



UL 921

STANDARD FOR SAFETY

Commercial Dishwashers

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UL Standard for Safety for Commercial Dishwashers, UL 921

Seventh Edition, Dated March 23, 2016

Summary of Topics

The seventh edition of the Standard for Commercial Dishwashers, UL 921, includes the addition of Supplement Section for Commercial Dishwashers Incorporating Self-Contained Condensing Systems

The new requirements are substantially in accordance with Proposal(s) on this subject dated October 2, 2015.

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CSA Group
CSA C22.2 No. 168-16
Second Edition



CSA America
ANSI Z83.21-2016
Second Edition



Underwriters Laboratories Inc.
UL 921
Seventh Edition

Commercial Dishwashers

March 23, 2016



ANSI/UL 921-2016

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This Standard is subject to periodic review, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquires@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Seventh Edition including revisions through March 23, 2016. The most recent designation of ANSI/UL 921 as an American National Standard (ANSI) occurred on March 23, 2016. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

The Department of Defense (DoD) has adopted UL 921 on June 18, 1992. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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PREFACE

This is the common CSA Group, and UL standard for Commercial Dishwashers. It is the Second edition of CSA C22.2 No. 168, the Second edition of ANSI/ CSA Z83.21, and the Seventh edition of UL 921. This edition of CSA C22.2 No. 168, ANSI/ CSA Z83.21, supersedes the previous edition published in 2006. This edition of UL 921 supersedes the previous edition(s) published on January 31, 2006.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Z83/CSA Joint Technical Subcommittee on Standards for Gas Food Service Equipment, and representatives of the commercial dishwasher industry in Canada and the United States for developing this harmonized standard are gratefully acknowledged.

Major changes in this edition are the addition of Supplement SA – COMMERCIAL DISHWASHERS SELF-CONTAINED CONDENSING SYSTEMS, updating the reference documents and reformatting to latest editorial guidelines.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the Z83/CSA Joint Technical Subcommittee on Standards for Gas Food Service Equipment under the jurisdiction of the Technical Committee on Performance and Installation of Gas Burning Appliances and Related Accessories and the Strategic Steering Committee on Standards for Gas Burning Appliances and Related Accessories, and has been formally approved by the Z21/83 and CSA Technical Committees, American National Standards Institute, and the Interprovincial Gas Advisory Council.

This standard was also reviewed by the CSA Subcommittee on Electrical Motor-Operated Cleaning Appliances for Commercial Use, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products, the CSA Strategic Steering Committee on requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of Harmonization

This standard is published as an identical standard for CSA Group and UL.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

Reasons for Differences From IEC

There is no corresponding IEC standard.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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Commercial Dishwashers

1 Scope

1.1 This Standard covers commercial, freestanding, under-counter, and counter-insert dishwashers, utensil-washers, and glass washers using water as the principal cleaning medium, hereafter referred to as dishwashers. These dishwashers utilize steam, gas, or electric heaters for heating the water. Heated water is provided to a dishwasher by means of steam, gas, or electric heating systems integral to the appliance, or by means not integral to the dishwasher that is provided at the installation site.

1.2 This Standard covers:

- a) electric dishwashers rated 600 V or less, installed in accordance with the Canadian Electrical Code (CEC), Part 1, CSA C22.1, and the National Electrical Code (NEC), NFPA 70; and
- b) the gas-handling, gas-burning, and gas-control features of gas-fired dishwashers having inputs of 400,000 Btu (420 MJ) per hour or less, limited to 0.5 psig (3.45 kPa) inlet pressure, installed in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, the International Fuel Gas Code, ICC IFGC, or the Natural Gas and Propane Installation Code, CSA B149.1 for use with:
 - 1) natural gas;
 - 2) manufactured gas;
 - 3) mixed gas;
 - 4) propane gas;
 - 5) liquefied petroleum gases; or
 - 6) LP gas-air mixtures.

1.3 These requirements cover dishwashers intended for use in commercial establishments, such as kitchens of restaurants and hospitals, where they are not intended to be accessible to the public.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard. A component shall comply with the CSA, UL, and ANSI standards as appropriate where the product is to be used.

2.1.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.1.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.2 Units of measurement

2.2.1 The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

2.3 Reference publications

2.3.1 Products covered by this standard shall comply with the reference installation codes and standards noted in this clause. For undated references to standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this standard was approved. For dated references to standards, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the standard was approved.

CSA Group Standards

B149.1-15

Natural Gas and Propane Installation Code

C22.1-15

Canadian Electrical Code (CEC), Part 1

C22.2 No. 0-10 (R2105)

General Requirements – Canadian Electrical Code (CEC), Part II

C22.2 No. 0.15-15

Adhesive Labels

CAN/CSA-C22.2 No. 0.17-00 (R2013)

Evaluation of Properties of Polymeric Materials

CSA C22.2 No. 8-13

Electromagnetic Interface (EMI) Filters

C22.2 No. 14-13

Industrial Control Equipment

CSA C22.2 No. 24-15

Temperature-Indicating and Regulating Equipment

CSA C22.2 No. 55-15

Special Use Switches

C22.2 No. 66.3-2006 (R2011)

Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers

CSA C22.2 No. 77-14
Motors with Inherent Overheating Protection

C22.2 No. 100-14
Motors and Generators

C22.2 No. 156-M1987 (R2013)
Solid-State Speed Controls

C22.2 No. 209-M1985 (R2013)
Thermal Cut-Offs

C22.2 No. 248.1-11
Standard for Low-Voltage Fuses – Part 1: General Requirements

CAN/CSA C22.2 No. 248.14-00 (R2015)
Standard for Low-Voltage Fuses – Part 14: Supplemental Fuses

CAN/CSA-C22.2 No. 61058-1-09 (R2014)
Switches for appliances - Part 1: General requirements

CAN/CSA-E60730-1-13
Automatic electrical controls for household and similar use - Part 1: General requirements

CAN/CSA-E60730-2 series of Standards
Automatic Electrical Controls for Household and Similar Use – Part 2: Particular Requirements

