UL RP 9691

Recommended Practice for Nameplates for Use in Electrical Installations

Recommended Practice for Nameplates for Use in Electrical Installations, UL RP 9691

First Edition, Dated March 22, 2021

Summary of Topics

This is the first edition of UL RP 9691, Recommended Practice for Nameplates for Use in Electrical Installations.

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First Edition

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This UL Recommended Practice consists of the First Edition.

Comments or proposals for revisions on any part of the Recommended Practice may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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1 Scope

1.1 This document provides general guidance for consistency in nameplates for electrical equipment in accordance with the National Electrical Code (NEC), NFPA 70. This recommended practice addresses nameplate content, formatting of the nameplate information, nameplate location on the equipment, and the durability of the nameplate.

1.2 The guidance provided does not replace the requirements contained in product standards or installation instructions. This document is intended to cover the basic nameplate information needed to safely select and install correctly sized power conductors and overcurrent devices and does not include all required markings for electrical equipment.

1.3 This document was developed due to product standards allowing for flexibility related to how information is displayed on equipment nameplates resulting in nameplate information that can vary significantly between products certified to the same standard. This variability causes difficulties in the field, as every manufacturer provides essential information in a different format based on their interpretation and application of the requirements. As products become more complex, nameplates can become more complex, so if uniformity and consistency are not put into place, issues and confusion in the field may increase.

1.4 Product standard requirements take precedence over any guidance provided in this document.

1.5 This recommended practice does not apply to the factory or field-installed caution, warning, and danger markings.

2 Units of Measurement

2.1 Values in parentheses are explanatory or approximate information.

3 Referenced Publications

3.1 Any undated reference to a code or standard appearing in this recommended practice shall be interpreted as referring to the latest edition of that code or standard.

3.2 The following publications are referenced in this recommended practice.

IEC 60050, International Electrotechnical Vocabulary (IEV)

IEC 62683-1, Low-voltage switchgear and control gear – Product data and properties for information exchange – Part 1: Catalogue data

IEEE 802.3, IEEE Standard for Ethernet

ISO/IEC 17030, Conformity assessment – General requirements for third-party marks of conformity (Updates for electronic labeling pending)

NFPA 70, National Electrical Code (NEC)

NFPA 79, Electrical Standard for Industrial Machinery

NEMA EL P1, NEMA Position Paper on Electronic Labeling

NEMA MG 1, Motors and Generators

UL 50E, Enclosures for Electrical Equipment, Environmental Considerations

UL 73, Motor-Operated Appliances

UL 444, Communications Cables

UL 499, Electric Heating Appliances

UL 508, Industrial Control Equipment (solid-state motor controllers only)

UL 508A, Industrial Control Panels

UL 845, Motor Control Centers

UL 969, Marking and Labeling Systems

UL 197, Commercial Electric Cooking Appliances

UL 1004-1, Rotating Electrical Machines – General Requirements

UL 1004-2, Impedance Protected Motors

UL 1004-3, Thermally Protected Motors

UL 1004-4, Electric Generators

UL 1004-6, Servo and Stepper Motors

UL 1004-7, Electronically Protected Motors

UL 1004-8, Inverter Duty Motors

UL 1004-9, Form Wound and Medium Voltage Rotating Electrical Machines

UL 2108, Low Voltage Lighting Systems

UL 2111, Overheating Protection for Motors

UL 2200, Stationary Engine Generator Assemblies

UL 60034-1, Rotating Electrical Machines – Part 1: Rating and Performance

UL 60730-1, Automatic Electrical Controls – Part 1: General Requirements

UL 60335-2-40, Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, 3rd Edition

UL 60947-4-1, Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and motor starters – Electromechanical contactors and motor-starters

UL 60950-1, Information Technology Equipment – Safety – Part 1: General Requirements

UL 61800-5-1, Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy (Note: Replaces UL 508C)

UL 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements

4 Glossary

4.1 For the purpose of this recommended practice, the following definitions apply.

4.2 AMBIENT TEMPERATURE RATING – A rating assigned to equipment that refers to the maximum ambient temperature of the room or space outside of the device enclosure or intended enclosure. (UL 508 or UL 60947-4)

4.3 AMPACITY – The maximum current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating. (NEC 100)

4.4 APPLIANCE (S) – Utilization equipment, generally other than industrial, that is normally built in standardized sizes or types and is installed or connected as a unit to perform one or more functions such as clothes washing, air-conditioning, food mixing, deep frying, and so forth. (NEC 100)

4.5 BRANCH CIRCUIT (NEC) – The circuit conductors between the final over-current device protecting the circuit and the outlet(s). (NEC 100)

4.6 BRANCH CIRCUIT (UL) – The conductors and components following the last overcurrent protective device protecting a load. (UL 508A)

4.7 BRANCH CIRCUIT OVERCURRENT PROTECTIVE DEVICE – A fuse or circuit breaker that has been evaluated to a safety standard for providing overcurrent protection. (See UL 508A for additional information.)

4.8 CURRENT – The flow of electric charge in a circuit. Examples of electric current rating values that may be provided on equipment nameplates include amperes, rated-load amperes, interrupting current, full-load current, and continuous current. The type of current rating is based on the type and use of the equipment and defined by the applicable codes and standards.

4.9 DAMP LOCATION – Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture.

Informational Note: Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses. (NEC 100)

4.10 DRY LOCATION – A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction. (NEC 100)

4.11 ENCLOSURE – A surrounding case constructed to provide a degree of protection to personnel against access to hazardous parts and to provide a degree of protection to the enclosed equipment against specified environmental conditions. (UL 50E)

4.12 FEEDER CIRCUIT – The conductors and circuitry on the supply side of the branch circuit overcurrent protective device. (UL 508A)

4.13 FREQUENCY – The measure of the rate of oscillation of current or voltage, measured in the number of cycles per second. The corresponding SI unit for frequency is Hertz (Hz). Equipment may be rated for multiple frequencies such as 50/60 Hz or may be rated "dc" to denote that it is rated for direct current.

4.14 HERMETIC REFRIGERANT MOTOR-COMPRESSOR – A combination consisting of a compressor and motor, both of which are enclosed in the same housing, with no external shaft or shaft seals, with the motor operating in the refrigerant. (NEC 100)

4.15 HORSEPOWER – A measure of mechanical output. In the context of this Standard, one horsepower is defined as, and shall be used interchangeably with, 0.746 kilowatts of output power. (UL 1004-1)

4.16 INDUSTRIAL CONTROL PANEL – An assembly of two or more components consisting of one of the following:

a) Power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers;

b) Control circuit components only, such as push buttons, pilot lights, selector switches, timers, switches, and control relays; or

c) A combination of power and control circuit components.

These components, with associated wiring and terminals, are mounted on, or contained within, an enclosure or mounted on a subpanel.

The industrial control panel does not include the controlled equipment. (NEC 100)

4.17 LEGIBLE NAMEPLATE – A nameplate that is readable at arm's length [approximately 18 in (457 mm)] by a person with normal or corrected vision. (UL 969)

4.18 MANUFACTURER'S IDENTIFICATION – Method as defined by codes and standards to identify the manufacturer of the equipment. Examples of manufacturer's identification include Identifying Designation, Identifying Name, Manufacturer's Name, Manufacturer's Trademark and Manufacturer's Symbol.

4.19 MAXIMUM OPERATING CURRENT (MOC) – MOC is marked instead of motor FLA on air-conditioning and refrigerating equipment having adjustable speed drives or drive systems. MOC is the current resulting when an electric motor and adjustable speed drive or drive system are operated under any conditions such as maximum speed/maximum load, maximum speed/minimum load, minimum speed/minimum load, minimum speed/maximum load, including locked-rotor such that current to the motor/adjustable speed drive or drive system is at a maximum. The MOC is the current at the input of the adjustable speed drive. (UL 1995)

Note: FLA is full load amps.

