

UL 1730

Smoke Detector Monitors and Accessories for Individual Living Units of Multifamily Residences and Hotel/Motel Rooms

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333 Pfingsten Road
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UL Standard for Safety for Smoke Detector Monitors and Accessories for Individual Living Units of Multifamily Residences and Hotel/Motel Rooms, UL 1730

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Revisions: This Standard contains revisions through and including November 20, 2007.

Summary of Topics

Revision pages for UL 1047 are being issued to reflect the recent adoption of UL 1730 as an American National Standard.

Text that has been changed in any manner is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

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INTRODUCTION

1 Scope

1.1 These requirements cover electrically operated smoke detector monitors intended to be used in ordinary indoor locations in accordance with the National Electrical Code, NFPA 70; the Life Safety Code, NFPA 101; and Chapter 2 of the National Fire Alarm Code, NFPA 72.

1.2 As covered by these requirements, a smoke detector monitor is a unit that provides for the connection and supervision of initiating circuits which are, in turn, to be connected to smoke detectors. The smoke detectors may be single station or multiple station and are installed within individual living units of multifamily residences or hotel or motel rooms. The monitor provides alarm or trouble indications at an attended central monitoring location as a supplement to the signal indication provided at the location of the smoke detector. These units are not intended for use as fire protective signaling control units.

1.3 In addition to smoke detector monitoring, a monitor covered by these requirements may provide for manual activation of alarm signals within the individual living units (whether integral with the smoke detectors or not) on either an individual or zone basis.

1.4 An installation wiring diagram attached to the monitor, or referenced in the markings on the monitor, indicates the devices and circuits acceptable for connection to it in the field.

1.5 These requirements do not cover automatic fire detectors or alerting devices not provided as part of the monitor, nor do they cover units intended for connection to smoke detectors that:

- a) Do not have integral sounding devices or
- b) Are installed in common areas of multifamily dwellings.

1.6 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements to determine that the level of safety as originally anticipated by the intent of this Standard is maintained. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard shall not be judged to comply with this Standard. Where appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

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.

2.1.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed 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 recognized rating established for the intended conditions of use.

2.1.4 Specific components are recognized as being 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 for which they have been recognized.

2.2 Units of measurement

2.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.2.2 Unless otherwise indicated, all voltage and current values mentioned in this standard are root-mean-square (rms).

2.3 Undated references

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

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 **ALARM SIGNAL** – An audible and visual signal indicating an emergency fire condition that requires immediate action.

3.3 **ALERTING DEVICE** – Any device that provides an audible signal to the attendant to indicate a fire or trouble condition. Examples of audible signal devices are bells, horns, sirens, electronic horns, buzzers, and chimes.

3.4 **ALERTING DEVICE CIRCUIT** – A circuit to which alerting devices are connected.

3.5 **END-OF-LINE RESISTOR** – A resistor installed at the end of an initiating or alerting device circuit to limit the amount of supervisory current.

3.6 **FAULT** – An open or ground condition on any line extending from a monitor or monitoring accessory.

3.7 **GROUNDING CONDUCTOR** – A conductor used to connect the intentionally grounded circuit of a wiring system to a grounding electrode.

3.8 **GROUNDING CONDUCTOR** – A conductor used to connect noncurrent carrying parts of equipment, raceways, and enclosure to a grounding electrode at the service. The grounding electrode is, in turn, connected to earth ground or to some conducting body that serves in place of earth ground.

3.9 **INITIATING DEVICE** – An automatically operated smoke detector, the operation of which results in a fire alarm indication at the monitor.

3.10 **INITIATING DEVICE CIRCUIT** – A circuit to which initiating devices are connected.

3.11 **MONITOR** – An electrically-operated visual and audible alerting device containing or having provision for connection to remote alarm and trouble alerting devices. This device is used to indicate the presence of alarm and faults on the circuit extending from the unit.

3.12 **MONITOR ACCESSORY** – A device or appliance that is externally connected to a monitor and employed to provide supplementary signaling indication. Such accessories include end-of-line resistors or diodes, auxiliary relays, remote switches, and living area interface units.

3.13 **PROGRAM-CONTROLLED UNIT** – A unit for which the intended operation is controlled or influenced by a stored program. As used here, the word "program" refers to a set of instructions that is carried out in a sequential and repetitive manner and that determines the system output signal resulting from a specific system input signal. "Stored" refers to the action provided by memory devices in which the memory may be either transient or permanent and that are used for retaining information, instruction, status, and the like.

3.14 **SIGNALING LINE CIRCUIT** – A circuit over which signals are transmitted between a monitor and its accessories.