UL¹ Standards

UL 94
Standard for Test for Flammability of Plastic Materials for Parts in Devices and Appliances

UL 244A
Standard for Solid-State Controls for Appliances

UL 248-1
Standard for Low-Voltage Fuses – Part 1: General Requirements

UL 248-14
Standard for Low-Voltage Fuses – Part 14: Supplemental Fuses

UL 353
Standard for Limit Controls

UL 372
Automatic Electrical Controls for Household and Similar Use – Part 2: Particular Requirements for Automatic Burner Ignition Systems and Components

UL 429
Standard for Electrically Operated Valves

UL 508
Standard for Industrial Control Equipment

UL 508C

Standard for Power Conversion Equipment

UL 723

Standard for Tests for Surface Burning Characteristics of Building Materials

UL 795

Standard for Commercial-Industrial Gas Heating Equipment

UL 873

Standard for Temperature-Indicating and -Regulating Equipment

UL 969

Standard for Marking and Labeling Systems

UL 1004-1

Standard for Rotating Electrical Machines – General Requirements

UL 1004-2

Standard for Impedance Protected Motors

UL 1004-3

Standard for Thermally Protected Motors

UL 60691

Standard for Thermal-Links – Requirements and Application Guide

UL 1449

Standard for Transient Voltage Surge Suppressors

UL 5085-3

Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers

UL 60730-1

Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements

UL 60730-2-5

Automatic Electrical Controls for Household and Similar Use - Part 2: Particular Requirements for Automatic Burner Ignition Systems and Components

UL 61058-1

Standard for Switches for Appliances – Part 1: General Requirements

ULC² Standards

CAN/ULC S102-2010

Standard for Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies

ANSI³ Standards

ANSI/ASTM E230/E230M

Standardized Thermocouples

ANSI Z21.15-2009/CSA 9.1-2009 (R2014)
Manually-Operated Gas Valves for Appliances Appliance Connector Valves, and Hose End Valves

ANSI Z21.18-2007/CSA 6.3-2007 (R2012)
Gas Appliance Pressure Regulators

ANSI Z21.20-2014/CAN/CSA-22.2 No. 60730-2-5-14
Automatic Electrical Controls for Household and Similar Use – Part 2: Particular Requirements for Automatic Burner Ignition Systems and Components

ANSI Z21.21-2015/CSA 6.5-2015
Automatic Valves for Gas Appliances

ANSI Z21.22-2015/CSA 4.4-2015
Relief Valves for Hot Water Supply Systems

ANSI Z21.23-2000
Standard for Gas Appliance Thermostats

ANSI Z21.35-2005/CSA 6.8-2005
Pilot Gas Filters

ANSI Z21.78-2010/CSA 6.20-2010
Combination Gas Controls for Gas Appliances

ASME⁴ Standards

ANSI/ASME B36.10M-2004
Welded and Seamless Wrought Steel Pipe

ANSI/ASME B1.20.1-2013
Standard for Pipe Threads, General Purpose (Inch)

ASTM⁵ Standards

F1696-14
Standard Test Method for Energy Performance of Single-Rack, Door-Type Commercial Dishwashing Machines

F1704-12
Standard Test Method for Capture and Containment Performance of Commercial Kitchen Exhaust Ventilation Systems

F1920-11
Standard Test Method for Performance of Rack Conveyor, Commercial Dishwashing Machines

F2474-14
Standard Test Method for Heat Gain to Space Performance of Commercial Kitchen Ventilation/Appliance Systems

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ICC⁶ Standards

ICC IFGC-2009
International Fuel Gas Code

NFPA⁷ Standards

ANSI Z223.1/NFPA 54-2015
National Fuel Gas Code

NFPA 70-2014
National Electrical Code (NEC)

ANSI/NFPA 96-2014
Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

ANSI/NFPA 211-2013,
Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

¹Underwriters Laboratories Inc.

² Underwriters Laboratories of Canada

³American National Standards Institute

⁴ American Society of Mechanical Engineers

⁵American Society for Testing and Materials

⁶International Code Council

⁷ National Fire Protection Association

2.4 General requirements

In Canada, general requirements as indicated in the Canadian Electrical Code, Part II, General Requirements CSA C22.2 No. 0, are applicable.

3 Definitions

3.1 For the purpose of these requirements the following definitions apply.

3.2 **Accessible, Readily** – Capable of being reached easily and quickly without the use of tools for operation, adjustment, and inspection.

3.3 **Air-circulating blower**– A complete blower assembly, including the blower wheel or fan, the blower housing, and the motor used to provide the means for circulating the air.

3.4 **Automatic gas ignition system** – A system intended to ignite and reignite an appliance burner(s). Such systems are intended to:

- a) automatically ignite gas at the main burner, or gas at the pilot burner so that the pilot ignites the main burner;
- b) prove the presence of either the ignition source, the main burner flame, or both; and

c) automatically act to shut off the gas supply to the main burner or pilot burner and the main burner, when the supervised flame or ignition source is not proved.

3.5 Automatically controlled dishwasher – A dishwasher or a unit of a system for which energization of a motor, a solenoid, a magnet, or similar component occurs without manual intervention. Automatic control also occurs during any single predetermined cycle of operation, when automatic changing of the mechanical load reduces the speed of a motor so that starting-winding connections to the branch circuit are reestablished.

3.6 Auxiliary control– A control intended primarily for the regulation of time, temperature, pressure, or operations under conditions of normal operation, and is not intended to address abnormal conditions such as overload or above maximum normal operating temperatures resulting from abnormal operation.

3.7 Barrier– A partition for the insulation or isolation of electric circuits, for the isolation of electric arcs, or for the isolation of moving parts or hot surfaces. In this respect, a barrier can serve as a portion of an enclosure and as a functional part.

3.8 Continuous-duty motor – A motor that, under any intended condition of use, is intended to operate unattended and under load for 3 hours or more.

3.9 Cord-connected dishwasher– A dishwasher that is connected to the electrical supply by a power-supply cord or cord set.