4.20 MAXIMUM RATED CURRENT (MRC) – MRC is marked instead of motor-compressor RLA and LRA on equipment having adjustable speed drives or drive systems. MRC is the current resulting when a hermetic refrigerant motor-compressor and adjustable speed drive or drive system are operated under any conditions such as maximum speed/maximum load, maximum speed/minimum load, minimum speed/minimum load, minimum speed/maximum load, including locked-rotor such that current to the motor-compressor/adjustable speed drive or drive system is at a maximum. The MRC is the current at the input of the adjustable speed drive. The test conditions to determine the MRC are found in Annex AA of UL 60335-2-34 or CAN/CSA C22.2 No. 60335-2-34. (UL 1995)

Note: RLA is rated load amps and LRA is locked rotor amps.

4.21 NAMEPLATE – Markings placed on electrical equipment, grouped together and/or on the same label, providing the manufacturer's name and the electrical rating of the equipment. Nameplate requirements are contained in applicable codes and standards.

4.22 NEUTRAL CONDUCTOR – the identified grounded conductor, referred to as "the neutral". (UL 1598)

4.23 NOMINAL VOLTAGE – A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (e.g., 120/240 volts, 480Y/277 volts, 600 volts).

4.24 PERMANENT NAMEPLATE – A nameplate that remains attached to equipment under anticipated use and remains legible.

4.25 POWER – Rating which defines the quantity of the electrical energy that is generated or consumed in an electrical circuit or equipment. Power ratings may be provided as voltamperes, kilovolt-amperes, horsepower (746 watts), or watts.

4.26 SERVICE FACTOR – A multiplier that, when applied to the rated output of a machine, indicates a permissible loading that can be carried continuously at the rated voltage and frequency. (UL 1004-1)

4.27 SHORT CIRCUIT CURRENT RATING – The prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding the defined acceptance criteria. (UL 508A) (NEC 100)

4.28 VISIBLE NAMEPLATE – A nameplate located on a piece of equipment that can be seen during or, if required, after installation.

4.29 VOLTAGE (OF A CIRCUIT) – The greatest root-mean-square (rms) (effective) difference of potential between any two conductors of the circuit concerned.

Informational Note: Some systems, such as 3-phase 4-wire, single-phase 3-wire, and 3-wire direct current, may have various circuits of various voltages. (NEC 100)

4.30 VOLTAGE TO GROUND – For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit. (NEC 100)

4.31 WET LOCATION – Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather. (NEC 100)

PART I – ALL EQUIPMENT

5 Durability and Legibility

5.1 General

5.1.1 The guidance in this section for nameplates durability and legibility is provided for use with electrical equipment installed in accordance with the National Electrical Code (NEC). For specific equipment guidance, refer to equipment sections within this recommended practice. Product standard requirements take precedence over guidance provided in this section.

5.1.2 NEC 110.21 requires the marking or label to be of sufficient durability to withstand the environment involved.

5.1.3 In general, UL specifies the following requirements for durability. The final acceptance of a permanent marking in a particular application is to be judged under the applicable requirements in the standard covering the device, appliance, or equipment on which the label or marking is used.

a) A marking that is required to be permanent may be molded, die-stamped, paint-stenciled, stamped, or etched metal that is permanently secured, or indelibly stamped lettering on a pressure-sensitive label secured by adhesive that, upon investigation, is found to be acceptable for the application.

b) An adhesive-attached label or related product that complies with the applicable requirements for indoor or outdoor use labels in UL 969 may be considered to be permanent for typical installations.

c) Ordinary usage, handling, storage, and the like of a product are considered to determine the permanence of a marking.

5.2 UL 969 Marking and Labeling Systems

5.2.1 The following provides an overview of UL 969. Refer to the latest edition of UL 969 for specific requirements and compliance criteria.

5.2.2 **Permanence and legibility** – After exposure to prescribed conditioning, labels are tested as follows for permanence and legibility as defined in UL 969.

a) Visual Examination – The labels are viewed at arm's length, approximately 18 inches, by a person with normal or corrected vision.

b) Legibility Test – Printed surfaces of labels are rubbed with thumb or finger and then examined.

c) Defacement Test – Labels or unprinted materials are scraped across printed areas and edges using the edge of a thick steel blade held at a right angle to the test surface.

d) Adhesion Test – This test is conducted to determine if it is possible to remove test strips from surfaces. Note that the adhesion test is not conducted after the low temperature exposure condition.

5.2.3 **Indoor use** – After exposure to the following conditions, the samples are tested as described in 5.2.2.

a) Indoor dry use locations.

1) As Received Exposure (Ambient Exposure) – 72 hours at 23 °C (73 °F) and 50 percent relative humidity.

2) Humidity Exposure – 72 hours at 32 °C (90 °F) and 85 percent relative humidity.

3) Elevated Temperature Exposure – 240 hours (10 days) at the test temperature corresponding to the maximum temperature rating for ten-day oven test temperatures shown in Table 5.1.

4) Low Temperature Exposure – 7 hours at the minimum temperature rating. This exposure is only applicable for products intended to be used at ambient air temperatures lower than 0 °C (32 °F).

b) Indoor use where exposed to high humidity or occasionally to water.

1) As Received Exposure (Ambient Exposure) – 72 hours at 23 °C (73 °F) and 50 percent relative humidity.

2) Water Immersion Exposure- Immersion in water for 48 hours in 23 °C water.

3) Elevated Temperature Exposure – 240 hours (10 days) at the test temperature corresponding to the maximum temperature rating for ten-day oven test temperatures shown in Table 5.1.

4) Low Temperature Exposure – 7 hours at the minimum temperature rating. This exposure is only applicable for products intended to be used at ambient air temperatures lower than 0 °C (32 °F).

5.2.4 **Outdoor Use** – After exposure to the following conditions, the samples are tested as described in 5.2.2. Note that the NEC defines locations as a wet location, damp location, or dry location. Protected outdoor areas may be considered a wet or damp location, depending on the region and degree of protection.

Recommended Practice: Note that nameplates used in a permanently exposed outdoor area, where the nameplate is unprotected from direct sunlight, should undergo further evaluation by the equipment manufacturer to ensure the markings are sufficiently durable to handle these conditions for the life of the equipment.

a) As Received Exposure (Ambient Exposure) – 72 hours at 23 °C (73 °F) and 50 percent relative humidity.

b) Water Immersion Exposure- Immersion in water for 48 hours in 23 °C water.

c) Elevated Temperature Exposure – 240 hours (10 days) at the test temperature corresponding to the maximum temperature rating for ten-day oven test temperatures shown in Table 5.1.

d) Low Temperature Exposure – 7 hours at the minimum temperature rating. Outdoor use minimum temperature rating is minus 23 °C (minus 10 °F) or lower.

e) Ultraviolet Light and Water Exposure (Sunlight Resistance) – Exposed to ultraviolet light and water spray with the ultraviolet light consisting of 720 hours of twin enclosed carbon-arc or 750 hours of xenon-arc.

Table 5.1
Ten-day oven test temperatures

Maximum temperature rating,		Test Temperature	
°C	(°F)	°C	(°F)
40	(104)	60 ±2	(140 ±3.6)
60	(140)	87 ±2	(189 ±3.6)
80	(176)	105±3	(221 ±5.4)
100	(212)	121 ±3	(250 ±5.4)
125	(257)	150 ±4	(302 ±7.2)
150	(302)	180 ±4	(356 ±7.2)
175	(347)	210 ±4	(410 ±7.2)
200	(392)	230 ±4	(446 ±7.2)
225	(437)	250 ±4	(482 ±7.2)
250	(482)	280 ±4	(536 ±7.2)
280	(536)	310 ±4	(590 ±7.2)

5.2.5 **Marking and labeling systems exposed to specific agents** – Additional exposure conditions may be required, depending on the product for which the marking and labeling system is intended and on the conditions that the particular product may encounter in service. After exposure to one or more of the following common agents, the samples are tested as described in 5.2.2. Other agents may be specified in the standard covering the device, appliance, or equipment on which the label is used.

a) Cooking oil immersion for 48 hours in corn oil.

b) Detergent (dishwasher) immersion for 48 hours in detergent.

c) Detergent (laundry) immersion for 48 hours in detergent.

d) Fuel Oil No. 1 immersion for 48 hours in fuel oil No. 1.

e) Fuel Oil No. 2 immersion for 48 hours in fuel oil No. 2.

f) Gasoline (splashing) immersion for 60 minutes in fuel.

g) Kerosene immersion for 48 hours in kerosene.

h) Lubricating oil immersion for 48 hours in oil.

i) Hydraulic fluid immersion for 48 hours in the fluid.