3.15 **SUPPLEMENTARY SIGNALING CIRCUIT** – A circuit to which room status or housekeeping equipment, or the like, may be connected.

3.16 TROUBLE SIGNAL – A visual and audible signal indicating a fault condition of any nature, such as an open or ground, or other trouble condition that has occurred in the device or connected wiring.

3.17 VOLTAGE CLASSIFICATIONS:

- a) High-Voltage Circuit – A circuit involving a potential of not more than 300 volts and having characteristics in excess of those of a low-voltage circuit
- b) Low-Voltage Circuit – A circuit involving a potential of not more than 30 volts alternating current (AC) rms, 42.4 volts direct current (DC) or AC peak.
- c) Power-Limited Circuit – A circuit in which the power is limited as specified in Power-Limited Circuits, Section 36.

INSTRUCTIONS AND DRAWINGS

4 General

4.1 Installation wiring diagram

4.1.1 An installation wiring diagram shall be provided with each monitor illustrating the field connections to be made. The drawing may be attached to the unit or, if separate, shall be referenced in the marking on the unit by the name or trademark of the manufacturer, drawing number, and issue number or date.

4.1.2 The drawing shall show a pictorial view of the installation terminals or leads to which field connections are to be made as they would appear when viewed during an installation. The terminal numbers on the unit shall agree with the numbers on the drawing.

4.1.3 The following marking information shall appear on the installation wiring diagram for the applicable circuits to which field connections are made. In addition, each circuit shall be marked to indicate that the circuit is "SUPERVISED" or "NOT SUPERVISED."

- a) Main Supply Circuit – Volts, frequency, and maximum current input or specific power supply with which the unit is intended to be used. A terminal for the connection of a grounded conductor shall be properly identified. If the input current can vary appreciably with the extent of output circuit loading and will affect the size of the supply circuit wire used, more than one current rating may be shown in conjunction with a marking on the unit indicating the limitations of loading.
- b) Trouble Supply Circuit – Voltage, frequency, and maximum current input.
- c) Battery Circuit – DC voltage and the maximum current input. For a storage battery intended to be charged by the unit, the maximum charging currents (trickle and fast charge) shall be indicated as well as the capacity in ampere-hours.
- d) Initiating Device Circuit – Reference by manufacturer's name and model number to the intended smoke detectors and the intended connection. Smoke detectors shall be shown connected in an initiating device circuit such that a trouble signal emanating from a particular detector (for example, the beacon lamp in a photoelectric detector) will not prevent operation for alarm signals from other initiating devices on the same circuit. The maximum line impedance shall be indicated unless the unit can operate with a 100 ohm impedance in each circuit.

- e) Alerting Device Circuit – The type of signaling devices and their intended connection. If the circuit is intended for the connection of a polarized appliance, the field connections to which the appliance is to be wired shall be marked with plus or minus (+, –) symbols, or symbols that have been determined to be equivalent, to indicate the intended field connection.
- f) Supplementary Signaling Circuits – Maximum current, voltage, and frequency. If the circuit provides relay contact operation, the position of the contacts and the condition of the circuit (supervisory, alarm, or trouble) shall be indicated.
- g) Signaling Line Circuit – Maximum line impedance, voltage, current, and frequency. The current operating range shall also be indicated if a field adjustment of current is indicated.
- h) Accessory Circuits – Reference to the name of manufacturer, model number, and connection to the accessory.
- i) Power-Limited Circuits – Connections to circuits that may be connected to power-limited cable shall be identified by the marking "Power-Limited Circuit" or a marking determined to be equivalent.
- j) Aluminum Connections – The following shall be marked on the wiring diagram: "Do Not Use Aluminum Conductors."
- k) Wiring Terminals – Where extra terminals are provided to which field connections are not intended, the marking "NC" or a marking determined to be equivalent shall be used.

4.1.4 The output parameters indicated in accordance with 4.1.3 (d) – (g) shall be stated as specified in Table 4.1, or in a format determined to be equivalent.

Table 4.1
Output parameters

		Current (or wattage)		
Designation	Type voltage	Normal maximum standby (alarm)	Frequency	Ripple voltage
Alternating current	AC			
Half-wave	HW			
Full-wave	FW			
Direct current	DC			

4.1.5 For a unit provided with field-wiring terminals as described in 14.3.1:

- a) If a special tool is required for connection, its use shall be indicated on the installation wiring diagram by name of manufacturer and model number or equivalent.
- b) The range of wire sizes shall be indicated on the installation wiring diagram.
- c) If means for testing for an open and a ground fault on the circuit to which the wiring is connected is not incorporated into the unit, the means shall be indicated on the installation wiring diagram.