3.10 Factory-wired – The installation of wiring or wiring harnesses on or in the equipment in the factory.

3.11 Field-wired – The wiring or wiring harnesses which are connected to the equipment in the field.

3.12 Field wiring terminal – A terminal to which a power supply or control connection is made in the field when the dishwasher is installed.

3.13 Igniter– A device that utilizes electrical energy to ignite gas at a pilot or main burner.

3.14 Internal wiring– Wiring that is interconnecting beyond the point where the power-supply cord of a cord-connected dishwasher enters the enclosure, or beyond the wiring terminals or leads for power-supply connection of a fixed dishwasher.

3.15 Gas ignition device– A device, either a pilot or an igniter, for igniting gas at a burner.

3.16 Extra-low voltage circuit– A circuit having an open-circuit potential of not more than 30 V, ac or dc, or 42.4 V peak ac supplied by a primary battery, by a standard Class 2 transformer, or by a combination of a transformer and a fixed impedance that, as a unit, complies with all performance requirements for a Class 2 transformer. A circuit derived from a line-voltage circuit by connecting a resistance in series with the supply circuit as a means of limiting the voltage and current is not an extra-low voltage circuit.

3.17 Line-voltage circuit – A circuit having a potential of not more than 600 V and having circuit characteristics in excess of those of a low-voltage circuit.

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3.18 Multi-flame pilot burner— A pilot burner that produces a single flame with variation in contour under minimum pilot conditions.

3.19 Operational maintenance — Any operation, accessible without the use of tools, that can be performed by other than authorized maintenance personnel for the equipment. The following service functions which require the use of tools to perform are not considered operational maintenance:

- a) resetting of overload devices and primary safety controls;
- b) repeated adjustment of timers; and
- c) replacement of fuses.

3.20 Permanently connected dishwasher — A dishwasher that is connected to the electrical supply by means of conduit, armored cable, or non-metallic sheathed cable.

3.21 Pilot— A gas flame utilized to ignite the gas at a main burner.

3.22 Pressure-relief device— A pressure-actuated valve or rupture member constructed to automatically relieve pressures above normal operating pressures.

3.23 Pressure-relief valve— A pressure-actuated valve held closed by a spring or other means and constructed to automatically relieve pressure in excess of its setting.

3.24 Recessed dishwasher— A dishwasher that is intended:

- a) to be supported by the floor;
- b) to rest against a wall in the rear;
- c) to rest against a wall, a cabinet, or another dishwasher on one side; and
- d) to rest against a cabinet or another dishwasher on the other side.

Installation configurations include a countertop covering the dishwasher and the adjacent cabinets and appliances. A recessed dishwasher is not intended for permanent attachment to the building structure or to adjacent cabinets or dishwashers.

3.25 Remotely controlled— A dishwasher or a unit of a system that is out of sight of an operator who is at the device by which the dishwasher is started.

3.26 Safety circuit — A circuit connected to an interlock, limit control, safety pilot, or similar control (other than an operating or regulating control), the failure of which results in a risk of fire, electric shock, or injury to persons during operation of the equipment or burner in the event any part of the circuit (wiring or components) becomes grounded, open-circuited, or short-circuited.

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3.27 Single-flame pilot burner – A pilot burner that produces a single flame with substantially uniform contour under minimum pilot conditions.

3.28 Temperature-limiting control – A control that functions only under conditions that produce abnormal temperatures.

3.29 Temperature-regulating control– A control that functions to regulate the temperature of the dishwasher under normal conditions of use.

3.30 Wall-insert dishwasher– A dishwasher that is intended to be permanently attached to the building structure and mounted in a wall or other vertical surface of a building or in a cabinet.

4 Construction Requirements Applicable To All Dishwashers

4.1 General

4.1.1 A dishwasher shall be constructed and assembled so that it has the strength and rigidity to resist the abuses to which it is subjected during intended use, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

4.1.2 A dishwasher shall be constructed and assembled so that parts fit together tightly and bolts or other fasteners are drawn tightly to produce rigidity. Exposed edges and surfaces shall be smooth when the potential exists for contact with hands or other body parts during the operation and maintenance of the dishwasher.

4.1.3 A free-standing dishwasher shall be provided with a means to attach it to a floor or with other mounting means unless the dishwasher has stability such that it does not overturn under conditions of intended use. See 7.22.1.

4.1.4 A dishwasher shall be provided with enclosures of material rated for the application that enclose all parts that involve, under any conditions of use, a risk of fire, electric shock, or injury to persons.

4.1.5 Side or back panels are not required for a dishwasher intended to be mounted in or under a counter and marked in accordance with 14.17. See 4.4.5 and 4.9.3.

Note: Omitting a portion of the overall enclosure of a dishwasher intended to be installed in conjunction with other equipment complies with the requirement when:

- a) the adjoining equipment completes the enclosure (see Clause 14.17); and*
- b) the installation instructions and marking provide the information required for proper installation.*

4.1.6 Asbestos shall not be used in the construction of a dishwasher.

4.1.7 The effects of the following factors shall be determined for compliance with 4.1.1:

- a) mechanical strength;
- b) resistance to impact;
- c) moisture-absorptive properties;

- d) combustibility;
- e) resistance to corrosion; and
- f) resistance to distortion at temperatures to which the enclosure is subjected under conditions of intended or unintended use.

All of these factors shall be evaluated with respect to thermal aging when a nonmetallic enclosure is being investigated to determine compliance.

4.1.8 A part fabricated from polymeric materials and that is subject to ignition by its operating environment shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50, when tested as specified in the requirements of the Standard for Tests for Surface Burning Characteristics of Building Materials, UL 723, or the Standard for Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies, CAN/ULC-S102.

4.1.9 A flame spread rating is not required for finishes and parts immersed in water, gaskets forming an air or water seal between metal parts, and miscellaneous small parts, such as drain fittings, insulating bushings, vibration mounts, wire ties, labels, and clamps having an exposed surface area not exceeding 161.29 cm² (25 in²).

4.1.10 A flame spread rating is not required for molded or formed polymeric-material components in such quantity that the total face surface area does not exceed 0.93 m² (10 ft²). For this construction, the polymeric material shall have a flame spread rating of not more than 25 or shall comply with the requirements for a material classified 5V in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, and CAN/CSA-C22.2 No. 0.17, Evaluation of Properties of Polymeric Materials.

