ELECTRICAL HEATING AND COOLING EQUIPMENT

JULY 2016

Electrical Heating and Cooling  
Equipment Marking and Application Guide

## PREFACE

Because of changes in installation codes, the increasing complexity of the equipment involved, and other factors, more and more markings are being used on electrical heating and cooling equipment.

The markings described in UL 1995, the “*Standard of Safety for Heating and Cooling Equipment*”, UL 60335-2-40, the “*Standard of Safety for Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*”, and UL 1996, the “*Standard of Safety for Electric Duct Heaters*”, are required on the various types of electrical heating and cooling equipment for proper and safe installations. Markings that apply only to servicing and operating the equipment, or markings placed on the equipment by the manufacturer that are not required by UL, are not covered in the Guide.

The adequacy of the markings described is determined as part of the investigation of equipment bearing the UL Certification/Listing Mark.

UL has developed this guide for use by code authorities, contractors, installers, users, designers and other interested parties to aid in determining what markings are pertinent for safe and proper installation of electrical heating and cooling equipment, and to understand the significance of these markings in order to facilitate a reasonably safe and code-compliant installation.

UL Marking Guides are updated as necessary due to new product development, changes in the National Electrical Code®, or the need for clarification. To confirm the current status of any UL Marking Guide, please consult the Code Authorities page of the UL Web Site at [www.ul.com/codeauthorities](http://www.ul.com/codeauthorities) or [www.ul.com/markinguide](http://www.ul.com/markinguide).

The Table of Contents lists the main headings and their page numbers. The Index gives an alphabetical list of the specific items and the section(s) number where information can be found. All references to the National Electrical Code® have been updated to the 2014 edition.

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## **INTRODUCTION**

### **USE OF THIS GUIDE**

This guide is intended to assist code authorities, designers, and installers in determining the suitability of electric heating and cooling equipment in a particular installation and use, and to address concerns related to fire, shock, and mechanical hazards.

Products are Certified, Listed or Classified by UL under an appropriate product category. A four-letter code (shown in parenthesis) following every category title in this guide is the UL product category code designation. A list of heating and cooling equipment product categories evaluated by UL, along with the applicable standard(s), can be found in Appendix A.

Each UL product category code provides a direct link to the Guide Information for the product category. The Guide Information includes the scope of the products covered, information relating to limitations or special conditions applying to the product, the requirements used for the investigation of the products, installation and use information, and information on product markings and the UL Mark to be used on the product.

The product markings identified in this Guide do not include every possible marking that could be provided either on a product or in its installation or operation instructions. The purpose of this Guide is to provide you with an indication of the type of text and location of markings that address features that may be critical in determining if a product is certified and / or if it is installed correctly. Refer to the specific Guide Information for the product category for additional marking information.

The numbering for code sections used in this document may change as the specific code is updated. A list of model codes and standards applicable for each product can be found in Appendix B.

Additional information can be found at [www.ul.com](http://www.ul.com).

## **INFORMATION ON CERTIFICATION, LISTING AND CLASSIFICATION**

Most codes and regulations require the certification of heating and cooling equipment to applicable safety-related standards. They also may require this equipment to be certified to energy performance standards as well. Products that are certified to safety-related standards have been evaluated with regard to all reasonably foreseeable safety-related hazards, including fire, electrical shock and mechanical hazards. Such products are termed “UL Listed.” Products that are certified to a limited range of hazards, or for use under specific conditions are termed “UL Classified.” Alternatively, any of these products can be “UL Certified” and bear the UL Certification Mark.

It is important to distinguish the difference between “UL Listed” and “UL Classified” and the relation these terms have with the term “listed,” as used in various codes. The term “listed” in the codes generally indicates that the product is required to be evaluated in accordance with the appropriate standard(s) by an independent third party certification organization such as UL. The term “listed” in the codes should not be confused with the term “UL Listed,” as explained above. It is important to recognize that not all certification agencies make this distinction in their certification services.

## INFORMATION ON UL MARKS

There are several types of UL Marks that can be found on heating and cooling equipment. General information on each of these Marks is provided below. Each has its own specific meaning and significance. The only way to determine if a product has been certified by UL is to look for the UL Mark on the product itself.

The UL Mark on a product means that UL has tested and evaluated representative samples of that product and determined that they meet the requirements in the applicable standard(s). Under a variety of UL programs, certified products are periodically checked by UL at the manufacturing facility to determine that they continue to comply with the standard(s).

The UL Marks may only be used on, or in connection with products certified by UL, and under the terms of a written agreement between the manufacturer and UL.

### IDENTIFICATION OF UL CERTIFIED PRODUCTS

Launched in mid-2013, the enhanced UL Certified Mark can be used on both UL Listed and Classified products and is intended to make it easier and simpler for stakeholders to understand the scope of UL's certifications of a specific product. The enhanced UL Certified Mark makes it possible to bundle multiple UL certifications for multiple geographies into a single Mark design. Today, this mark is used for products certified to U.S., Canadian, European and Japanese requirements. This Mark utilizes a unique identifier to enable stakeholders to search UL's Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) to quickly review detailed certification information.

All currently existing versions of UL's Listing and Classification Marks remain valid and should continue to be accepted as an indication of certification.

UL expects the transition to the enhanced Mark to happen over time, so you may not see it in the immediate future. For more information on this important development, please go to [www.ul.com/markshub](http://www.ul.com/markshub) > Resources. Access to the Marks Hub is free and open to all regulators, but registration to use it is required.



### **UL Listing Mark**

This is one of the most common UL Marks. If a product carries this Mark, it means UL found that representative samples of this product met UL's safety requirements. These requirements are primarily based on UL's own published Standards for Safety, or other recognized third party standards. The UL Listed Mark includes the UL symbol, the word "Listed," the product or category name, and a control number assigned by UL.



### **UL Classification Mark**

This Mark appears on representative samples of products that UL has evaluated but only with respect to specific properties, a limited range of hazards, or suitability for use under limited or special conditions. The UL Classified Mark includes the UL symbol, the word "Classified," a statement of the scope of evaluation, the product or category name, and a control number assigned by UL.



### **UL Gas-Fired Mark**

UL's Gas-Fired Mark is used exclusively on gas-fired appliances and equipment. The Gas-Fired Mark indicates a product's compliance to nationally recognized gas standards, including UL, ANSI Z21/Z83 Series and CSA/CGA standards. The UL Gas-Fired Mark signifies that a product has been evaluated to reasonably foreseeable hazards including both gas and electrical hazards. Gas-fired equipment evaluated to Canadian national standards is authorized to display the Canadian Gas-Fired Mark. For gas-fired equipment evaluated to both U.S. and Canadian standards, the combination U.S. and Canadian Gas-Fired Mark is authorized.



## UL Energy Mark

The UL Energy Mark appears on air conditioners and furnaces, and similar products evaluated to U.S. and Canadian energy efficiency standards. These products are already certified for safety by UL before earning the UL Energy Mark.