6 Placement on Equipment

6.1 Nameplates should be placed in a readily viewable location on the equipment aligned with other marking requirements. The nameplate should be easily seen, readily apparent to an installer or user.

6.2 The location should be as close as practical to the supply connections.

6.2.1 Where the location of the supply connections is not visible after installation, the nameplate information should be relocated or repeated in a location that is visible after installation.

6.2.2 Be mindful that the nameplate for an industrial control panel associated with equipment may not be the overall nameplate of the equipment.

6.2.3 Consideration in location of the nameplate should be given to not exposing users to live parts.

6.3 The location should be readily viewable, not beneath or below appurtenances or projections of the equipment.

6.4 The nameplate should not be placed on removable parts such as covers secured by screws.

6.5 Factory or field installed markings for multiple industrial control panels can dramatically improve the ability to quickly identify the power supply for the specific industrial control panel where a group of industrial control panels is installed to control equipment.

a) When an industrial control panel supplies power and control to other industrial control panels, it should be identified "1 of X" with any additional panels that are controlled by that industrial control panel marked as "2 of X", "3 of X" etc. The full nameplate is provided on additional industrial control panels associated with equipment that are not fed from any other industrial control panel.

b) All industrial control panels should have markings to indicate the following.

1) Supply voltage and full-load current of each power source to ensure correct conductor size and overcurrent device.

2) "Fed from" indication. The "Fed from" includes the Overcurrent Device in another industrial control panel that provides power to these additional industrial control panels. If the additional industrial control panels are not fed from another industrial control panel, they would have their own nameplate with all the required information.

7 Electronic Labeling of Products and Equipment

7.1 General

7.1.1 Electronic labeling of products and equipment already appears in many electronics via the integral device display, a website link via a text URL (Uniform Resource Locator), or by scanning a QR (Quick Response) code. The electrical industry is in the process of pursuing similar methods to provide installation information. The information in this section is provided to bring awareness to current and future methods that may be used in supplying traditional electrical information and markings via electronic labeling.

7.1.2 The global market for electrical and electronic products is becoming increasingly regulated by governments and/or independent organizations. In many cases, these regulations mandate compliance with international, national, and/or industry standards defining requirements for electrical and/or machine safety, electromagnetic compatibility (EMC), environmental compliance, and industry/application-specific installations.

7.1.3 In many cases, the validation of compliance with applicable regulations is with a unique conformity marking, typically included on a product nameplate. Examples include:

a) Third-party marks such as UL, CSA Group Testing and Certification (CSA), Intertek Testing Services (ETL), FM Approvals (FM), Federal Communications Commission (FCC), Eurasian Conformity (EAC), Korea Certification (KC), Taiwan Bureau of, Standards, Metrology, Inspection (BSMI), and China Compulsory Certificate (CCC).

b) Self-declaration marks such as CE, Australian Regulatory Compliance Mark (RCM), Administrative Measure on the Control of Pollution Caused by Electronic Information Products (China RoHS).

7.1.4 Manufacturers are already required to provide specific information on product nameplates, including, but not limited to:

a) Company name, tradename, or trademark

b) Product ID or catalog number

c) Electrical and other associated information that is necessary for the proper installation and use of the product

d) Warning and/or other safety-related statements or symbols (including language translations)

e) Manufacturer's information such as company address, factory codes, date codes, serial numbers, bar codes

7.1.5 Including all of this information on one or more labels applied to a product while ensuring the nameplates remain readily visible and legible can be extremely difficult, if not impossible.

7.1.6 Advances in technology are leading to the development of more "smart" devices and digital products that can be integrated into a building automation system, all in response to industry initiatives such as the Internet of Things (IoT), Digital Factory, Industry 4.0, etc.

7.1.7 Electronic product labeling utilizes existing technology to display required and supplemental product markings, ratings, and other important information in a manner that ensures the information is readily visible and legible.

7.1.8 Electronic product labeling is already being implemented on devices with integral displays such as mobile phones.

7.1.9 Electronic product labeling has global support through industry trade associations such as the National Electrical Manufacturers Association (NEMA) and Zentralverband Elektrotechnik-und Elektronikindustrie e.V. (ZVEI). Additional information is available in NEMA EL P1-2018, NEMA Position Paper on Electronic Labeling.

7.2 **Types of Electronic Product Labeling** – The following provides examples of electronic labels:

a) Integral display on a device;

b) Link to a website via text URL; and

c) Scanning a machine-readable code such as a QR code.

7.3 **International Standards** – The following international standards were under development to provide additional information on electronic product labeling when UL RP 9691 was published. These standards are provided for information purposes only.

a) ISO/IEC 22603-1, Digital representation of product information – Part 1: General requirements (DRAFT)

b) ISO/IEC 22603-2, Digital representation of product information – Part 2: Requirements for electronic devices (DRAFT)

c) ISO/IEC 17030, Conformity assessment – General requirements for third-party marks of conformity (Updates for electronic labeling pending)

7.4 Minimum Hard Copy to Accompany a Product

7.4.1 Care is needed that electronic means are not the sole method for obtaining nameplate, instructional, or safety-related information. In addition to product nameplate items identified in 7.1.4, a minimum amount of a hard copy should accompany a product identifying important information.

7.4.1.1 A hard copy would include safety message (s) identifying critical hazards and avoidance statements instructing the customer to read and understand all literature before proceeding. The safety messages would include hazards that may not be immediately apparent to the user, especially those users inclined to try installation and configuration without the instructions if the instructions are not easily accessible.

7.4.1.2 A listing of the technical literature available for the offer essential for installation and start-up. The technical literature should be identified by title and identification number.

7.4.1.3 Information on how and where the technical literature can be accessed is to be provided. The following are examples where technical literature may be accessed; enclosed compact disk (CD), enclosed thumb drive, QR Code, or web address for download. The information must include alternatives for obtaining a hard copy such as “Contact your local sales office for a hard copy of documentation or additional information,” or contact information to a customer service center via phone, email, web address, or the like.

8 International Harmonization

8.1 General

8.1.1 An increasing number of manufacturers of electrical equipment are developing products for a global market. Accordingly, these products must meet regulations in multiple countries and quite possibly multiple product safety standards. As a result, it can be challenging to incorporate all required product information on existing product nameplates.

8.1.2 The use of globally recognized terminology and/or symbols to define required product ratings and other important safety information is recommended to ensure this information is clear and legible.

8.2 Recommended References

8.2.1 Classification Attribute Specification (CAS)

a) Standard developed and maintained by the Industry Data Exchange Association (IDEA) based on the United Nations Standard Products and Services Codes (UNSPSC).

b) The specification includes global categorization system for product descriptors such as voltage, current, color, etc.

8.2.2 IEC 62683-1, Low-voltage switchgear and controlgear – Product data and properties for information exchange – Part 1: Catalogue data

a) International standard developed and maintained by IEC technical committees.

b) Reference dictionary for general description and attributes of low-voltage switchgear and controlgear.

8.2.3 Electropedia – IEC 60050, International Electrotechnical Vocabulary (IEV)

a) Online database for terms and definitions of electrical, electronic, and other related technical products.

b) Terms and definitions provided in English and French, with equivalent translations in various other languages.

8.2.4 eCl@ss Standard

a) Standard developed and maintained by eCl@ss based on input from global industry participants.

b) Global categorization system for product descriptors such as voltage, current, color, etc.

8.2.5 Low Voltage Directive 2014/35/EU

Guidelines – Electrical equipment designed for use within specific voltage limits.