4.1.11 A cast- or sheet-metal section of an enclosure shall have a thickness not less than that specified in Table 1, Minimum thickness of enclosure materials.

4.1.12 Reinforcement as specified in Table 1, Minimum thickness of enclosure materials, is not required to consist of a complete frame for all edges. A large enough number of reinforcing members shall be employed to provide additional support for all surfaces.

4.1.13 Ventilation and other openings in the external enclosure of a dishwasher shall be constructed, located, or baffled so that:

- a) the risk of water entering the enclosure as a result of spillage or splashing is reduced; and
- b) electrical disturbances are contained within the enclosure.

4.1.14 An enclosure shall be constructed so that molten metal, burning insulation, flaming particles, or similar material does not fall onto combustible materials, including the surface on which the dishwasher is supported.

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4.1.15 Compliance with 4.1.14 requires that a switch, a relay, a solenoid, or similar component be completely enclosed, unless it is shown that malfunction or breakdown of the component does not result in a risk of fire, or there are no openings in the bottom of the enclosure. See Clause 7.15, Abnormal operation test, and Clause 7.16, Blocked plunger test.

4.1.16 Component terminals are not required to be enclosed.

4.1.17 Compliance with 4.1.14 requires the use of a barrier:

a) under a motor unless:

- 1) structural parts of the motor or of the dishwasher provide the equivalent of such a barrier;
- 2) the protection provided with the motor is such that no burning insulation or molten material falls onto the surface that supports the dishwasher when the motor is subjected to fault conditions of open main winding, open starting winding, and starting switch short-circuited;
- 3) the motor is provided with overload protection such that, regardless of the motor insulation system class rating:
 - i) the temperature of the motor windings does not exceed 125°C (257°F) under the maximum load under which the motor runs without causing the protector to cycle; and
 - ii) the temperature of the motor windings does not exceed 150°C (302°F) with the rotor of the motor locked; and

Note: A shaded-pole motor having a difference of 1 A or less between no-load and locked-rotor currents and having a 2:1 or smaller ratio between locked-rotor and no-load current, and is provided with protection for locked-rotor conditions complies with the requirement.

- 4) the motor is impedance protected and the locked-rotor temperature of the winding of an open motor or the enclosure of a totally enclosed motor does not exceed 150°C (302°F) with the dishwasher otherwise operating normally;

b) under wire unless it is flame-retardant wire; and

c) under a combustion chamber or burner compartment.

4.1.18 The barrier specified in 4.1.17 shall:

- a) be horizontal or at such an angle that falling molten, burning, or flaming materials hitting the barrier does not rebound and fall on the supporting surface;
- b) be located as illustrated in Figure 1, Location and extent of barrier;
- c) have an area not less than that determined in accordance with Figure 1; and
- d) be metal or constructed of a polymeric material that complies with 4.1.7.

4.1.19 With reference to 4.1.17, an opening that is intended for drainage or ventilation shall be such that molten metal, burning insulation, or similar material does not fall onto combustible material.

4.2 Field-attached accessories

4.2.1 An accessory intended for installation on, or connection to, a dishwasher to modify or supplement the functions of the dishwasher shall comply with 4.2.2 – 4.2.7.

4.2.2 A dishwasher having provisions for accessories to be attached in the field shall be constructed so that the use of the accessories does not introduce a risk of fire, electric shock, or injury to persons.

4.2.3 The installation of an accessory by the operator shall be an operation that is accomplished by receptacles and plug-in connectors.

4.2.4 The installation of an accessory by qualified personnel shall be an operation performed by use of wire connectors to a terminal block provided for the purpose.

4.2.5 The installation of an accessory shall be such that the field rearrangement of components or wiring, the cutting or splicing of wiring, or the soldering of connections is not required.

4.2.6 Each accessory shall be tested and trial-installed to determine whether:

- a) the accessory can be installed;
- b) the instructions are detailed and correct; and
- c) use of the accessory does not result in a risk of fire, electric shock, or injury to persons.

4.2.7 A dishwasher that includes provisions for field connection of a detergent or chemical dispenser, or other accessory, shall be supplied with:

- a) a circuit that provides a programmed signal to the dispenser or other accessory; and
- b) a wiring diagram or other marking that gives the electrical rating and illustrates how connections to the circuit shall be made.

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4.3 Doors and covers

4.3.1 An overcurrent or overload-protective device shall not be accessible from outside the dishwasher without opening a door or a cover.

Note: The operating handle of a circuit breaker, the operating button of a manually-reset motor protector, or a similar part that projects outside the enclosure complies with the requirement.

4.3.2 A door or a cover of an enclosure that gives access to a fuse or overload-protective device that requires replacement shall be secured by being hinged or pivoted, or by sliding.

Note: A cover that is provided over a compartment that encloses current-carrying parts, is intended for access to replace or reset a burned out overload-heater element, fuse, or similar component, and that requires the use of tools for removal complies with the requirement.

4.3.3 A door or cover over a fuseholder shall fit tightly. Means shall be provided for holding the door or cover closed. The holding means shall be a captive screw or a latch operated by hand or by a hand tool such as a screwdriver.

Note: A snap latch complies where no live parts, other than fuse clips or screwshells, are accessible with the cover open.

4.4 Accessibility of current-carrying parts

4.4.1 The electrical parts of a dishwasher shall be so located or enclosed to reduce the risk of persons unintentionally contacting uninsulated current-carrying parts.

4.4.2 When determining compliance with 4.4.1, a part of the outer enclosure can be removed by the user of the dishwasher, without the use of tools, shall be removed.