## FIELD EVALUATIONS

You may encounter situations in which you are unable to determine if a product has been listed by a third-party organization. Or in other situations you might encounter a product bearing a listing label that may have been modified in the field, and now you question whether or not the product still complies with the applicable standard. UL offers a field evaluation service that provides data to assist you in making your decision whether to accept the product and/or approve the installation. Anyone directly involved with a product – including manufacturers, owners, contractors, and regulatory authorities – can request a Field Evaluation. Detailed information for this program can be found on UL's Web site at [www.ul.com/field](http://www.ul.com/field).



## **1. GENERAL INFORMATION**

UL Standards for electrical heating and cooling equipment include requirements for the location, legibility and permanence of the markings described in this Guide. These requirements vary depending on the importance of the marking, environmental and use conditions, and a number of other factors. UL evaluates the reliability of an adhesive used to secure a marking. UL requires markings to be located where they will be visible after the equipment is installed; and affixed to a permanent unit part, or to a part that requires the use of a tool to remove and that must be in place for the unit to operate properly except for certain supplementary markings.

Normally, nameplate markings must be located where they can be read without using tools to partially disassemble the unit. Access to the nameplate of a unit designed for built-in installation may require removal of a panel or grill that gives access to the field wiring compartment.

## **2. LISTING MARKS**

Section 110.3(A)(1) of the *National Electrical Code®(NEC®)* states that “suitability of equipment may be evidenced by listing or labeling.” Only units that bear a UL Listing Mark are UL Listed. For electrical heating and cooling equipment, the UL Mark that is required on the unit includes: the name and/or symbol of Underwriters Laboratories; the word “LISTED;” a UL control number; and the product or category name. Some Listed Heating and Cooling Equipment may contain a Listed Gas Heating Section. This will be identified on the unit by the UL *Gas-fired Listing* Mark that is provided either on the Listed heating and cooling equipment or on a Listed gas-fired heating section or portion of a Listed Unit. Alternatively, the mark may also be the UL Enhanced Certification Mark.



## **3. COMPANY IDENTIFICATION**

If there is a question on the design or construction of a unit, the identification of the organization responsible for the product is important. This is one of the basic markings required by *NEC®* Section 110.21.

UL requires that the responsible manufacturer or private labeler be identified on the unit nameplate by a company name, trade name or trademark. This company is also known as the “Listee” and is the name that appears in UL’s Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database).

## **4. MODEL IDENTIFICATION**

The nameplate of every unit bearing a UL Listing Mark is required to include a distinctive model identification. This may be a “Model No.,” “Type,” “Cat. No.,” “Part No.,” or similar identification, and may consist of any combination of numbers and letters. The model designation is important

when referencing the manufacturer's installation instructions or other published literature, and when contacting the manufacturer or UL with questions about the product. The model designation is also important for determining the acceptable use of "split-system" sections, or accessories (see "Split-Systems" and "Use of Accessories").

## 5. SPLIT-SYSTEMS

Many central cooling air conditioners and heat pumps are Listed as "split-systems." Such Listings are given to equipment for which two or more sections of the system have been evaluated together. Sections of systems are typically identified on the Listing Mark as "Section of Central Cooling Air Conditioner" or "Section of Heat Pump," but may be identified as another type of Listed product such as a "Fan Coil Unit" or an "Electrical Central Heating Furnace." These Listed combinations are identified in the UL *Electrical Appliance and Utilization Equipment Directory*. It is important to note that combinations of equipment not identified in UL's published Listings have not been evaluated by UL.

## 6. USE OF ACCESSORIES

UL evaluates accessories to determine their suitability for field installation and use with specific models of UL Listed equipment. Listed accessories bear a Listing Mark that includes the word "accessory" in the product or category name (see "Listing Marks"). The Listing Mark may indicate the specific equipment type with which the accessory is to be used (such as "Accessory for Heat Pump"). If the Listing Mark indicates "Air Conditioning Equipment Accessory," it is commonly designed for use on more than one type of heating or cooling equipment. In all cases, however, the accessory is Listed only for equipment marked (on wiring diagram, etc.) to indicate the permitted use of the specific accessory. Many Listed units are marked for use with more than one accessory. In some cases, the marking will indicate that if one accessory is used, another must be used in conjunction.

One common marking for accessories relates to the use of supplementary electric resistance heaters. Typically, such a marking will indicate the optional use of any one of a series of heater accessories. It will usually also specify some action to be taken by the installer to indicate which heater has been installed or that no heater has been installed. Failure of the installer to perform the specified action can be considered as noncompliance with *NEC®* Section 110.3(B). For example, the marking may state, "Any of the following heater accessories may be installed. Installer to check appropriate block" followed by a list of accessory model numbers and associated electrical ratings, including a line stating "none." To comply with *NEC®* Section 110.3(B), the installer must mark the appropriate block. The accuracy of this installer marking can be verified by examining the markings on the accessory.

For some accessory types, such as a compressor "hard start" kit, the intended mounting location within the unit may not be obvious. In such cases, the unit marking is required to indicate the intended mounting location.

A unit Listed for use with accessories requiring wiring connections to the unit will show these connections on an attached wiring diagram (see "Wiring Diagram").

## **7. EXTERNAL LOADS OR LINE VOLTAGE SWITCHING DEVICES**

A unit that provides a means for connecting an external load, such as a cooling tower, an evaporator blower motor, or a blower motor that circulates air across duct heaters, is marked to specify the maximum rating of each such load. These markings may also specify the minimum wire sizes to be used. Minimum wire size markings are required when the load is a motor connected to a multimeter or combination load circuit and the wire size normally adequate for carrying the load current would not be protected properly by an overcurrent device for the circuit.

A unit with a means of connecting a switching device in other than a Class 2 control circuit is marked with the minimum required ratings for each such device.

These markings are located in the unit where field wiring is to be connected to the remote load or switching device, or on the wiring diagram attached to the unit (see "Wiring Diagram").

## **8. SUPPLEMENTARY OVERCURRENT PROTECTION**

*NEC®* Section 424.22(C) permits supplementary overcurrent protective devices required for subdivided loads of resistance type heating elements in electric space heating equipment to be supplied as a separate assembly by the heater manufacturer. All units that require this supplementary overcurrent protection, but do not have the protective devices factory installed, are marked to identify the separate assembly available from the unit manufacturer. This information is marked on or adjacent to the nameplate containing the electrical ratings of the heating elements. The assembly has a separate UL Listing, and the common identification on its Listing Mark is "Control Panel for Specific Electric Space Heating Equipment."

Other specific Listed separate assemblies such as a panelboard, however, may be referenced by the marking on the heating unit. In any case, the proper use of the separate assembly identified on the unit will provide compliance with *NEC®* Sections 424.22(B) and (C).

## **9. ELECTRICAL RATING, GENERAL**

The nameplate for each Listed unit includes the appropriate electrical ratings. These ratings identify the required characteristics of each electrical circuit to be connected to the unit and also the load characteristics that the unit will impose on each circuit.

For a unit with a single motor as its only energy consuming component, the motor nameplate may provide the required electrical ratings if all ratings on the motor nameplate apply to its use in the unit, and the motor nameplate is visible as installed. If motor ratings are shown on the unit nameplate, they take precedence over the ratings on the motor nameplate.