8.3 International Terms and Terminology Awareness

8.3.1 There are certain terms and terminology which are substantially different in definition, reference standards and/or usage between North American and International audiences. This section provides a few examples of those terms:

Table 8.1

Term	US Codes and Standards	International Electrotechnical Vocabulary (IEV), IEC 60050
circuit breaker	The NEC describes a circuit breaker as a device designed to open and close a circuit by nonautomatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within it rating. UL 1077 supplementary protectors are often called circuit breakers, but this is incorrect. Circuit breakers are listed to the UL 489 standard, while supplementary protectors are listed to the UL 1077 standard. UL 1077 supplementary protectors can never be used in place of UL 489 circuit breakers.	Mechanical switching device, capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified duration and breaking currents under specified abnormal circuit conditions such as those of short circuit (IEV ref 441-14-20)
ground	The NEC describes ground as the earth.	(local) earth (local) ground (US)

Table 8.1 Continued on Next Page

Table 8.1 Continued

Term	US Codes and Standards	International Electrotechnical Vocabulary (IEV), IEC 60050
		Part of the Earth which is in electric contact with an earth electrode and the electric potential of which is not necessarily equal to zero. (IEV ref 195-01-03) See IEV Section 195-01: Fundamental concepts for terms such as: • Reference earth • Protective earthing • Functional earthing • (Power) system earthing See IEV Section 195-02: Electrical installation and equipment for terms such as: • Earth electrode • Earthing conductor • Neutral point • Neutral conductor • Protective conductor • Protective earthing conductor • Functional earthing conductor • PEN conductor • PEM conductor • PEL conductor
disconnecting means	The NEC describes the disconnecting means as a device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.	"Disconnecting means" is not listed in the IEV. Arguably the IEV definition of "circuit breaker" aligns with the NFPA 70 definition of "disconnecting means."

8.4 Dual Dimensioning

8.4.1 There are dual dimensioning requirements for acceptability in certain countries. Certain dimensions can be considered safety critical.

8.4.2 Safety-critical dimensions are as follows:

a) Motor power: kW vs horsepower (HP)

b) Torque: N-m vs lb-ft or lb-in

c) Wire size: mm^2 vs AWG or kcmil

Note that while many UL standards do provide an equivalent mm2 value to AWG or kcmil wire sizes, there is no direct correlation between metric wire sizes and US customary measures. Markings representing minimum or maximum wire sizes for an application must be tested independently or go to the more conservative measure.

PART II – INDUSTRIAL CONTROL PANELS AND INDUSTRIAL MACHINERY

9 Scope

9.1 Part II guidance is provided for industrial control panels and industrial machinery used in accordance with the National Electrical Code (NEC) and NFPA 79.

9.2 Part II guidance covers:

a) Industrial control panels and industrial machinery for installation in accordance with the NEC and NFPA 79.

b) Industrial control panels and industrial machinery certified to UL 508A.

9.3 Product standard requirements take precedence over guidance provided in Part II.

10 NEC Marking Requirements

10.1 The following is a summary of the required information based on the NEC and NFPA 79. Refer to the referenced standards for complete requirements.

10.1.1 Industrial Control Panel – An industrial control panel includes the following information based on NEC 409.110.

a) **Manufacturer's Information**

The manufacturer's name may be the manufacturer's name, trademark, or other descriptive markings by which the organization responsible for the product can be identified.

b) **Electrical Ratings**

1) Supply voltage

2) Number of phases

3) Frequency

4) Full-load current for each incoming supply circuit. Note that in order to size conductors and overcurrent protection, the full-load current rating of all heating loads, the rating or setting of the largest overcurrent protective device, the full-load current rating of the highest rated motor, and total full-load current ratings of all other connected motors and apparatus based on their duty cycle that may be in operation at the same time.

c) **Disconnecting Means** – Markings are required to indicate that more than one disconnecting means is required to de-energize the equipment as follows:

1) When industrial control panels are supplied by more than one electrical source.

2) Where more than one disconnecting means is required to disconnect all circuits 50-volts or more within the control panel.

3) Documentation is to be provided for the location of the means necessary to disconnect all circuits 50-volts or more.

d) **Short-Circuit Current Rating** – The short-circuit current rating of the industrial control panel is provided based on one of the following:

1) Short-circuit current rating of a listed and labeled assembly

2) Short-circuit current rating established utilizing an approved method. ANSI/UL 508A, Industrial Control Panels, Supplement SB is an example of an approved method.

Note that the short-circuit current rating markings are not required for industrial control panels containing only control circuit components.

e) **Service Equipment** – When the industrial control panel is intended as service equipment, it will be marked to identify it as being suitable for use as service equipment.

f) **Wiring Diagram** – One of the following is to be available:

1) Electrical wiring diagram

2) Identification number of a separate electrical wiring diagram

3) Designation referenced in a separate wiring diagram

g) **Enclosure Type Number** – An enclosure type number is marked on the industrial control panel enclosures as required by NEC 110.28. UL 50E provides definitions for specific enclosure types, their applications, and the environmental conditions for which they are designed to protect against as follows:

1) TYPE 1 – Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts and to provide a degree of protection against ingress of solid foreign objects (falling dirt).

2) TYPE 2 – Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt); and to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing).

3) TYPE 3 – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); and that will be undamaged by the external formation of ice on the enclosure.

4) TYPE 3R – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); and that will be undamaged by the external formation of ice on the enclosure.

5) TYPE 3S – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); and for which the external mechanism(s) remain operable when ice laden.

6) TYPE 3X – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); that provides an increased level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

7) TYPE 3RX – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt); to provide a degree of

protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); that provides an increased level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

8) TYPE 3SX – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, and snow); that provides an increased level of protection against corrosion; and for which the external mechanism (s) remain operable when ice laden.

9) TYPE 4 – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts ; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose-directed water); and that will be undamaged by the external formation of ice on the enclosure.

10) TYPE 4X – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose-directed water); that provides an increased level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

11) TYPE 5 – Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and settling airborne dust, lint, fibers, and flyings); and to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing).

12) TYPE 6 – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts ; to provide a degree of protection against ingress of solid foreign objects (falling dirt) to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, hose-directed water, and the entry of water during occasional temporary submersion at a limited depth); and that will be undamaged by the external formation of ice on the enclosure.

13) TYPE 6P – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts to provide a degree of protection against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, hose-directed water, and the entry of water during prolonged submersion at a limited depth); that provides an increased level of protection against corrosion; and that will be undamaged by the external formation of ice on the enclosure.

14) TYPE 12 – Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and circulating dust, lint, fibers, and flyings); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing); and to provide a degree of protection against light splashing and consequent seepage of oil and non-corrosive coolants.

15) TYPE 12K – Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and circulating dust, lint, fibers, and flyings); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing); and to provide a degree of protection against light splashing and consequent seepage of oil and non-corrosive coolants.

16) TYPE 13 – Enclosures constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection against ingress of solid foreign objects (falling dirt and circulating dust, lint, fibers, and flyings); and to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (dripping and light splashing); and to provide a degree of protection against spraying, splashing, and seepage of oil, and non-corrosive coolants.

10.1.2 **Industrial Machinery (NEC)** – The nameplate includes the following information for each incoming supply circuit provided based on NEC 670.3:

a) Electrical Ratings

1) Supply voltage

2) Number of phases

3) Frequency

4) Full-load current – The nameplate full-load current is provided as follows:

i) Is not less than the sum of the full-load currents required for all motors and other equipment that may be in operation at the same time under normal conditions of use

ii) Where unusual type loads, duty cycles, and so forth require oversized conductors or permit reduced-size conductors, the required capacity is included.

b) **Protective Device Ampere Rating** – Maximum ampere rating of the short-circuit and ground-fault protective device.

c) **Motor Ampere Rating** – Ampere rating of largest motor, from the motor nameplate, or load.

d) **Short-Circuit Current Rating** – The short-circuit current rating is provided for the machine industrial control panel based on one of the following:

1) The short-circuit current rating of a listed and labeled machine control enclosure or assembly.

2) The short-circuit current rating established utilizing an approved method. Supplement SB in UL 508A, provides is an example of an approved method.

e) **Wiring Diagram** – One of the following is to be available.