4.4.3 With reference to the requirement in 4.4.1:

- a) an opening complies with the requirement when a 19.1-mm (3/4-in) diameter rod can not be inserted into the opening and when:
 - 1) a probe as illustrated in Figure 2, Probe for uninsulated live part, does not touch any uninsulated live part when inserted, at any angle, through the opening; and
 - 2) a probe as illustrated in Figure 3, Probe for film-coated wire, does not touch film-coated wire when inserted, at any angle, through the opening; and
- b) for an opening that enables a 19.1-mm (3/4-in) diameter rod to be inserted, at any angle, the opening complies with the requirement only under the conditions described in 4.4.4 and Figure 4, Opening in enclosure.

4.4.4 With reference to Figure 4, Opening in enclosure, for an opening to comply with the requirement, uninsulated current-carrying parts and film-coated wire, inside the enclosure shall be:

- a) X mm (X in) or more from the perimeter of the opening; and

- b) outside the volume generated by projecting the perimeter X mm (X in) normal to the plane.

The dimension X equals five times the diameter of the largest-diameter rod that is able to be inserted through the opening. In any case, X shall not be less than 102 mm (4 in). In evaluating an opening, any barrier located within the volume shall be ignored unless it intersects the boundaries of the volume in a continuous, closed line.

4.4.5 Each electrical component of an under-counter dishwasher not provided with an overall enclosure – back, top, and sides – when shipped from the factory shall be enclosed, other than at its terminals.

4.4.6 With reference to 4.4.5, an enclosure is not required for:

- a) insulated wiring;
- b) a solenoid, a solenoid valve, a relay, or a motor-starting relay whose malfunction or breakdown does not result in a risk of fire;
- c) a motor protected in accordance with 4.1.17(a)(3) and 4.1.17(a)(4); or
- d) a component more than 76.2 mm (3 in) from the back, top, and side surfaces of the smallest compartment that encloses the dishwasher.

4.4.7 The guarding and arrangement of a part shall be such that:

- a) a strainer, a basket, or a similar part is easily installed and removed without a risk of injury to persons;
- b) containers that must be removed, cleaned, and replaced are easily refilled by the operator; and
- c) removal, replacement, and refilling of these containers and ingredients shall not result in damage to or contamination of wiring, electrical components, or other parts.

4.4.8 The part arrangement described in 4.4.7 shall be such that the risk of spillage on current-carrying parts, including film-coated wire, is remote.

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4.5 Corrosion protection

4.5.1 To reduce the risk of corrosion, an iron or steel part shall be enameled, galvanized, plated, or similarly treated.

4.5.2 The corrosion protection treatment is not required for:

- a) a bearing, a balance weight, a lamination, or a minor part of iron or steel such as a washer or screw; or
- b) an iron or steel part where corrosion of the part does not result in a risk of fire, electric shock, or injury to persons.

4.5.3 A reservoir for a cleaning agent or other additive – liquid or powder – shall be resistant to the corrosive and other deteriorating effects of the intended contents.

4.6 Mechanical assembly

4.6.1 A switch, a lampholder, an attachment-plug receptacle, a connector base (motor-attachment plug), or similar component shall be securely mounted and shall not rotate.

The means intended to inhibit rotation of the switch is not required when the switch complies with the following:

- a) the switch has a plunger or push-type actuator that does not tend to rotate the switch when operated. A toggle switch does not comply with this requirement;
- b) the risk of the switch loosening from its mounting means due to operation is remote;
- c) in the event switch rotation occurs, spacings are not reduced below the minimum required values; and
- d) intended operation of the switch is by mechanical means rather than by direct operation by persons.

4.6.2 The means intended to inhibit rotation of a lampholder for a lamp that is not replaced, such as a neon pilot or indicator light in which the lamp is sealed in a nonremovable jewel, is not required when the means does not reduce spacings below the minimum required values.

4.6.3 Friction between surfaces shall not be used as the only means to reduce the risk of the rotation specified in 4.6.1. For example, using a lock washer that is applied as intended to prohibit the rotation of a stem-mounted switch or other device having a single-hole mounting means complies with the requirement.

4.6.4 An uninsulated live part shall be secured so that the part does not rotate or shift in position where such motion results in a reduction of spacings less than the required spacings.

4.6.5 Friction between surfaces shall not be used as the only means to reduce the risk of rotation specified in 4.6.4. For example, using a lock washer to prohibit rotation of the components complies with this requirement.

4.7 Power-supply connections

4.7.1 Cord-connected dishwashers

4.7.1.1 A portable dishwasher shall be provided with a power-supply cord.

4.7.1.2 The power-supply cord shall be provided either permanently attached to the dishwasher or as a separate detachable cord set.

4.7.1.3 A dishwasher intended for use with a detachable cord set shall not be provided with terminal pins that accommodate a standard flatiron appliance receptacle.

4.7.1.4 A flexible cord used in a power-supply cord shall be Type S, SE, SO, SOO, ST, STO, or STOO. The length of the cord – measured from the face of the attachment plug to the point of entry into the dishwasher – shall not be less than 1.83 m (6 ft).

Note: For conditions of use, such as those of a counter-top glass washer, that indicate that a lighter cord is applicable, using a Type SJ, SJE, SJO, SJOO, SJT, SJTO, or SJTOO cord complies with the intent of the requirement.

4.7.1.5 The current rating of the flexible cord used in a power-supply cord for a dishwasher rated 15 A or less, and the current rating of cord fittings, shall not be less than the current rating of the dishwasher.

4.7.1.6 For a dishwasher rated 15 A or less, the attachment plug shall:

- a) have a voltage rating equal to the rated voltage of the dishwasher and a current rating not less than 125 percent of the current rating of the dishwasher; and
- b) be a grounding type.

Note: The use of a 20-A attachment plug complies with the requirement when the dishwasher is rated not more than 4000 W at 240 V.

4.7.1.7 The attachment plug for a dishwasher that is adaptable for use on two or more different values of voltage by field alteration of internal connections shall have a voltage rating equal to the voltage for which the dishwasher is connected when shipped from the factory. See 14.7.

4.7.1.8 Strain relief shall be provided for a permanently attached power-supply cord so that mechanical stress on the flexible cord is not transmitted to terminals, splices, or interior wiring. The strain relief shall comply with the requirements in Clause 7.23, Strain relief test.