## **10. VOLTAGE RATING**

All equipment requiring connection to an electrical supply source is required to include the voltage rating of each source on the unit nameplate. The rating includes the voltage as either a single nominal value such as "230 V" or as a voltage range such as "220—240V." Standard voltage ranges are 110—120, 200—208, 220—240, 254—277, 440—480 and 550—600. Units marked with a single nominal value within one of these voltage ranges can be connected properly to any

voltage within the indicated range, but not to a different voltage. For example, a unit marked "230 volts" can be connected properly to a 240-volt supply source, but not to a 208-volt supply source.

Some equipment is marked for use on more than one voltage. Individual voltage ratings may be a single value or a range of values as indicated above, with each of the multiple ratings separated from the others by a slash (e.g., "208/240" or "220—240/440—480") or by a separate line or column in a tabulation of ratings.

When inductive loads are involved, it is usually necessary to change some connections to make the equipment suitable for one of the voltage ratings. Instructions for these changes are usually indicated on the wiring diagram attached to the unit and typically involve at least a change in a control circuit transformer tap within the equipment.

If the inductive load is a motor, the instructions may appear on the motor itself, with a marking to indicate the voltage for which it is factory connected and how to reconnect it for another voltage.

Many motors and other components with dual voltage ratings, however, are used in equipment that is UL Listed for a single voltage only. When a unit is UL Listed for more than one voltage, this is indicated on the unit nameplate.

Some equipment showing two voltage ratings may be designated to have both voltages supplied from the same supply circuit. In such cases, the rating indicates the number of wires needed in the supply circuit (e.g., "120/240 V, 3W" or "120/240 V, 3ph, 4W") or the number of wires will be indicated clearly on the wiring diagram attached to the unit.

Some equipment designed for connection to a 2-wire branch circuit nominally rated at 208 or 240 volts, may not be suitable for potentials exceeding 120 volts to ground. Such equipment is marked "Maximum Voltage to Ground 120" (or the equivalent) near the supply voltage rating.

## 11. FREQUENCY RATING

Some form of frequency rating is required with each marked voltage rating. This may be identified as "Cycles," "Cycles per Second," "Hertz" or an appropriate abbreviation. A unit or unit circuit for connection to direct current will be marked to indicate this suitability.

## 12. ELECTRICAL LOAD RATINGS

The unit nameplate indicates the electrical load on each supply circuit, other than a Class 2 control circuit, to which the unit is intended to be connected. These load ratings include any remote loads or accessories identified by markings on the unit (see "Remote Loads" and "Use of Accessories"). In general, the individual segments of this load rating are appropriately identified. Rather than individual ratings for each load segment, a single overall rating may be given:

- 1) When a unit does not include any motors rated at 1/8 horsepower or more; or
- 2) When a unit rated for single-phase alternating current includes a hermetic refrigerant motor-compressor and other loads, and its markings indicate a minimum circuit ampacity and maximum size of the overcurrent device of 15 amperes at 240 volts or less, or 20 amperes at 120 volts (see

“Minimum Circuit Ampacity” and “Branch-Circuit, Short-Circuit and Ground-Fault Protection”).

For some units intended to be connected to two or more supply circuits, it may be necessary to consult the unit wiring diagram to determine which loads are connected to each circuit (see “Wiring Diagram”).

The load rating may be expressed in watts or kilowatts for resistance loads such as electric heaters and motors rated less than 1/8 horsepower. All other load ratings are expressed in amperes.

For hermetic refrigerant motor-compressors, the required individual segment rating is always given in rated-load amperes (RLA). Locked-rotor amperes (LRA) are also included but may be omitted for single-phase compressors with an RLA rating of 9 amperes or less at 115 volts, or 4.5 amperes or less at 230 volts.

Air conditioning liquid chillers with “star-delta” start centrifugal motor-compressors and not factory equipped with a controller or overload protection for that motor are marked with LRA ratings for both the star and delta connections (see “Remote Overload Protection for Motors”).

For all other motors, the required individual segment rating is expressed in amperes, full-load amperes, or an appropriate abbreviation. A locked-rotor current rating is not required.

A pilot duty (electromagnetic) load, or a resistance load of less than 1 ampere need not be identified separately on the unit nameplate. Also, a load such as a crankcase heater need not be identified separately if it is not energized concurrently with an identified larger load, such as a compressor motor. The unit nameplate ratings for motor loads may differ from the ratings on the motor nameplates. Unit nameplate ratings should be used for properly sizing the supply conductors, disconnect means, etc., since these ratings reflect the actual loads that will be imposed by operation of the motor in the unit.

Units with dual voltage ratings may also show dual-load ratings or a single-load rating representing the highest load imposed at either voltage. Dual-load ratings can be shown in tabular form or separated by a slash. For example, a motor rating of “120/240 V, 6.4/ 3.2 A” indicates the motor is rated 6.4 amperes at 120 volts and 3.2 amperes at 240 volts.

### **13. MOTOR HORSEPOWER RATINGS**

In equipment where the selection of a properly rated remote controller or disconnect means is dependent on the horsepower rating of a motor, the horsepower rating is required to be included in the unit nameplate (see “Electrical Rating, General”). It is not necessary that a horsepower rating be included on the unit nameplate for a hermetic refrigerant motor-compressor.

If the nameplate is marked with the disconnect size the horsepower is not required to be marked for the other motors.

A fan or blower motor rated at less than 1/8 horsepower when its ampere or wattage rating is included on the unit nameplate

## 14. BRANCH-CIRCUIT SELECTION CURRENT

The nameplate on a unit that includes a hermetic refrigerant motor-compressor may show branch-circuit selection current for the motor-compressor in accordance with *NEC®* Section 440.4(C). This rating may be identified by a suitable abbreviation and will always be equal to or higher than the motor-compressor RLA rating marked on the unit nameplate. The branch-circuit selection current rating for the motor-compressor is to be used instead of the rated-load amperes in determining appropriate ratings for externally mounted controllers and disconnecting means, branch-circuit conductors, and short-circuit and ground-fault protective devices for these conductors. A branch-circuit selection current rating is always included on the unit nameplate if the motor-compressor's thermal protector or the protective system built into the unit permits a continuous current flow greater than 156 percent of the rated-load current for the motor-compressor, or the single overall ampere rating for the unit marked on the unit nameplate (see "Electrical Load Ratings").

## 15. SUPPLY WIRE SIZE

According to *NEC®* Section 424.3(B), the ampacity of branch-circuit conductors supplying fixed electric space heating equipment consisting of resistance elements with or without a motor shall be not less than 125 percent of the total load connected to the circuit. Units incorporating fixed electric space heating means on the same circuit with a motor usually show the minimum required ampacity for the conductors supplying that circuit (see "Minimum Circuit Ampacity"). If a circuit supplying fixed electric space heater does not include a motor, the unit marking needs not to show a minimum circuit ampacity. The above noted *NEC®* requirement ordinarily applies to the proper sizing of the supply conductors for such a circuit.

*NEC®* Sections 424.22(D) and (E) indicate exceptions to the requirement for sizing such conductors based on 125 percent of the load. Units with fixed electric space heating loads arranged in accordance with these exceptions are marked with a minimum conductor size for each such circuit involved. Such markings are located on or adjacent to the unit nameplate. For other markings that specify minimum conductor size, see "Temperature Ratings of Field Installed Wiring" and "External Loads for High Voltage Switching Devices."