1) Electrical diagram number(s)

2) Index number of the electrical drawings

10.1.3 **Industrial Machinery (NFPA 79)** – The nameplate includes the following information based on NFPA 79 16.4:

a) **Manufacturer's Information**

1) Name or trademark of supplier

2) Model, serial number, or other designation

b) **Electrical Ratings**

1) Rated voltage

2) Number of phases and frequency (if ac)

3) Full-load current for each supply

i) The full-load current shown on the nameplate will not be less than the full-load currents for all motors and other equipment that can be in operation at the same time under normal conditions of use, design load, and duty cycle.

ii) Where unusual loads or duty cycles require oversized conductors, the required capacity will be included in the full-load current specified on the nameplate.

iii) Where more than one machine supply circuit is provided, the nameplate will state the information for each circuit.

c) **Motor Ampere Rating** – Ampere rating of the largest motor or load.

d) **Protective Device Ampere Rating** – Where provided the maximum ampere rating of the short-circuit and ground-fault protective device is marked.

e) **Short-Circuit Current Rating** of the industrial control panel.

f) **Wiring Diagram** – One of the following is to be available:

1) Electrical diagram number(s)

2) Index number to the electrical drawings

g) **Single Motor or Motor Controller Nameplate** – Where only a single motor or motor controller is used, the motor nameplate may serve as the electrical equipment nameplate where it is visible.

h) **Overcurrent protection provided at machine supply terminals** – When supply conductor and machine overcurrent protection is furnished as part of the machine, the machine is marked with:

1) "Supply conductor and machine overcurrent protection provided at machine supply terminals."

2) A separate nameplate may be used for this purpose.

10.2 **Legibility and Permanence** – A legibly and durably marked permanent nameplate is attached to the control equipment enclosure or machine. The marking or label is of sufficient durability to withstand the environment involved as identified in Part 1 of this document.

10.3 **Location**

a) Plainly visible after installation – The marking for industrial control panels and nameplate for industrial machinery (located on either the control equipment enclosure or machine) is required to be plainly visible after the equipment is installed.

b) Additional identification plate – Where equipment is removed from its original enclosure or is placed so that the manufacturer's identification plate is not easily read, an additional identification plate is to be attached to the machine or enclosure.

11 Certification Marking Requirements

11.1 Required Information

The following is required information based on UL 508A requirements for nameplate markings. The industrial control panel nameplate marking includes:

a) **Manufacturer's Information**

1) Manufacturer's name or authorized designation.

2) Factory identification (a distinctive marking identifying the particular factory if the manufacturer assembles industrial control panels in more than one factory).

b) **Electrical Ratings** – Each source of supply will have the following electrical ratings.

1) Voltage

i) The voltage rating of an industrial control panel not exceeding the voltage rating of any component connected to the source of supply.

ii) When an industrial control panel contains components marked with a slash voltage rating, such as 120/240, 480Y/277, or 600Y/347, the voltage rating of the industrial control panel is:

A) The complete slash voltage rating, when intended for connection to the higher voltage; or

B) Not more than the lower voltage rating.

2) Amperage – Total full-load amperage:

The full-load ampere rating of the panel includes the sum of the ampere ratings of all loads that are able to be operated simultaneously plus the primary ampere rating of all control transformers connected to the input voltage.

3) Ampere or horsepower rating – Of the largest motor (when multiple loads are controlled).

4) Number of phases – When other than single phase.

5) Frequency

c) **Short circuit current rating** of industrial control panel.

d) **Field wiring diagram number** – When load ratings or field wiring information is only included on the diagram.

e) **Enclosure Type rating** for enclosed panels only.

11.2 Location

11.2.1 The following is a summary of the location of required markings from UL 508A. All markings are located so that they are visible after installation of field wiring when a cover or door is opened. This does not apply to markings on a diagram.

11.2.2 The location of the required nameplate for an enclosed industrial control panel are to be visible without opening the door or cover of the enclosure.

11.2.3 An open industrial control panel with a partial or incomplete enclosure, should be provided with a second label so that the user will not be exposed to live parts.

11.2.4 External load ratings are located so they are visible as follows:

a) Without opening the door or cover of the enclosure, or

b) On the door or cover of the enclosure or on the inside walls of the enclosure, or

c) On the field wiring diagram, prints or instructions that are referenced on the nameplate and shipped with the industrial control panel.

11.3 Enclosure Markings

The following is based on UL 508A for enclosure markings.

11.3.1 Multiple enclosures – An enclosed industrial control panel consisting of two or more sections intended to be assembled together in the field will have a marking on each section, "Section ___ of ___, see diagram No. ___ for interconnections" or equivalent wording.

11.4 Methods of Markings

The following is based on UL 508A for the placement of markings. Markings placed on an industrial control panel may be made by:

a) Die-stamping

b) Silk-screening

c) Etching in metal or plastic

d) Indelible ink on adhesive-backed label stock

e) Permanently attached to the industrial control panel by rivets, screws, or adhesive

12 Recommended Practice

12.1 The guidance for markings in Part II does not cover all industrial control panels and industrial machinery. This information does provide a basis for understanding markings for equipment not included in this section. The following are additional industry resources available to aid in understanding nameplate information.

a) Many UL Standards can be viewed online via UL's Free Digital View at https://www.shopulstandards.com/Catalog.aspx. IEC/ISO based standards include only national differences.

b) Certification organizations may provide additional information based on their certification programs. Information such as marking guides, application guides, and product-specific markings may be available on the certification organization's website.

PART III – APPLIANCES

13 Scope

13.1 Part III guidance is provided for appliances to be used in accordance with the National Electrical Code (NEC).

13.2 Part III guidance covers:

a) Appliances for installation in accordance with NEC Article 422. The section currently provides guidance for motor-operated appliances, commercial electric cooking appliances, and electric heating appliances. The guidance does not cover all Article 422 appliances at this time.

b) Appliances certified to UL 73 for motor operated appliances, UL 197 for commercial cooking appliances, and UL 499 for electric heating appliances. The guidance does not cover all appliance standards. Appliances may be certified to International Electrotechnical Commission (IEC) based standards, which are not included at this time.

NOTE: The following standards are provided for informational purposes and are not included in Part III at this time.

a) UL 60335-1 Safety of Household and Similar Electrical Appliances, Part 1: General Requirements

b) UL 60335-2-24 Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers

c) UL 60335-2-34 Household and Similar Electrical Appliances, Part 2: Particular Requirements for Motor-Compressors

d) UL 60335-2-40 Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

e) UL 60335-2-89 Household and Similar Electrical Appliances – Safety – Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor

13.3 Product standard requirements take precedence over guidance provided in Part III.

14 NEC Marking Requirements

14.1 The following is a summary of required nameplate Information based on NEC Article 422. Refer to NEC Article 422 for complete requirements.

14.2 **Appliance Nameplates** – A summary of markings for appliance nameplates are as follows:

a) Manufacturer's Information – Identifying Name

b) Electrical Ratings

1) Volts

2) Amperes or Watts

3) Frequency or Frequencies – Marking is required where the appliance is limited to specific frequencies.

c) Overload Protection

1) Marking is required when motor overload protection is external/separate to the appliance.

2) Non-motor-operated appliances

i) The overcurrent protection for the appliance is required by the NEC not to exceed the overcurrent protection marked on the appliance.

ii) When the appliance is not marked with an overcurrent protection rating, the following applies:

A) If the current rating is 13.3 amps or less, the overcurrent protection is not to exceed 20 amps

B) If the current rating is greater than 13.3 amps, the overcurrent protection is not to exceed 150% of the appliance current rating.

C) For motor-operated appliances, see marking for motors in Part IV.

D) For air conditioning and refrigerating equipment, see marking for HVAC equipment in Part VIII.

d) Additional Markings

1) Appliances that are not factory-equipped with cords and attachment plugs are marked with:

i) The minimum supply circuit conductor ampacity

ii) The maximum rating of the circuit overcurrent protective device

Note these markings apply to appliances consisting of a single motor with other load(s) or consisting of multiple motors with or without other load (s), and where both the minimum supply circuit conductor ampacity and a maximum rating of the circuit overcurrent protective device are not more than 15 amps.

2) An alternative marking method is to specify the:

i) The rating of the largest motor in volts and amperes, and

ii) the additional load(s) in volts and amperes, or volts and watts.

Note that the ampere rating of a motor 1/8 horsepower or less or a nonmotor load 1 ampere or less may be omitted unless such loads constitute the principal load.

e) Heating Elements – Marking for all heating elements that are rated over one ampere, replaceable in the field, and a part of an appliance include:

1) Volts and amperes rating (volts and watts allowed as an alternative), or

2) Manufacturer's part number

f) Horsepower Markings – The horsepower rating on the appliance nameplate is provided as follows:

1) Will not be less than the horsepower rating on the motor nameplate.