4.7.1.9 For a knot in a flexible cord serving as strain relief, the surfaces that the knot contacts shall be smooth and free from projections, sharp edges, burrs, or fins.

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4.7.1.10 The edges of an entry hole for a flexible cord, including a hole in a bushing, shall be smooth and free from projections, sharp edges, burrs, or fins.

4.7.1.11 The hole in the metal for an insulating bushing constructed of material other than ceramic, phenolic or cold-molded composition, fiber, or other material rated for the application shall be smooth and free from projections, sharp edges, burrs, or fins.

4.7.1.12 Means shall be provided so that a flexible cord can not be pushed into an appliance through the cord-entry hole when such displacement results in a risk of:

- a) subjecting the cord to mechanical damage;
- b) exposing the cord to a temperature higher than that for which the cord is rated;
- c) reducing spacings, such as to a metal strain-relief clamp, below the minimum required values; or
- d) damaging internal connections or components.

To determine compliance, the cord shall be tested in accordance with Push-back relief test, Clause 7.24.

4.7.2 Permanently connected dishwashers

4.7.2.1 A dishwasher intended to be fastened or secured in position or permanently connected to the water supply or drain line shall be provided with wiring terminals or leads for field connection to the power-supply conductors and means for connection of a permanent wiring system.

4.7.2.2 A compartment or outlet box provided for connections to the power-supply conductors shall be located so that:

- a) during the making of electrical connections in the compartment or outlet box, internal wiring and electrical components are not exposed to mechanical abuse or stress; and
- b) after the dishwasher has been installed as intended, the terminal compartment or outlet box is accessible without moving the dishwasher.

4.7.2.3 A dishwasher provided with an extension for the point of supply connection to an accessible location remote from the dishwasher shall be a maximum length of 1.83 m (6 ft).

4.7.2.4 A compartment or outlet box to which the permanent wiring system is attached shall be secured to the dishwasher so that the compartment or box does not rotate with respect to the dishwasher.

4.7.2.5 A terminal or splice compartment shall be complete and shall enclose all field-wiring terminals and all splices to be made in the field unless the dishwasher enclosure is otherwise complete, that is, unless all sides and a complete bottom are provided when the dishwasher is shipped from the factory.

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4.7.2.6 A dishwasher constructed so that it is adaptable upon installation to different supply voltages – for example, 120 V, 2-wire or 120/240 V, 3-wire – shall be provided with a means for making the connections during field installation without changing or disrupting internal wiring or connections other than at the point of field connection.

4.7.2.7 A dishwasher intended for connection to a grounded power-supply conductor shall have one terminal or lead identified for connection of the grounded conductor of the supply circuit when it employs:

- a) an Edison-base screwshell lampholder;
- b) a single-pole switch;
- c) a single-pole automatic control; or
- d) a ballast that is marked to specify the connection of a grounded circuit conductor.

4.7.2.8 The identified terminal or lead shall be connected to the screwshell of a lampholder and to the identified circuit conductor of a ballast when specified. The identified terminal or lead shall not be connected to a single-pole switch or a single-pole automatic control other than an auxiliary control complying with 4.22.10.

4.7.2.9 A field-wiring terminal for connection of a grounded power-supply conductor shall be of, or plated with, a metal substantially white in color and shall be readily distinguishable from other terminals; or proper identification of that terminal shall be clearly shown in some other manner, such as on a wiring diagram adjacent to the terminal.

4.7.2.10 The surface of a lead intended for field connection of a grounded power-supply conductor shall be white or gray, and that lead shall be readily distinguishable from other leads.

4.7.2.11 The requirements in 4.7.2.10 related to color coding do not apply to internal wiring.

4.7.2.12 For a lead intended to be spliced in the field to an external conductor:

- a) the lead shall not be smaller than 18 AWG (0.82 mm²);
- b) the insulation shall not be less than 0.8 mm (1/32 in) thick; and
- c) the free length of the lead inside an outlet box or wiring compartment shall not be less than 152 mm (6 in) unless the use of a lead 152 mm (6 in) or longer results in a risk of fire or electric shock.

4.7.2.13 A field-wiring terminal or lead shall be rated for the connection of conductors having an ampacity not less than:

- a) the rating of the branch circuit marked on the dishwasher in accordance with 14.4 or 14.13; or
- b) the current rating of the dishwasher when the dishwasher is not marked as indicated in (a).

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4.7.2.14 The ratings of field-wiring terminals and leads of a dishwasher rated 100 A or less shall be based on the use of power-supply wires rated 60°C (140°F). For a dishwasher rated more than 100 A, the ratings shall be based on the use of power-supply conductors rated 75°C (167°F).

4.7.2.15 A field-wiring terminal shall be provided with a soldering lug, a pressure wire connector, or a wire-binding screw at a terminal intended to accommodate an 8 AWG (8.4 mm²) or smaller conductor. The lug or connector shall be firmly bolted or held by a screw. For a wire-binding screw, upturned lugs or the equivalent shall be provided to hold the wire in position.

4.7.2.16 A field-wiring terminal shall not rotate.

4.7.2.17 A wire-binding screw shall thread into metal.

4.7.2.18 A wire-binding screw at a field-wiring terminal:

- a) shall not be smaller than No. 10;
- b) shall be a No. 8 screw at a terminal intended for the connection of a 14 AWG (2.1 mm²) conductor; or
- c) shall be a No. 6 screw for the connection of a 16 or 18 AWG (1.3 or 0.82 mm²) control-circuit conductor.

4.7.2.19 A terminal plate tapped for a wire-binding screw, including an equipment-grounding screw, shall be of metal not less than 1.27 mm (0.050 in) thick and provide a minimum two threads' engagement in the metal, or not less than 0.76 mm (0.030 in) thick for tapped threads investigated and found to have the required mechanical strength.

4.7.2.20 Extrusion of the metal at a tapped hole to provide two full threads for the binding screw meets the intent of the requirement for two full threads specified in 4.7.2.19.

4.7.2.21 An upturned lug or a cupped washer shall retain a conductor of the size specified in 4.7.2.13 under the head of the screw or the washer.