## 16. MINIMUM CIRCUIT AMPACITY

In general, a unit designed to have more than one motor, or a motor with other loads, supplied from a single branch-circuit, must be marked to show the minimum required supply-circuit conductor ampacity for each circuit. There are two exceptions:

- 1) If the branch-circuit involved is to be rated 15 amperes, and the unit is marked "Use Only on a 15 Ampere Branch-Circuit," and
- 2) If the unit is to be supplied through a remote control assembly specified on the unit nameplate, and the minimum ampacities are specified on that assembly.

These ampacity markings are in accordance with *NEC®* Section 430.7(D) and 440.4(B) and are computed in accordance with Section 430.24 and 440.33. Any remote loads identified by other markings on the equipment and supplied from the unit are included in these computations. The

marking is on or adjacent to the unit nameplate and is usually identified as “Minimum Circuit Ampacity” or its abbreviation.

## 17. BRANCH-CIRCUIT, SHORT-CIRCUIT AND GROUND-FAULT PROTECTION

Units required to be marked with a minimum circuit ampacity (see “Minimum Circuit Ampacity”) are also required to show the maximum ampere rating of the short-circuit and ground-fault protective device for each applicable circuit. These markings also conform with *NEC®* Section 430.7(D). They are computed in accordance with Section 430.53 and take into account any remote loads used in the ampacity calculations. The branch-circuit, short-circuit and ground-fault protection marking is included on the same label as the ampacity marking and is typically identified as “Maximum Fuse Amps,” “Maximum Fuse or HACR Type Circuit Breaker Amps,” “Maximum Fuse or Circuit Breakers Amps,” “Maximum Overcurrent Protection Amps” or their suitable abbreviations.

There are several other situations when the maximum ampere rating of the short-circuit and ground-fault protective device must be marked on the unit, even though a marking for minimum circuit ampacity may not be required. Typical examples are overcurrent protection devices for separate high voltage control circuits or transformers in the unit. These markings are identified in the same manner as described above, but can be located on an attached wiring diagram (see “Wiring Diagram”) or adjacent to the terminals or leads to which the supply circuit wires are to be connected, rather than on or adjacent to the unit nameplate.

The markings for short-circuit and ground-fault protection always include some indication of the type of protection device as well as the maximum current rating. This is significant since the various types of devices recognized by the *NEC®* to provide this protection do not necessarily provide the same level of protection for all units. Briefly, if the marking indicates:

- 1) Only “Fuse,” then only fuses are to be used;
- 2) “Circuit Breaker” and “Fuse,” then either fuses or circuit breakers
- 3) “Fuse or Circuit Breaker” or “Overcurrent Protection,” then fuses or any type of circuit breaker (including “HACR Type”) may be used.

In any case, the devices used should be covered by the *NEC®* to provide short-circuit and ground-fault protection.

The maximum rating and type of protective device specified in the marking described above are those considered in the evaluation of the unit for Listing, and are intended to apply to the protective devices installed on the line side of the supply circuit conductors, not to protective devices factory installed in the unit.

## 18. BRANCH-CIRCUIT RATING

*NEC®* Section 424.3(A) indicates that branch circuits supplying two or more outlets for fixed electric space heating equipment shall be rated 15, 20, 25 or 30 amperes. Although this is rarely applicable to the type of equipment covered in this Guide, some units rated 16 amperes or less may not be suitable for connection to 20- or 30-ampere branch-circuits. Such units show the

maximum rating of the branch-circuit to which they are to be connected. This marking will be on or adjacent to the unit nameplate, or near the area where supply wires are to be connected.

## 19. INTEGRAL OVERLOAD PROTECTION FOR MOTORS

Most electrical heating and cooling equipment includes appropriate overload protection for each motor in accordance with Part III of *NEC® Article 430*. In many cases, the unit or the individual motor is marked to indicate that this protection is provided. Even if there are no such markings, it can be assumed that adequate protection is provided for each motor unless the unit markings indicate the need for remote devices to provide such protection (see “Remote Overload Protection for Motors”).

A unit with a thermally protected hermetic refrigerant motor-compressor always includes a marking in accordance with *NEC® Section 440.4(A)* to indicate the type of thermal overload protection provided for each motor-compressor. A unit that uses thermal protection complying with *NEC® Sections 440.52(A)(2) and (B)(2)* is marked “Motor-Compressor Thermally Protected,” or an equivalent statement to reference the motor-compressor(s) involved, unless the motor-compressor itself is marked “Thermally Protected.” When protection is provided by an integral protective system in a unit, complying with *NEC® Sections 440.52(A)(4) and (B)(4)*, the unit is marked “Motor-Compressor Thermally Protected System,” or an equivalent statement to reference the motor-compressor(s) involved.

A unit that includes a 3-phase motor and overload protection for that motor other than an overcurrent unit in each motor supply conductor will provide adequate primary single-phase failure protection when supplied by transformers connected wye-delta or delta-wye. Such a unit is marked to indicate that the motor is protected under primary single-phasing conditions.

## 20. REMOTE OVERLOAD PROTECTION FOR MOTORS

Some units evaluated to determine the adequacy of specific motor controllers (starters) to provide motor overload protection may be shipped from the factory without the controller installed. For these units, UL requires that the manufacturer provide the proper controller for remote mounting, and the unit must be marked to identify this controller. The marking includes the controller manufacturer’s name, the model designation and the rating of the overcurrent (heater) element to be used in the overload relay of the controller. This marking is located either where field wiring connections to the controller are to be made, or on the wiring diagram attached to the unit (see “Wiring Diagram”).

Some units that contain a continuous-duty single-speed blower motor rated over 1 horsepower as the only load on a supply circuit need not include overload protection for that motor when:

- 1) The motor is located where it will not be adversely affected by high ambient air temperatures during normal use of the unit; and,
- 2) Energization of any electric space heaters in the unit cannot occur without the blower operating.

These units are marked to indicate the need for providing a remote controller with overload protection devices rated or selected for compliance with the installation codes specified by the jurisdictional authority.

Most air conditioning liquid chillers that use a centrifugal motor-compressor are not factory equipped with a controller or overload protection for that motor. In this case, the unit nameplate will indicate that these components are not provided and designate the manufacturer's specifications for the components to be installed remotely. The specifications include the electrical rating of the required controller, the start sequencing, the overload protection trip current and the connections to the chiller electrical control system. If a current transformer is to be provided as part of the controller to provide a signal input circuit to the chiller control system, the specifications will also include requirements for the current transformer and any necessary shunting resistor.

## **21. CONNECTION TO NONMETALLIC ENCLOSED WIRING**

Most UL Listed equipment is provided with knockouts or openings designed to accommodate properly sized conduit fittings for any of the appropriate types of wiring systems covered by the *NEC®*. Some units, however, are designed only for connection to a system other than metal-clad cable or conduit. These units are marked to indicate the appropriate type of system or systems to be used. This marking will be visible when power supply connections are being made.