2) Will not to be less than the equivalent horsepower of the combined loads. This applies when an appliance consists of multiple motors, or one or more motors and other loads.

14.3 **Legibility and Permanence** – The marking or label should be of sufficient durability to withstand the environment involved.

14.4 **Location** – Marking is located to be visible or easily accessible after installation.

15 Certification Marking Requirements

15.1 Required Information

The following is a summary of the required nameplate Information based on UL 73 for motor operated appliances, UL 197 for electric cooking appliances, and UL 499 for electric heating appliances. For complete requirements, refer to the specific UL standard for the appliance. These UL standards can be viewed online at https://www.shopulstandards.com/Catalog.aspx.

15.2 **Motor-Operated Appliances** – The following markings are a summary of markings required in UL 73. The information provided is for the basic nameplate information and does not address cautionary markings. Refer to UL 73 for complete requirements.

a) **Manufacturer's Information**

1) Manufacturer's Name

i) The name may be the manufacturer's name, trade name, or trademark, or other descriptive marking by which the organization responsible for the product may be identified.

ii) The manufacturer's identification may be in a traceable code if the product is identified by the brand or trademark owned by a private labeler.

2) Catalog number – A distinctive catalog number or the equivalent.

3) Date of manufacture – The date of manufacture may be abbreviated or in a nationally accepted conventional code or a code affirmed by the manufacturer.

b) **Electrical Ratings**

1) Volts

2) Amperes – An appliance may be rated in watts instead of amperes if:

i) The full-load power factor is 0.80 or more or

ii) The rating of a cord-connected appliance is 50 W or less.

2) Number of phases if an appliance is intended for use on a polyphase circuit.

3) Frequency

i) Expressed in Hertz, Hz, cycles-per-second, cps, cycles/second, c/s, ac-dc, or ac only.

ii) The frequency may be expressed as _____/dc – for example, 60/dc – if a universal motor nameplate serves as the appliance rating marking.

4) Horsepower

i) If a permanently connected appliance is marked with a horsepower (hp) rating, the rating will not be less than the marked horsepower rating of the motor.

ii) If the appliance employs multiple motors, or one or more motors and other loads, the marked horsepower rating of the appliance will not less than the equivalent horsepower of the combined loads.

iii) The total load is calculated in accordance with NEC 422.62(A).

c) **Single Motor Appliance** – An appliance with a single motor as its only electrical-energy-consuming component with the motor's nameplate is readily visible after the motor has been installed in the appliance is not required to show the electrical rating given on the motor nameplate elsewhere on the appliance.

d)**Dual-Voltage Motor Appliance** – If the motor nameplate of a dual-voltage motor is employed to give the electrical rating of the appliance, the appliance will be additionally marked to indicate the voltage which it was connected when shipped from the factory.

15.3 **Commercial Electric Cooking Appliances** – The following markings are a summary of markings required in UL 197. Refer to UL 197 for complete requirements. For a bank or stack of appliances, each appliance is provided with a separate, individual nameplate. The following does not address cautionary markings.

a) **Manufacturer's Information**

1) Manufacturer's name

i) Trade name, trademark, or other descriptive markings by which the organization responsible for the product is capable of being identified.

ii) Manufacturer's identification may be a traceable code.

2) Catalog number or the equivalent

3) Date or dating period of manufacture – The date of manufacture may be abbreviated or in a nationally accepted conventional code or a code affirmed by the manufacturer.

b) **Electrical Ratings**

1) Volts

i) The voltage rating is in accordance with any appropriate single voltage or range of voltages such as 110 – 120, 120/208Y, 220 – 240, 120/240, 277/480Y, 254 – 277, 416, 440 – 480, 550, 575, and 600.

ii) Equipment with a potential considered less than 150 volts:

A) A nominal voltage rating of 120/208Y, 120/240, 120/208Y, 208 volt single or three phase, or a 120/240 appliance is considered to involve a voltage to ground of less than 150 volts.

B) Equipment marked: “Do not connect to a circuit operating at more than 150 volts to ground” or with equivalent wording includes:

I) Two-wire, 220 – 240 volt cord-connected appliances intended for connection to a circuit operating at 150 volts or less to ground.

II) Three-wire, three-phase, 220 – 240 volt cord-connected appliances intended for connection to branch-circuit conductors operating at 150 volts or less to ground. The marking identifies the plug pins that are to be supplied by circuit conductors of 150 volts or less to ground.

III) Two-wire, 220 – 240-volt permanently-connected appliance intended for connection to a circuit operating at 150 volts or less to ground.

IV) Three-wire, three-phase, 220 – 240-volt permanently connected appliance intended for connection to branch-circuit conductors operating at 150 volts or less to ground. The marking identifies the leads or terminals that are to be supplied by circuit conductors of 150 volts or less to ground.

iii) Equipment with a potential considered greater than 150 volts:

A) A two-wire, single-phase, or a three wire, three-phase appliance with a rating in the range from 220 – 240 volts is assumed to involve a potential to ground of more than 150 volts.

2) Amperes or watts (rated power)

i) The current rating of each individual ungrounded supply conductor is stated separately (for example, L1: ___ amperes, L2: ___ amperes) when the input currents of different ungrounded supply conductors vary sufficiently to require overcurrent protection or supply wiring different from that which would be calculated assuming a balanced load.

A) The current ratings of the individual ungrounded supply conductors are not required to be stated separately when:

I) The appliance is rated in watts and the maximum ampere rating (the maximum current drawn from any individual ungrounded supply conductor) is specified; and

aa) All ungrounded supply conductors were protected by protective devices rated in accordance with the maximum ampere rating given; or

bb) the appliance is marked to specify the use of a protective device with a specific rating.

ii) For appliances with a general use outlet, the rated power takes into account the added load by a general use attachment plug receptacle.

A) The attachment plug receptacle is marked with the load, in amperes or watts, on or adjacent to the receptacle where it is clearly visible to the user when plugging in an attachment plug to the receptacle.

B) Note that a receptacle intended only for the connection of a part of the appliance or a specific accessory or accessories is marked to specify the part, accessory or accessories to be connected. The marking includes the model number(s) of the accessory or accessories, or the maximum electrical ratings.

iii) For appliances with an accessory or accessories, the rated power takes into account the added load that may be imposed on an appliance and its supply connections by an accessory or accessories.

An electrical accessory intended for field installation in or on an appliance is marked with the name or identifying symbol of the manufacturer or private labeler, with a catalog number or equivalent with which it is intended to be used. The appliance is marked to indicate the catalog number or equivalent designation of such an accessory and the name of the manufacturer or private labeler of that accessory.

iv) For appliances with resistive heating elements, the rated power is not be less than the sum of the rated power of any resistive heating elements that operate simultaneously during any condition of normal use. The rated current of an appliance is not be less than the sum of the calculated currents (rated power divided by rated voltage) of any resistive heating elements that operate simultaneously during any condition of normal use.

Note that when under normal conditions of use, a heating element is operated at a voltage different from its rated voltage, the power or current rating of that element is adjusted in accordance with the standard.

v) For appliances with two power supply cords provided, the electrical rating for each cord is provided on the appliance. Under specified conditions, the total electrical rating may appear on the appliance as follows:

ELECTRICAL RATING
Warmer 120 V, 10 A, 1200 W*, 60 Hz
Refrigerator 120 V, 7 A, 60 Hz
Total 120 V, 17 A, 60 Hz
* Wattage rating is not required

vi) A product, for commercial and professional use, that contains two power supply cords will be marked appropriately:

A) “CAUTION – This unit has two power supply cords. Unplug both cords before moving or servicing this appliance,”

B) “CAUTION – This Product has Two Power Supply Cords. Connect Each Plug to a Receptacle that is Connected to an Individual Branch Circuit,” or

C) “CAUTION – This product has two power supply cords. Connect each plug to a receptacle that is connected to an individual branch circuit. Unplug both cords before moving or servicing this appliance.”

3) Phases

i) Number of phases when the appliance is designed for use on a polyphase circuit.

ii) Include a “Y” in the voltage rating (such as 208Y, 480Y) when intended for a 3-phase 4 wire “Y” connection.