4.8 Current-carrying parts

4.8.1 A current-carrying part shall be silver, silver alloy, copper, copper alloy, stainless steel, or other corrosion-resistant material. Unplated iron or unplated steel shall not be used as a current-carrying part.

4.8.2 Plated iron and plated steel may be used for a current-carrying part, if the part:

- a) has a temperature during intended operation of more than 100°C (212°F);
- b) is within a motor or associated governor; or
- c) complies with 2.1.1.

4.9 Internal wiring

4.9.1 The internal wiring and interconnecting wiring between parts of a dishwasher shall be enclosed or protected.

4.9.2 Flexible cord may be used, and not required to be enclosed or protected, provided:

- a) the cord is one of the types specified in 4.7.1.4;
- b) the cord complies with Strain relief test, Clause 7.23; and
- c) the cord is routed and protected to reduce the risk of damage.

4.9.3 In an under-counter dishwasher shipped from the factory without back or side panels, internal wiring shall be located, cabled, routed, or secured so that wiring is not damaged prior to, and during, installation.

4.9.4 With reference to 4.9.1, the required protection of insulated wiring exists when the wiring is investigated as though it were film-coated wire and the wiring complies with 4.4.3 (a) (2) and Figure 3, Probe for film coated wire. Internal wiring not so protected complies where it is secured within the enclosure so that the risk of damage to the wiring due to stress or mechanical abuse is remote.

4.9.5 Wiring employed for internal wiring shall be standard building wire or appliance wiring material rated for the application, and shall comply with Table 2, Characteristics of internal wiring.

4.9.6 Appliance wiring material having insulation not less than 0.4 mm (1/64 in) thick and without a braid or jacket in a circuit operating at not more than the rated voltage of the wiring shall be located within an individual, completely enclosed chassis that is not required to be opened for placement or normal field adjustment.

4.9.7 Unless it is investigated as an uninsulated current-carrying part, insulated internal wiring of a dishwasher, including a grounding conductor, shall consist of wire having insulation rated for the application. The following factors shall be used to determine the applicable wire to be used:

- a) the temperature and voltage to which the wire is subjected;
- b) exposure to oil, grease, cleaning fluid, or other substances having a degrading effect on the insulation;
- c) exposure to moisture; and
- d) other conditions of service to which the wire is subjected during intended use.

4.9.8 Internal wiring that is subjected to potential mechanical damage shall be in armored cable, conduit, or electrical metallic tubing or shall be otherwise protected.

4.9.9 Internal wiring shall be protected from sharp edges, including projections, screwheads, burrs, and fins.

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4.9.10 A hole through which insulated wires pass in a sheet-metal wall within the overall enclosure shall be provided with a smooth, rounded bushing or shall have smooth surfaces, free of burrs, fins, projections, and sharp edges, upon which the wires bear so that the insulation is not abraded.

4.9.11 A splice or connection shall be mechanically secure and provide electrical continuity. A soldered connection shall be made mechanically secure before being soldered. Splices shall be located only in accessible junction boxes or control enclosures. For a soldered connection on a printed wiring board, the wire shall be passed through a hole in the printed wiring board before soldering.

4.9.12 A splice shall be provided with insulation equivalent to that of the wires being spliced. For splices involving 250 V or less, the use of insulation consisting of two layers of friction tape, of two layers of thermoplastic tape, or of one layer of friction tape on top of one layer of rubber tape complies with this requirement. The effects of factors such as dielectric properties and heat- and moisture-resistant characteristics shall be evaluated during the investigation to determine compliance of splice insulation consisting of coated-fabric, thermoplastic, or other tubing.

4.9.13 An insulated splicing device shall be used within the limits of its voltage and temperature ratings.

4.9.14 Thermoplastic tape used as an insulating means shall not be wrapped over a sharp edge.

4.9.15 Stranded internal wiring connected to a wire-binding screw shall be connected so that loose strands of the wire do not:

- a) reduce spacings;
- b) contact other current-carrying parts not always of the same polarity as the wire; and
- c) contact dead-metal parts.

4.9.16 When the loosening of a screw or nut results in a risk of fire or electric shock, the screw or nut shall be provided with a means to reduce the risk of loosening. For example, where a wire-binding screw or nut can be loosened by vibration, providing a lock washer under the head of the screw or under the nut complies with the requirement.

4.9.17 An open-end spade lug shall be provided with additional means, such as upturned ends or similar construction, to hold the lug in place in the event that the wire-binding screw or nut becomes loosened. An open-end lug with a lock washer alone shall not be used.

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4.10 Separation of circuits

4.10.1 Conductors of circuits operating at different potentials shall be reliably separated from each other unless each conductor is provided with insulation rated for the highest potential involved in the circuits.

4.10.2 An insulated conductor shall be retained so that it does not contact an uninsulated live part of a circuit operating at a different potential.

4.10.3 In a compartment intended for the field installation of conductors, and that contains provision for connection of Class 2 circuit conductors, and Class 1 power or lighting circuit conductors, a barrier shall be provided to separate the conductors of the different circuits, or the arrangement of the compartment shall be such that a minimum spacing of 6.4 mm (1/4 in) is maintained between all circuit conductors located in the compartment.

4.11 Insulating materials

4.11.1 An insulating washer, a bushing, or similar component, and a base or a support for the mounting of current-carrying parts shall be of a moisture-resistant material, such as porcelain, phenolic, or cold-molded composition, or other material that is rated for the application, and shall not be adversely affected by the temperatures to which it is subjected under conditions of intended use.

4.11.2 The effects of the following factors on insulating material in conjunction with the effects of thermal aging on the insulating material shall be determined for compliance with 4.11.1:

- a) mechanical strength;
- b) dielectric strength;
- c) insulation resistance;
- d) the degree to which the material is enclosed or protected; and
- e) any other factor that has a bearing on the risk of fire, electric shock, and injury to persons, under conditions of intended use.

4.11.3 Materials such as mica, some molded compounds, and certain refractory materials are typically usable as the only support of a current-carrying part. A material, such as magnesium oxide, shall not be used for direct contact or support of current-carrying parts unless the material is used in conjunction with other insulating materials or is so located and protected so that the current-carrying parts are not damaged and the material does not absorb moisture.