## **22. EQUIPMENT GROUNDING CONNECTION**

Except as indicated below, every unit is required to have a means for connecting the equipment grounding conductor for each circuit, other than a Class 2 control circuit, to which the unit is to be connected. If a wire binding screw is provided for this purpose, it will have a green colored head. A pigtail lead for this purpose will be green and may have yellow stripes. A pressure type wire connector will be marked "G," "Gr," "Ground," "Grounding," or the equivalent, on or near the connector, or will be identified on the unit wiring diagram. The grounding terminal may be

identified by the symbol  .

A unit that requires connection to a circuit with power supply conductors larger than No. 2 AWG does not have to be provided with means for connecting an equipment grounding conductor for that circuit. Such a unit may be grounded by an appropriate metallic raceway, but it will be marked "If This Unit Is Supplied By A Wiring System That, In Accordance With The National Electrical Code, Requires The Installation Of An Equipment Grounding Conductor Or Conductors, A Terminal Or Terminals For Connection Thereof Must Be Installed," or an equivalent statement.

## **23. FACTORY-PROVIDED WIRE CONNECTORS**

Some units have pigtails leads for connection to supply or control circuit wiring when the unit is installed. To help provide a reliable splice, these leads are ordinarily no more than two wire sizes smaller than the minimum size copper conductor required by the *NEC®* for the external circuit. When two or more pigtails leads are to be connected to the same external circuit conductor, each pigtail may be more than two wire sizes smaller, if a suitable reusable wire connector, such as a twist-on wire connector, is factory-provided on the pigtails. If so, the unit is marked to indicate that the provided connector is to be used for field wiring splice connection.

Some units equipped with pigtail leads for splice connections to an external line voltage circuit have reusable wire connectors on these leads that may not be suitable for splicing to properly sized external circuit wiring. These wire connectors may be used, for example, to insulate lead ends, not necessarily used in every installation. Such units are marked to indicate that these wire connectors are not for field wiring connections.

Either type of marking described above will be located in the field wiring area where plainly visible during installation and inspection.

## 24. COPPER OR ALUMINUM WIRING

Units provided with terminals for field-connected wiring are marked to indicate the use of copper conductors only or whether aluminum and/or copper clad aluminum conductors may also be used. This marking is independent of any marking on the terminals and visible during unit installation and inspection after unit installation. Such a marking is typically located on a surface adjacent to the terminals or included on the attached unit wiring diagram. The conductor material(s) specified by the marking applies to the wires connected to the unit itself. Other conductor materials, however, may be used elsewhere in the circuits supplying the unit, provided that proper consideration is given to ampacities, splicing methods, etc.

## 25. TEMPERATURE RATING OF FIELD INSTALLED WIRING

For some equipment, the testing and construction are based on the use of wiring with 75°C insulation. However, most equipment, where ampacities of 100 or less are involved, is marked for use with 75°C rated conductors at 75°C ampacities. The use of wiring with 75°C insulation is necessary when conductor ampacities higher than 100 are required. When the use of wiring with insulation rated higher than 75°C (or 75°C) is required because of terminal or wiring compartment temperatures, the equipment must be marked to specify the minimum temperature rating (90°C) and the minimum conductor size of the wires unless the conductor size is to be based on the 75°C wire ampacity. Such markings are located adjacent to the field-wiring connection point or on an attached wiring diagram and are visible while making the connections and after they have been made. Some equipment is marked to indicate an area for locating field wiring and splices to prevent excessive insulation temperatures.

## 26. WIRING DIAGRAM

Most units have an attached wiring diagram. Such a diagram is required on a UL Listed unit when the method of connection to the electrical supply is not obvious, or if it is necessary to electrically connect an accessory or other remote load to the unit. Also, such a diagram is always required on a duct heater and includes the proper external connections for interlocking with the blower motor to insure compliance with *NEC®* Section 424.63. Many of the other markings concerning proper field-wiring connections described elsewhere in this Guide may be included in this wiring diagram.

## 27. CONNECTION TO LOW VOLTAGE SUPPLY SOURCE

Some units require an external supply source for low -voltage control circuits. The required voltage rating of this source (typically 24 volts) will be identified on the unit wiring diagram (see "Wiring Diagram") or by a marking adjacent to the terminals or leads to which the supply wires

are to be connected. The minimum necessary capacity rating of the supply transformer will also be included in this marking unless it is less than 5 volt amperes. If the supply is required to be a limited energy type because of wiring or loads within the unit, the marking will also indicate this (e.g., "Class 2," etc.).

## **28. EXTERNAL DEVICES AND/OR WIRING IN LOW VOLTAGE CIRCUITS**

Many units are intended for connecting external low-voltage control circuit switching devices and wiring. If the power supply for such a circuit is part of the unit and the unit is marked Class 2 the circuit is a Class 2 control circuit per *NEC® Article 725* and may be wired accordingly. If external to the unit, the type of supply source will determine the external wiring and components to be used as explained in Section 27.

If the type of unit transformer, the function of the control circuit, or other items require that the circuit be treated as a Class 1 control circuit, the unit will be marked "Wire Per NEC Class 1" or the equivalent. This marking is located on the attached wiring diagram (see "Wiring Diagram") or in the immediate vicinity of the terminals or leads provided for connection to the control circuit.

## **29. MULTIPLE CLASS 2 SUPPLIES**

A unit with a built-in transformer that provides a Class 2 control circuit supply for connection to a heating/ cooling thermostat or an equivalent device will be marked to indicate that isolation shall be maintained between this circuit external to the unit and separate external Class 2 output circuits. This marking may be a part of the wiring diagram (see "Wiring Diagram") that shows the proper wiring connections necessary to maintain this separation, or it may be a statement such as "Use Thermostat With Isolating Contacts To Prevent Interconnection Of Class 2 Outputs." The statement may be located in the immediate area of the unit's field-wiring Class 2 circuit connections, or on the unit wiring diagram.

A unit that contains two or more built-in transformers to supply separate external Class 2 control circuits is marked similarly to warn that separation must be maintained between these circuits external to the unit.

Failure to heed these markings can result in control circuits exceeding the limitations for Class 2 control circuits as defined in *NEC® Article 725*.

## **30. INSTALLATION CLEARANCES**

Many types of units require clearances between the cabinet and attached duct work, and combustible materials. These clearances are required to be marked on the unit nameplate. The required clearances are given in inches.

Except units that show "Duct Heater" as the product identity with the Listing Mark, all equipment with electric resistance space heaters is marked with the required clearance even if the "clearance" is zero.

Duct heaters need to be marked only with required clearances that are greater than zero. All duct heaters rated 50 kilowatts or less, however, are required to be suitable for zero clearance

installations.

Designated clearances other than zero are based on tests with uninsulated sheet metal ducts attached. Under these conditions, temperatures not higher than established maximum values have been measured on a wooden test enclosure, representing combustible construction, with the specified clearance (air) from the unit and ducts. When clearances are required between an attached outlet duct and combustible materials, the marking usually specifies the length of duct beyond the plenum or unit cabinet from which clearances must be maintained. If no distance is specified, the clearances need not be maintained from the portions of duct that are more than 6 feet from the plenum.