4) Frequency

i) An appliance may be rated ac, when it does not contain a component such as a motor, relay coil, or other control device for which a specific frequency rating is required.

ii) An appliance intended for alternating current only or direct current is rated accordingly.

c) **Current-carrying power supply conductors** (number of)

1) When the appliance is designed for use on a circuit with more than two current-carrying conductors.

2) The number of current-carrying power supply conductors includes both ungrounded and grounded supply conductors and does not include the equipment grounding conductor.

d) **Permanently Connected Appliances** – A permanently connected appliance having one motor and other loads, or more than one motor with or without other loads, are marked with either:

1) The minimum supply-circuit conductor ampacity and maximum rating and type of supply-circuit overcurrent-protective device. Note that this does not apply if both the minimum circuit size and maximum rating of the circuit overcurrent-protective device are not more than 15 amperes.

2) The rating of the largest motor in volts and amperes, and the additional load in volts and amperes, or volts and watts. Note that the ampere rating of a motor rated 1/8 horsepower (94 W output) or less or a nonmotor load of 1 ampere or less may be omitted unless the loads constitute the principal load.

e) **Individual Branch Circuit** – Appliances may be marked “For use on individual branch circuit only” or the equivalent.

f) **Branch Circuit Overcurrent Device** – Appliances may be marked to indicate the maximum branch circuit overcurrent protective device current rating. When the marked overcurrent protective device current rating is 20 amperes or less, the marking indicates that the appliance is to be connected to a dedicated branch circuit.

15.4 **Electric Heating Appliances** – The following markings are a summary of markings required in UL 499. Refer to UL 499 for complete requirements. The following markings do not address cautionary markings.

a) **Manufacturer's Information**

1) Manufacturer’s name

i) Manufacturer’s name, trade name, trademark, or other descriptive marking by which the organization responsible for the product may be identified.

ii) Heating appliances produced or assembled at more than one factory; each finished product will have a distinctive marking – which may be in code – by which it may be identified as the product of a particular factory.

2) Catalog number or the equivalent

b) **Electrical Ratings**

1) Volts

i) A product intended for use on alternating current only or direct current will be marked.

ii) The voltage rating will provide any appropriate single voltage or range of voltages, such as 100 – 120, 208, 220 – 240, 254 – 277, 416, 440– 480, 550, 575, and 600.

2) Amperes, volt-amperes, or watts

3) Phases – The heating appliance is marked with the number of phases if the product is constructed for use on a polyphase circuit.

4) Frequency – The heating appliance is marked with the frequency if necessary, because of motors, relay coils, or other control devices.

c) **Permanent Connection** – A heating appliance having provision for permanent connection to the electrical supply and incorporating a motor load of more than 1/20 hp will be marked with the motor load in amperes and volts.

d) **Attachment-Plug Receptacle** – When a heating appliance includes an attachment-plug receptacle that is not intended as a disconnecting means for any part of the product or necessary accessory, and that serves as a general-use outlet, the added load that the receptacle imposes on the product and its supply connections – not less than 660 W or 6 A – is taken into consideration in determining the electrical rating of the product.

e) **Liquid-Heating Appliances**

1) A liquid-heating appliance in which live parts are in contact with the liquid will be rated for alternating current only.

2) The rating of a liquid-heating appliance of the immersed-electrode type may include a current or wattage range to indicate the general variations that may be anticipated when the product is used with water of different conductivity.

f) **Individual Heating Element** – Each individual heating element or unit that is a part of a heating appliance and that is replaceable in the field is marked with its electrical ratings in amperes or watts, and also in volts, or with the manufacturer's part number.

g) **Location or Position of Appliance** – A heating appliance whose acceptable performance depends upon its proper location or position is marked – such as "top" and "bottom"– to indicate the way in which it is to be installed or used, unless such position is obvious.

h) **Wire Size and Temperature Rating** – The product is marked" For supply connections use ___ AWG or larger wires suitable for at least ___°C (___°F)" or with an equivalent statement.

1) If a temperature higher than 60°C (140°F) during normal temperature testing is attained inside the terminal box or wiring compartment of a permanently connected heating appliance where field-installed conductors are intended to be connected.

2) This wording will be located at or near the point where the supply connections are to be made and is located to be clearly visible during installation and examination of the supply-wiring connections.

15.5 **Legibility and Permanence**

a) General Requirements

1) An appliance is required to be plainly and permanently marked.

2) The permanently connected nameplate is to be readily visible after installation.

b) Requirements Specific to UL 197 for commercial electric cooking appliances.

1) A permanent marking is to be located on a part that is not removable without the use of tools or on a part that cannot be removed without impairing the operation of the filter.

2) The marking may be molded, die-stamped, paint-stenciled, stamped or etched on metal, or indelibly stamped on pressure-sensitive labels secured by adhesive.

3) Pressure-Sensitive Labels

i) Pressure-sensitive labels are rated for the maximum temperature and type of surface to which the label is applied and is to be suitable for occasional exposure to cooking oil.

ii) Pressure-sensitive labels secured by adhesive are tested to, UL 969 or the testing requirements in UL 197.

iii) A pressure-sensitive label is tested in accordance with UL 197 or tested for exposure to cooking oil at 200°C in accordance with UL 969 when:

A) Used on an appliance that employs oil or grease in its normal cooking operation.

B) Required to be permanent.

C) Not located inside the enclosure or otherwise shielded from spillage of hot oil.

iv) Pressure-sensitive labels exposed to unusual service conditions are tested in accordance with UL 197 or evaluated for the intended service conditions in accordance with UL 969.

16 Recommended Practice

The guidance for markings in Part III does not cover all appliances. This information does provide a basis for understanding markings for appliances not included in Part III. Additional industry resources are available to aid in understanding nameplate information. The following are a list of a few of these resources.

a) UL Standards can be viewed online via UL's Free Digital View at https://www.shopulstandards.com/Catalog.aspx. IEC/ISO based standards include only national differences.

b) Many certification organizations may provide additional information based on their certification programs. Information such as marking guides, application guides, and product-specific markings may be available on the certification organization's website.

PART IV – MOTORS, MOTOR CIRCUITS, AND CONTROLLERS

17 Scope

17.1 Part IV guidance is provided for motors, motor circuits, and controllers used in accordance with the National Electrical Code (NEC).

17.2 Part IV guidance covers:

a) Motors, motor circuits, and controllers for installation in accordance with NEC Article 430.

b) Motors, motor circuits, and controllers certified to UL 1004-1, UL 508, or UL 60947-4-1.

17.3 Product standard requirements take precedence over guidance provided in Part IV.

18 NEC Marking Requirements

18.1 **General** – The following guidance for marking on motors and multimotor equipment is based on NEC Article 430 for Motors, Motor Circuits, and Controllers, which covers motors, motor branch-circuit, and feeder circuit conductors and their protection, motor overload protection, motor control circuits, motor controllers, and motor control centers.

18.2 **Motors and Multimotors** – A motor is marked with the following information on a visible nameplate. For typical motor applications the motor will be marked based on NEC 430.7 as follows:

a) **Manufacturer's Information** – Manufacturer's Name

b) **Electrical Ratings**

1) Rated volts

2) full-load current

3) Number of phases if an ac motor

4) Rated frequency

5) Rated full-load speed

6) Secondary volts and full-load current (if a wound-rotor induction motor)

7) Field current and voltage for dc excited synchronous motors

8) Rated horsepower (if 1/8 hp or more)

c) **Rated temperature rise** – Or insulation system class and rated ambient temperature.

d) **Time rating** – The time rating will be 5, 15, 30, or 60 minutes, or continuous.

e) **Code letter or locked-rotor amperes** (if ac motor rated 1/2 hp or more). Code letters are provided in NEC Table 430.7(B).

f) **Design Letter** for design B, C, or D motors where:

1) A Design B motor is a squirrel-cage motor designed to withstand full-voltage starting, developing locked-rotor, breakdown, and pull-up torques adequate for general applications, drawing locked-rotor current not to exceed the design values, and having a slip at rated load of less than 5 percent.

2) A Design C motor is a squirrel-cage motor designed to withstand full-voltage starting, developing locked-rotor torque for special high-torque applications, pull-up torque, breakdown torque, with locked-rotor current and having a slip at rated load of less than 5 percent.