4.11.4 A thermoplastic or thermosetting material shall not be used for the direct contact or support of uninsulated current-carrying parts unless the material is rated with respect to mechanical strength and rigidity, resistance to heat, resistance to flame propagation, resistance to electrical arcing, dielectric strength, and other properties for the condition of use. The effects of all of these properties are evaluated with respect to the effects of thermal aging on thermoplastic materials.

4.11.5 A screw or other fastener used to mount or support small, fragile insulating parts shall not be so tight as to crack or break such parts with expansion and contraction.

4.11.6 Vulcanized fiber, impregnated fiber, or similar materials shall not be used for the direct contact or support of uninsulated current-carrying parts where shrinkage, moisture absorption, or warpage results in a risk of fire or electric shock. Using vulcanized fiber as insulating material for a bushing, washer, separator, or barrier complies with this requirement.

4.12 Thermal insulation

4.12.1 Thermal insulation in direct contact with a current-carrying part shall be glass wool or equivalent material that is nonconductive, nonabsorbent, resistant to flame propagation, and that has been shown by investigation to be rated for such use. Thermal insulation in contact with wiring shall be nonabsorbent and resistant to flame propagation.

4.12.2 Thermal insulation not in contact with a current-carrying part or wiring shall be material that has been shown by investigation to be rated for such use.

4.12.3 Thermal insulation shall not contact products of combustion or condensation unless the insulation is rated for such conditions of use.

4.12.4 The leading edges of thermal insulation and other surfaces shall be protected from damage. Locating the edges of thermal insulation against bulkheads or panel flanges to protect the leading edges complies with the intent of this requirement.

4.12.5 The body of the thermal insulation shall be secured in position by one of the following methods:

- a) mechanical fasteners with a coverage of at least one fastener per square meter of exposed surface area, unless the insulation is retained in position under all test conditions by a lesser number of fasteners due to the inherent rigidity of the fasteners. Mechanical fasteners shall be bolts, metal clamps, wire rods or the equivalent. The location of the mechanical fasteners shall not result in a reduction of electrical spacings below the required values or short-circuiting or grounding of uninsulated electrical components; or
- b) an adhesive rated for use with the type of thermal insulation and the substrate to which it is attached. The adhesive shall secure the insulation at any temperature attained by the adhesive when the dishwasher is tested in accordance with the performance requirements of this standard.

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4.13 Equipment grounding and bonding

4.13.1 General

4.13.1.1 All exposed dead-metal parts and all dead-metal parts within the enclosure that are exposed to contact during any user-servicing operation and that have the potential of becoming energized shall be conductively connected to the means for equipment grounding.

4.13.1.2 To determine whether a part has the potential to become energized, such factors as construction and the proximity of wiring shall be evaluated.

4.13.1.3 A dishwasher that is provided with means for separate connection to more than one power supply shall be provided with a separate means for equipment grounding for each power supply.

4.13.1.4 The grounded power-supply conductor (neutral) shall not be grounded at, or in conjunction with, the dishwasher.

4.13.1.5 An equipment-grounding or bonding connection means shall reliably penetrate a nonconductive coating, such as paint or vitreous enamel.

4.13.1.6 An equipment-grounding means and separate individual conductors used for internal bonding purposes shall be located so that the probability of its removal during servicing of the dishwasher is remote.

4.13.1.7 A power-supply cord with an equipment-grounding conductor connected to the frame or enclosure as an equipment-grounding means for all cord-connected dishwashers complies with these requirements.

4.13.1.8 The equipment-grounding conductor of a power-supply cord shall be attached to the grounding pin of an attachment plug, and shall be connected within the frame or enclosure by means of a screw. A sheet-metal screw shall not be used to secure an equipment-grounding conductor. The screw shall not require removal during routine servicing not involving the power-supply cord.

4.13.2 Equipment-grounding terminals and leads

4.13.2.1 The free length of an equipment-grounding lead intended for connection to an equipment-grounding conductor shall be insulated – for example, shall have the end folded back and taped to the lead – unless the uninsulated end of the lead is located so that it does not contact current-carrying parts in the event that the lead is not used in the field.

4.13.2.2 An equipment-grounding terminal or lead shall be capable of connecting an equipment-grounding conductor that is:

- a) sized in accordance with 4.7.2.13; and
- b) sized in accordance with the National Electrical Code, NFPA 70, and the Canadian Electrical Code (CEC), Part 1, CSA C22.1.

The grounding terminal shall be located adjacent to the supply terminals or leads and shall be accessible for inspection and maintenance by removing a cover or the equivalent.

4.13.2.3 An equipment-grounding terminal or lead shall be conductively connected to the frame or enclosure by a positive means, such as by a bolted or screwed connection.

4.13.3 Equipment-grounding identification

4.13.3.1 The surface of the insulation of an equipment-grounding lead intended for connection to an equipment-grounding conductor shall be green with or without one or more yellow stripes, and no other lead shall be so identified.

4.13.3.2 A terminal intended for the connection of an equipment-grounding conductor shall be identified by:

- a) use of a wire-binding screw with a green-colored head that is hexagonal or slotted, or both;
- b) use of a threaded stud with a green-colored hexagonal nut;
- c) use of a green-colored pressure terminal connector;
- d) being marked "G," "GR," "GND," "Ground," "Grounding," or similar marking;
- e) a marking on a wiring diagram provided on the product; or
- f) the grounding symbol shown in Figure 5, Grounding symbol, on or adjacent to the connector or on a wiring diagram provided on the product.

4.14 Lampholders

4.14.1 A lampholder shall be constructed or installed so that uninsulated current-carrying parts other than a screwshell are not exposed to contact by a person removing or replacing the lamp.

Note: If it is necessary to dismantle the appliance or remove a cover plate or other part by means of a tool in order to remove or replace a lamp, uninsulated current-carrying parts may be accessible to contact during the relamping process only.

4.15 Receptacles

4.15.1 A receptacle intended for general use shall be of the grounding type.

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