### 31. STATIC PRESSURE

The external static pressure imposed by the duct system attached to a unit can affect the unit air flow adversely. UL tests equipment at a high enough static pressure to take into account the effect of typically connected duct work; the minimum test static required is based on the rated heating and/or cooling capacity of the equipment. Tests on larger equipment require higher static pressures to account for the anticipated use of longer, more complex duct systems. Some units are marked to indicate the static pressure at which they were tested.

### 32. REFRIGERANT TYPE

Units employing a compressor with or without a refrigerant coil indicate the refrigerant to be used for field charging and the refrigerant used for any factory charge (see "Refrigerant Amount"). This designation is a number in accordance with ASHRAE Standard 34, or UL 2182, the Standard for Refrigerants, and is either prefixed or suffixed by the word "Refrigerant" or prefixed by the letter "R" or the trade name of the refrigerant. The use of a refrigerant type other than one designated in the marking is not covered by the UL Listing of the unit, except as noted in the section "Refrigerant Retrofit." Units without a compressor need not be marked with the refrigerant type.

### 33. REFRIGERANT AMOUNT

The nameplate on a unit containing a refrigerant compressor is marked with information concerning the amount of refrigerant. For a self-contained unit with the full amount of refrigerant needed for proper operation of the system, the marking will state the factory refrigerant charge weight.

A unit requiring field charging that is a section of a complete system Listed by UL (see "Split-Systems"), or one that contains a complete refrigerant system is marked to show the correct refrigerant charge weight or how to determine the correct charge. The marking to show how to determine the correct charge may refer to other markings on the unit or to the installation instructions. In either case, the nameplate always includes a blank for the installer to mark the total system charge weight.

UL Listed units that do not contain the complete refrigerant systems and are not a section of a complete system Listed by UL, merely include a blank on the nameplate for the installer to mark the total system charge weight.

### **33A. REFRIGERANT RETROFIT**

The information marked on the equipment nameplate relative to refrigerant type and amount of refrigerant is critical when equipment is to be evaluated using the installation requirements of ASHRAE 15, "Safety Code for Mechanical Refrigeration." In these cases, the information in the ASHRAE standard, such as refrigerating system classification, table of allowable refrigerants and amounts, and system application requirements, is used to make calculations that ensure that the refrigerant type and amount are suitable for the application, the size of the room, the type of occupancy, etc.

In view of the national and international environmental protocol restrictions on the use of ozone-depleting chemicals and the increasing availability of alternative refrigerants, situations will arise in the field for which the equipment's original refrigerant is retrofitted with another type of refrigerant. The amount of the new refrigerant may also change from the amount of original refrigerant used.

In some cases, the alternative refrigerant being retrofitted will not be included in the ASHRAE 15 standard. For the interim period, until such time as the ASHRAE standard can be revised, information (such as allowable amounts per cu. ft. of space) has been included in the UL Listing Report covering the equipment. This information may be obtained from the equipment manufacturer.

Replacing the refrigerant in a system with a different refrigerant designation shall not be made without approval of the AHJ, the user, and adherence to applicable safety requirements. In case of a refrigerant change that results in a different refrigerant safety group, the system shall be made to comply with UL 60335-2-40. When the refrigerant is changed to another refrigerant within the same safety group, the system shall comply with the regulations that were applicable to the existing system.

### **34. REFRIGERANT PRESSURE**

A unit with refrigerant-containing components is marked to indicate the pressure for which the refrigerant system or any of its components were factory tested for leakage. Separate test pressures may be marked for the discharge (high) and suction (low) sides of the system. The pressure is identified as "Design Pressure" and appears on the unit nameplate.

These pressure markings are of little concern to installers or inspectors when the unit involved is one of the following:

- 1) A unit that is marked to indicate that it is factory charged (see "Refrigerant Amount");
- 2) A unit serving as a section of a UL Listed system (see "Split-Systems") charged with the correct refrigerant type and amount (see "Refrigerant Type" and "Refrigerant Amount"); and,
- 3) A unit containing a complete refrigerant system charged with the correct refrigerant type and amount.

For these types of units, the factory test pressure is adequate for the factory charge or the designated field charge.

For other types of units, the adequacy of the factory test pressure may need to be determined by measurements on the installed system.

A unit requiring connection to a remote condenser that is not part of a UL Listed system is also marked to specify the minimum design pressure of the remote condenser. To comply with this specification, the "Design Pressure" marked on the condenser should be at least as high as the minimum design pressure specified, and the condenser should be the type specified.

### **35. HEATING AND COOLING COILS**

Equipment intended to employ water or steam as a heat exchange medium for the conditioned air is required to be marked with the fluid type(s) for which it has been evaluated. If a coil is for hot (or both hot and cold) water, the marking indicates the maximum permissible inlet water temperature. If the coil is for steam, or for water at a temperature exceeding 200°F, the marking indicates the maximum permissible pressure. If the coil is for cooling only, this information is marked. Such markings are generally located in the area where piping connections are made to the unit.

### **36. SUITABLE FOR OUTDOOR USE**

A unit evaluated for outdoor installation is identified by a marking "Outdoor Use" or equivalent statement on or near the nameplate. These units are investigated for adequate corrosion protection and the ability of the enclosure to prevent accumulation of water, which could result in risk of electric shock or fire. Some equipment such as a through-the-wall unit, is marked to indicate that only a portion of the unit may be mounted outdoors. Equipment that is UL Listed for outdoor use is identified either by an appropriate footnote or by the designation of the Listed equipment (i.e., outdoor section) in UL's published Listings. A unit not marked as indicated above is UL Listed for indoor installation only.

### **37. MOUNTING POSITION**

The intended mounting position of most units is obvious from their construction and/or position of their unit markings. For some equipment, particularly duct heaters, the mounting position is not obvious. Most duct heaters are suitable for mounting in either horizontal or vertical ducts. All duct heaters and some similar types of equipment are required to be marked with their acceptable mounting positions (e.g., "This Side Up In Horizontal Duct," "This Side Up In Vertical Duct," etc.). Other equipment, such as indoor air handlers, are often investigated and UL Listed for mounting in several positions (e.g., upflow, downflow, horizontal).

For some types of equipment, including all units incorporating electric resistance space heaters, it is particularly important that the unit be oriented properly, as to which side is up when mounted in the horizontal position.

Note that a unit suitable for mounting in any one of several positions sometimes may be properly installed with the markings located sideways or upside down. If there is any question concerning the mounting position of a UL Listed unit, and there are no markings on the unit to indicate that it may be mounted in this position, consult the manufacturer's installation instructions. UL reviews the instructions packaged with the unit as part of its investigation.

## **38. AIR FLOW DIRECTION**

For some duct heaters, proper operation of the temperature limiting devices is dependent on the direction of air flow across the heating elements. Such units are marked with an arrow and appropriate wording to indicate the proper direction of air flow.

## **39. AIR VELOCITY**

Proper operation of electric resistance space heaters is dependent on the quantity of air moving past the elements. The adequacy of the air moving means is determined as part of the investigation of all central electric space heating equipment Listed with specific fans or blowers. This pertains to units with both heaters and blowers factory installed and to units marked to indicate the use of field-installed heater accessories (see "Use of Accessories").