4.2 Operating instructions

4.2.1 A monitor shall be provided with understandable operating instructions. These instructions shall appear on the cabinet front or on a separate sheet that can be framed and located adjacent to the unit.

4.2.2 If separate from the unit, the instructions shall include the model number of the unit and be referenced in the marking on the unit by number and issue number or date.

4.2.3 The instructions shall include a capsule description of pertinent conditions applicable to the particular monitor. Examples of typical conditions are as follows:

- a) Normal standby;
- b) Alarm;
- c) Alarm test;
- d) Alarm reset;
- e) Trouble;
- f) Off-normal position of switches;
- g) Function of lights, switches, and meters;
- h) Periodic testing recommendations;
- i) Fuse replacement; and
- j) Alarm silencing procedure.

4.2.4 In addition to the description specified in 4.2.3, a blank space shall be provided on the instruction sheet to fill in the name, address, and telephone number of the local service representative to contact in the event of trouble.

4.2.5 If the instructions appear on a separate sheet a notation shall be added on the bottom that the instructions should be framed and placed adjacent to the unit for ready reference.

CONSTRUCTION

ASSEMBLY

5 Protection of Service Personnel

5.1 An uninsulated live part of a high-voltage circuit and sharp corners or projections within the enclosure shall be located, guarded, or enclosed to reduce the likelihood of unintentional contact by persons performing service functions that may be performed while the unit is energized.

5.2 During the examination of a unit in connection with the requirements in 5.1, a part of the outer enclosure that may be removed without the use of tools, or part of the outer enclosure that may be removed by the user to allow access for making intended operating adjustments, shall be disregarded; it will not be assumed that the part in question affords protection against electric shock.

5.3 An electrical component requiring examination, replacement, adjustment, servicing, or maintenance while the unit is energized shall be located and mounted with respect to other components and with respect to grounded metal so that it is accessible for such service without subjecting the service personnel to a risk of electric shock from adjacent uninsulated high-voltage live parts.

5.4 The following are not considered to be uninsulated live parts:

- a) Coils or relays and solenoids, and transformer windings, if the coils and windings are provided with insulating overwraps rated for the potentials involved;
- b) Terminals and splices having insulation rated for the potential involved; and
- c) Insulated wire.

5.5 If the linear distance from a component requiring servicing to an uninsulated high-voltage part is less than 6 inches (152 mm), the part shall be protected by insulating tape, barriers, or a means determined to be equivalent.

Exception No. 1: A unit need not comply with this requirement if either:

- a) An interlock is provided on the cover that de-energizes all live parts when the cover is removed or*
- b) The cover is marked in accordance with 53.8.*

Exception No. 2: This requirement does not apply to uninsulated high-voltage parts if the current is limited in accordance with the Electric Shock Current Test, Section 43.

6 Enclosures

6.1 General

6.1.1 The frame and enclosure of a monitor shall have the strength and rigidity to resist total or partial collapse with attendant reduction of spacings, loosening or displacement of parts, or development of other conditions that could impair operation of the unit and increase the risk of fire, electric shock, or injury to persons.

6.1.2 Uninsulated high-voltage electrical parts of a unit shall be located or enclosed to provide protection from unintentional contact.

6.1.3 An operating part, such as a gear mechanism, a light-duty relay, or similar device, shall be enclosed to protect against malfunction from dust or other foreign material that may impair the intended operation.

6.1.4 The mounting means of an enclosure shall be accessible without disassembly of any operating part of the unit. Removal of a completely assembled panel to mount the enclosure is not considered to be disassembly of an operating part.

6.1.5 A material used within an enclosure shall be classified V-2 or HF-2, or less flammable, in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

Exception No. 1: A motor, relay, capacitor, semiconductor, transformer, switch, insulating tubing or tape, or other electrical element need not comply with this requirement if it complies with the flame test applicable to the component.

Exception No. 2: A meter face and case (if acceptable for mounting live parts) and indicator lamp or jewel need not comply with this requirement.