3) A Design D motor is a squirrel-cage motor designed to withstand full-voltage starting, developing high locked rotor torque, locked-rotor current, and having a slip at rated load of 5 percent or more.

g) **Winding** – A dc motor is marked as one of the following. Note that fractional horsepower dc motors 175 mm (7 in.) or less in diameter are not required to be marked.

1) Straight shunt (Typically marked as shunt on the nameplate.)

2) Stabilized shunt (Typically marked as shunt on the nameplate.)

3) Compound

4) Series

h) **Thermally protected**

1) A Thermally protected motor will be marked “thermally protected”.

2) Thermally protected motors rated 100 watts or less can use the abbreviated marking “TP”.

i) **Impedance-protected**

1) Motors that are impedance-protected are marked “impedance protected”.

2) Impedance-protected motors rated 100 watts or less may use the abbreviated marking “ZP”.

j) **Condensation prevention heaters** – Motors equipped with electrically powered condensation prevention heaters will be marked with:

1) Rated heater voltage

2) Number of phases

3) Rated power in watts

k) **Electronically protected** – Motors that are electronically protected from overloads will be marked “electronically protected” or “EP”.

18.3 **Multimotor and Combination-Load Equipment, Factory-Wired**

In addition to the applicable markings defined in 18.2, multimotor and combination-load equipment will be marked with the minimum supply current conductor ampacity and the maximum ampere rating of the circuit short-circuit and ground-fault protective device. This is based on NEC 430.7.

18.4 **Controllers** – Marking on controllers based on are based on NEC 430.8 are shown as follows:

a) **Manufacturer’s Information** – Manufacturer's name or identification

b) **Electrical Ratings**

1) Rated voltage

2) Rated current or horsepower rating

3) Short-circuit current rating

c) **Other** – Other necessary data to properly indicate the applications for which it is suitable.

19 Certification Marking Requirements

19.1 **General Information** – The following summary of markings is based on UL 1004-1 for rotating electrical machines.

19.1.1 **Markings**

a) **Manufacturer's Information**

1) Manufacturer's name or identification

2) Machine catalog or model number

b) **Electrical Ratings**

1) Rated voltage

2) Full-load amperes – Watts or kilowatts, or both.

3) Phases – Number of phases for a machine intended for use on a polyphase circuit if greater than 1.

4) Rated frequency – Rated frequency may be expressed in one of the following terms:

i) hertz (Hz)

ii) ac-dc

iii) (frequency in Hz)/dc (for example, 60/dc)

iv) ac only – or direct current

5) Rated horsepower- Or output wattage if over 100 W (1/8 hp)

i) Note that a fractional horsepower air-over motor is not required to be marked to indicate output horsepower or wattage.

ii) Note that generators may be marked with kVA when additionally marked with the intended Power Factor (PF) rating of the machine.

6) Rated speed

7) Temperature rise – Rated temperature rise or the insulation system class.

8) Ambient temperature rating – If other than 40°C (104°F).

c) **Continuous Duty** – "Continuous" or "CONT" for continuous duty motors only.

d) **Winding Type for DC Motors** – The motor will be marked straight shunt, stabilized shunt, compound, or series. Note that straight shunt and stabilized shunt are typically marked as shunt on the nameplate.

e) **Service Factor** – Rated service factor for motors intended to be operated without a dedicated drive, where the service factor exceeds 1.0 will be marked with a service factor.

19.1.2 **Legibility and Permanence**

a) Markings are to be permanent. Ordinary usage, handling, storage, and the like of a machine are to be considered in the determination of the permanence of a marking.

b) The marking should present the required information clearly and legibly under conditions of intended use and user servicing of the product. Markings are to be:

1) Molded, die-stamped, paint-stenciled, stamped, or

2) Etched metal that is permanently secured, or

3) Indelibly stamped lettering on a pressure-sensitive label. The pressure-sensitive label or a label that is secured by cement or adhesive and that is required to be permanent will comply with the Standard for Marking and Labeling Systems, UL 969.

19.2 Contactors and Motor Starters – The following markings are based on UL 508 for industrial controls, and UL 60947-4-1 for switchgear and control gear. The following is a summary of the marking requirements based on these standards.

19.2.1 **Markings**

a) Manufacturer's name, trademark, or other descriptive marking

b) Electrical ratings

c) Catalog number or equivalent

19.2.2 **Legibility and Permanence** – Any markings that are required to be permanent will be:

a) Molded, die-stamped, paint-stenciled, stamped, or

b) Etched metal that is permanently secured, or

c) Indelibly stamped lettering on a pressure-sensitive label secured by adhesive.

d) Ordinary usage, handling, storage, and the like of a product is to be considered in the determination of the permanence of a marking.

19.3 **Adjustable Speed Electrical Power Drive Systems** – The following summary of markings is based on UL 61800-5-1 for adjustable speed power drives. For the complete marking requirements refer to UL 61800-5-1.

19.3.1 **Markings**

a) Manufacturer's name, trademark, or other descriptive marking

b) Electrical ratings. Note these electrical ratings of the drive are used to comply with NEC 430.122 for minimum size and ampacity.

c) Catalog number or equivalent

19.3.2 **Legibility and Permanence** – Ordinary usage, handling, storage, and the like of a product will be considered in the determination of the permanence of a marking in accordance with the, UL 969 for marking and labeling systems. Markings may be:

a) Molded, die-stamped, paint-stenciled, stamped, or

b) Etched metal that is permanently secured, or

c) Indelibly stamped lettering on a pressure-sensitive label secured by adhesive.

20 Recommended Practice

20.1 **Recommended Nameplate Properties**

a) **Legible Nameplate** – The marking should present the required information clearly and legibly under conditions of intended use and user servicing of the product.

b) **Permanently Marked**

1) Ordinary usage, handling, storage, and the like of a machine should be considered in the determination of the permanence of a marking.

2) Markings may be molded, die-stamped, paint-stenciled or stamped.

3) Markings may be etched metal that is permanently secured.

4) Markings that are indelibly stamped lettering on a pressure-sensitive label or a label that is secured by permanent cement or adhesive should comply with UL 969 for marking and labeling systems.

20.2 **Recommended Nameplate Information**

a) **Manufacturer's Information**

1) **Manufacturer's identification** – Manufacturer's name or identification that identifies the organization responsible for the product.

2) **Machine catalog or model number**

b) **Electrical Ratings**

1) **Rated voltage**

2) **Full-load amperes** – Watts or kilowatts, or both.

3) **Phases** – Number of phases for a machine intended for use on a polyphase circuit if greater than 1.

4) **Rated frequency** – Expressed in one of the following terms: hertz, Hz, ac-dc, (frequency in Hz)/dc (for example, 60/dc), or ac only – or direct current.

5) **Rated horsepower** or output wattage if over 100 W (1/8 hp).

i) A fractional horsepower air-over motor is not required to be marked to indicate output horsepower or wattage.

ii) Generators may be marked with kVA when additionally marked with the intended Power Factor (PF) rating of the machine.

6) **Rated speed**

7) **Rated temperature rise** or the insulation system class.

8) **Rated ambient temperature** if other than 40°C (104°F).

PART V – HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

21 Scope

21.1 Part V guidance is provided for heating, ventilation, and air conditioning (HVAC) installed in accordance with the National Electrical Code (NEC). The section currently contains guidance for hermetic refrigerant motor-compressors, which includes systems such as split systems with air conditioning outdoors and a remote fan coil unit on the inside and where the system's fan coil consists of a gas heat section or electric heat section. This section also includes multimotor and combination-load equipment, which is typically installed for larger commercial systems and includes components such as chillers, boilers, air handlers, variable air volume (VAV) system, and powered induction units (PIU).

21.2 Part V guidance covers:

a) HVAC for installation in accordance with NEC Article 440.

b) HVAC certified to UL 60335-2-40.

21.3 Product standard requirements take precedence over guidance provided in Part 5.

22 NEC Marking Requirements

The following is a summary of required nameplate Information based on NEC Article 440. For complete requirements, refer to NEC Article 440.

22.1 **Hermetic Refrigerant Motor-compressor Nameplates** – A summary of markings for hermetic refrigerant motor-compressor nameplates are as follows:

a) **Manufacturer's Information** – The manufactures identification may be one of the following:

1) Manufacturer's name

2) Trademark

3) Symbol