### **Multispeed Blower Motors**

Some units designed for field-installed heaters use a multispeed blower motor, and it may be necessary to adjust the fan speed when certain heaters are installed. Such equipment is marked to indicate the need for this change, and details showing how to accomplish it are included in markings, usually on the wiring diagram.

### **Large Commercial/Industrial Equipment**

Some very large commercial and industrial type equipment with fixed electric space heating use belt-driven, adjustable speed blowers. The manufacturer's installation instructions include directions for setting the blower speed based on the external static pressure. UL verifies these instructions as part of its product investigations, and these instructions should be followed to assure adequate air flow.

### **Duct Heaters**

One type of unit UL does not investigate for use with specific air moving equipment is a duct heater. *NEC®* Section 424.59 requires provision of uniform and adequate air flow over the face of the heating elements in a duct heater. Every duct heater is marked to indicate the minimum required air flow. This marking may include the specific minimum velocity, but in most cases, it will reference the installation instructions for details. The installation instructions typically include a chart or graph showing the minimum required air flow based on the heater kilowatt rating and the temperature of the air entering the heater. They also include directions for using the graph, and generally at least one example. The manufacturer's instructions, packaged with the heater, are reviewed as part of the UL investigation. It is important that they be followed, as also indicated in *NEC®* Section 424.66.

Minimum air velocities for duct heaters are usually specified in feet per minute, but may be specified in cubic feet per minute, if the duct heaters are to be installed only in a duct of the same size as the heater. The installation instructions should be consulted for any restrictions in this regard.

*NEC®* Section 424.59 states that the airflow shall be uniform as well as adequate. Another factor that should not be overlooked is the fine print note in *NEC®* Section 424.59. Generally, an unobstructed straight run of duct at least 4 feet long on the inlet side of the heater is adequate to insure fairly uniform air flow across the duct area. Obstructions on the outlet side of the heater, however, can also affect uniformity of airflow. See the Guide Information for Duct Heaters (KOHZ)

on UL's Online Certifications Directory ([www.ul.com/database](http://www.ul.com/database)) or UL Product Spec ([www.ul.com/productspec](http://www.ul.com/productspec)) for additional guidance.

## 40. INLET AIR TEMPERATURE

UL's investigation of most equipment is based on the assumption that the air entering an indoor unit is at normal room temperature. UL tests are conducted with inlet air temperatures of 80°F. Some indoor units are investigated and Listed for connection to duct systems where the air entering the unit is preheated by some other means. Since duct heaters are typically used in such installations, any unit identified as a "Duct Heater" as part of the Listing Mark is marked to indicate a maximum entering air temperature (see *NEC®* Section 424.60). For some duct heaters, this marking may reference the installation instructions that, as indicated elsewhere in this Guide, have been investigated as part of the Listing and should be consulted. Fan units may also be used in applications where the inlet air is preheated, and if tested to cover this application, will also be marked to indicate a maximum entering air temperature. If not so marked, a maximum entering air of 80°F is assumed. Use of equipment in systems that preheat inlet air to a temperature higher than its marked maximum inlet temperature, or 80°F if not marked, can result in overheating of wiring, electrical components and duct work.

## 41. DUCT CONNECTIONS

Units designed to be connected to a duct system for conditioned air are Listed for installation in accordance with the applicable portions of the National Fire Protection Association Standard for Installation of Air Conditioning and Ventilating Systems, NFPA 90A, and/or the Standard for Warm Air Heating and Air Conditioning Systems, NFPA 90B. Certain unit markings may limit the types of installations permitted by these Standards.

NFPA Standards 90A and 90B permit certain types of residential installations of nonheating equipment without a noncombustible duct or equivalent barrier beneath a bottom air discharge or return air opening in a unit. A unit that does not include a means of heating but requires such a barrier is marked "For Nonresidential Installation Only."

A unit not investigated for connection to a duct system as defined in these Standards, may be marked "This Unit Is Intended Only For Free-Air Discharge Or For Connection To A Duct Supplying Only One Room."

Certain types of equipment that cannot be properly installed with attached duct work in rooms having a ceiling height of 7-1/2 feet or less may be marked to indicate the minimum required ceiling height.

## 42. SHORT-CIRCUIT CURRENT RATING

*NEC®* Section 440.4(B), now requires that multimotor and combination-load equipment shall be provided with a visible nameplate marked with the short-circuit current rating, with the following exception:

Multimotor and combination-load equipment used in one and two family dwellings, cord and attachment plug connected equipment, or equipment supplied from a branch circuit protected at 60 amps or less shall not be required to be marked with a short-circuit current rating.

All these types of markings described above are located on or adjacent to the unit nameplate.

### **43. CARBON DIOXIDE (R744) AS A REFRIGERANT**

Equipment intended to utilize carbon dioxide (R744) in a secondary loop or a cascade system as a heat exchange medium for the conditioned air is required to be marked with the fluid type(s) for which it has been evaluated. If the equipment is for use with R744 (carbon dioxide) system components, the marking indicates the design pressure of the equipment is not less than the design pressure of the associated components.

If the equipment contains a pressure vessel within the R744 loop or system, but pressure relief and pressure-regulating relief valves are not provided as part of the equipment, a marking shall be located where visible to the installer indicating that pressure-relief or pressure-regulating relief valves are not installed on the equipment and that a sufficient number of valves having capacity deemed adequate shall be field-installed on the system.

Pressure-regulating relief valves shall be provided with the following or equivalent marking: "Do not defeat, cap, add piping to the outlet of the valve or attempt to change the relief setting."

### **44. MOTORS FOR USE WITH SOLID-STATE SPEED CONTROLS**

Motors intended for use with remotely located solid-state speed controls for Heating & Cooling equipment is requires to be marked with the following statement, "SUITABLE FOR USE WITH ANY SOLID-STATE SPEED CONTROLS" or equivalent wording. If a speed control is specified by the manufacture, the marking is not required.

### **45. HEAT PUMP WATER HEATING EQUIPMENT**

Heat pump water heating equipment that have a heat exchanger are required to be marked with following. If the heat exchanger is intended for connection to a potable water system, it shall be of double wall construction and the design shall incorporate either a vented interface or redundant construction to prevent the leakage of refrigerant into potable water, the equipment shall be marked with the following, or the equivalent: "CAUTION: DOUBLE WALL HEAT EXCHANGER, SUITABLE FOR POTABLE WATER CONNECTION". Heat exchangers may be of single wall construction provided they are not intended for connection to a potable water system, and shall be marked with the following, or the equivalent: "CAUTION: SINGLE WALL HEAT EXCHANGER, NOT SUITABLE FOR POTABLE WATER CONNECTION".

### **46. Flammable Refrigerants**

Equipment intended to utilize a flammable refrigerant as a heat exchange medium for the conditioned air is required to be marked with the fluid type(s) for which it has been evaluated. The flame symbol and the instruction manual symbol of 7.6 shall be visible when a FLAMMABLE REFRIGERANT is employed and the following conditions exist:

- accessing parts expected to be subjected to maintenance or repair;
- observing the appliance under sale or installed conditions;
- observing the appliance packaging, if the appliance is charged with refrigerant.

An additional warning symbol (flame symbol: W021 of ISO 7010) shall be placed on the nameplate of the unit near the declaration of the refrigerant type and charge information. The perpendicular height shall be at least 10 mm, and the symbol need not be in colour. When installed, the marking should be visible after removing a DETACHABLE part. The

following warning shall also be applied to the appliance when a FLAMMABLE REFRIGERANT is employed. WARNING: "APPLIANCE shall be installed, operated and stored in a room with a floor area larger than 'X' m<sup>2</sup>" (only applies to APPLIANCES that are not FIXED APPLIANCES). The height of the letters shall be  $\frac{1}{4}$  inches. When a FLAMMABLE REFRIGERANT is employed, a warning symbol W021 of ISO 7010, including colour and format, shall be permanently placed on the appliance. The perpendicular height of the triangle containing the "Caution, risk of fire" symbol shall be at least 30 mm. When a FLAMMABLE REFRIGERANT is employed, a symbol requiring reference to the manual [ISO 7000-0790 (2004-01)], including colour and format, shall be permanently placed on the appliance. For APPLIANCES using FLAMMABLE REFRIGERANTS, an installation, service and operation manual, either separate or combined manuals, shall be provided and include the information given in Annex DD of UL 60335-2-40.

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## APPENDIX A

### UL HEATING AND COOLING EQUIPMENT PRODUCT CATEGORIES

UL does list this type of equipment and continues to develop new product categories to address the safety issues associated with this type of equipment. Below is a list of product categories that UL currently lists to address these types of products. Each product category is tabulated with a UL Category Code. By clicking on the code, you will be linked to the UL Guide Information for the category and any Listings or Classifications under that Product Category in the UL Online Certifications Directory database at [www.ul.com/database](http://www.ul.com/database).

<b>Category Code</b>	<b>Category Name</b>	<b>Standard Used</b>
<b>LZLZ</b> <b>Electric Heating and Cooling Equipment</b>		
KTFV	Absorption Air Conditioning Equipment	UL 1995, UL 795, UL 296, ANSI Z21.40.1
ACKZ	Air conditioners, packaged terminal	UL 484, or UL 60335-2-40 ANSI Z21.86
ABFY	Air conditioning equipment accessories	UL 1995 or UL 60335-2-40
KZZV	Central furnaces	ANSI Z21.47
KOHZ	Duct heaters	UL 1996
LZPG	Ductless heating and cooling equipment, large, open building	UL 1995 or UL 60335-2-40
LZPU	Heater assemblies Classified for use on Specified Equipment	UL 1995 or UL 60335-2-40
LZFE	Heating and Cooling Equipment	UL 1995 or UL 60335-2-40
KMLW	Remote control panels for electric duct heaters	UL 1996
KKWS	Room Air Heaters, Fixed and Location Dedicated	UL 2021
ACVS	Special purpose air conditioners	UL 484 or UL 60335-2-40
MJAT	Specialty heating and heating-cooling appliance accessories	UL 1995, or UL 60335-2-40 UL 462, UL 207, UL 295, UL 795, UL 296
<b>Gas-Fired Heating and Cooling Equipment</b>		
LLRR	Commercial radiant heaters	ANSI Z83.19 or Z83.20
LKQA	Outdoor patio heaters	ANSI Z83.26
LTCT	Unit heaters	ANSI Z83.8
LPOL	Unvented room and log heaters	ANSI Z21.11.2
LPNH	Vented room heaters	ANSI Z21.86
LPPM	Vented fireplace heaters	ANSI Z21.88
<b>Solid-Fuel-Fired Heating and Cooling Equipment</b>		
LBHZ	Solid-fuel-fired central furnaces	UL 391
DGAW	Solid-fuel type room heaters	UL 1482
<b>Oil-Fired Heating and Cooling Equipment</b>		
LGJR	Floor furnaces	UL 729
LUDZ	Unit heaters	UL 731
<b>Kerosene-Fired Heating and Cooling Equipment</b>		
LQLT	Room heaters	UL 896
<b>Combination-fired Heating Equipment</b>		
LANT	Gas-Oil-Fired Central furnaces	ANSI Z21.47 and UL 727

LTQR	Gas-oil-fired unit heaters	ANSI Z83.8 and UL 731
LBEV	Solid-fuel Combination central furnaces	UL 391

## APPENDIX B: HEATING AND COOLING EQUIPMENT CODES AND STANDARDS

Heating and cooling equipment must be installed in accordance with model codes and installation standards. These codes require these products to be listed and labeled in accordance with applicable product standards.

UL standards are typically identified as Standards for Safety and cover reasonably foreseeable risks associated with a product. Limitations applicable to the products covered by the standard are delineated in the Scope section of the standard. UL standards are intended to:

- Identify requirements for evaluation of products and provide consistency in the application of these requirements.
- Provide guidance for development of products by manufacturers.
- Provide requirements compatible with nationally recognized installation codes

An UL Outline of Investigation is a document that contains the construction, performance, and marking criteria used by UL to investigate a product when the product is not covered by the scope of an existing UL Standard for Safety. Outlines are not consensus documents and do not require review by an UL Standards Technical Panel (STP) or other external group.

ANSI Z21.11.2	Gas-Fired Room Heaters, Volume II, Unvented Room Heaters
ANSI Z21.47	Gas-Fired Central Furnaces
ANSI Z21.86	Vented Gas-Fired Space Heating Appliances
ANSI Z21.88	Vented Gas Fireplace Heaters
ANSI Z83.8	Gas Unit Heaters and Gas-Fired Duct Furnaces
ANSI Z83.19	Gas-Fired Low-Intensity Infrared Heaters
ANSI Z83.20	Gas-Fired High-Intensity Infrared Heaters
ANSI Z83.26	Gas-Fired Outdoor Infrared Patio Heaters
IFGC	International Fuel Gas Code
IMC	International Mechanical Code
NEC (NFPA 70)	National Electrical Code
NFGC (NFPA 54)	National Fuel Gas Code
NFPA 90A	Installation of Air-Conditioning and Ventilating Systems
NFPA 90B	Installation of Warm Air Heating and Air-Conditioning Systems
UL 207	Refrigerant-Containing Components and Accessories, Nonelectrical
UL 295	Commercial-Industrial Gas Burners
UL 296	Oil Burners
UL 391	Solid-Fuel and Combination-Fuel Central and Supplementary Furnaces
UL 462	Heat Reclaimers for Gas-, Oil-, or Solid Fuel-Fired Appliances
UL 484	Room Air Conditioners
UL 727	Oil-Fired Central Furnaces
UL 729	Oil-Fired Floor Furnaces
UL 731	Oil-Fired Unit Heaters
UL 795	Commercial-Industrial Gas Heating Equipment
UL 896	Oil-Burning Stoves
UL 1482	Solid-Fuel Type Room Heaters

UL 1995	Heating and Cooling Equipment
UL 1996	Electric Duct Heaters
UL 2021	Fixed and Location-Dedicated Electric Room Heaters
UL 60335-2-40	Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers"
UMC	Uniform Mechanical Code