Exception No. 3: The material used to form a gear, cam, belt, bearing, strain-relief bushing applied over a PVC-jacketed cord, or other small part that contributes negligible fuel to a fire need not be investigated if the part is isolated from uninsulated electrical parts that are not power-limited either by:

- a) At least 0.5 inch (12.7 mm) of air or*
- b) A solid barrier of material classified V-2 or less flammable.*

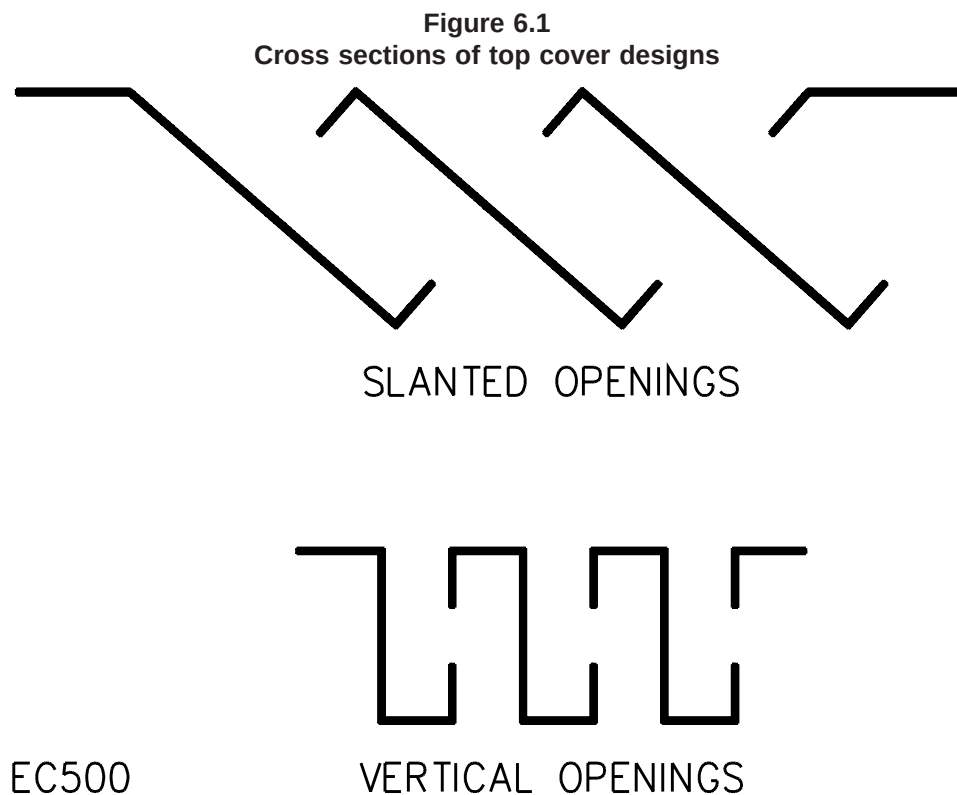
Exception No. 4: Tubing for air or fluid systems, and foamed plastic, need only be classified HB or HBF, if the tubing or foamed plastic is isolated for uninsulated electrical parts that are not power-limited either by:

- a) At least 0.5 inch (12.7 mm) of air or*
- b) A solid barrier of material classified V-2 or less flammable.*

6.1.6 If a monitor is not intended to be installed in a separate cabinet that has provision for connection to a Class I wiring system, as defined by the National Electrical Code, ANSI/NFPA 70, the enclosure of the unit shall have provision for connection to a Class I wiring system.

6.1.7 An opening in the top of the enclosure shall be constructed and sized to reduce the likelihood of entry of foreign objects.

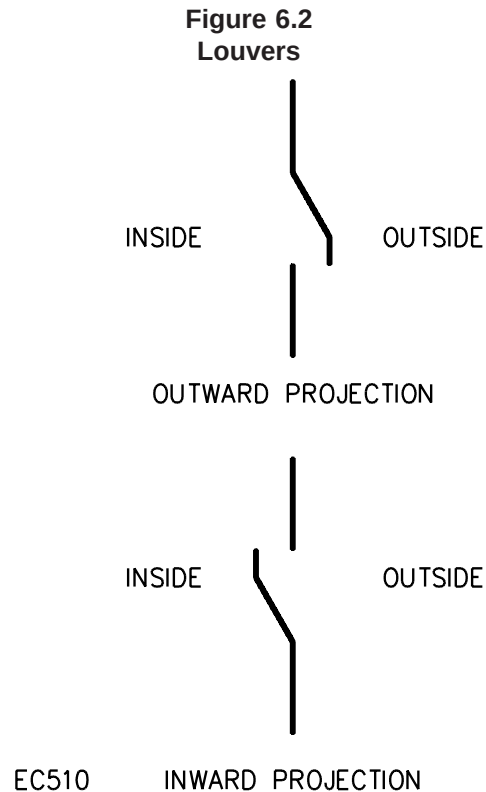
6.1.8 To comply with the requirements in 6.1.7, an opening directly over an uninsulated live part shall not exceed 0.187 inch (4.75 mm) in any dimension unless the configuration of the opening prevents direct entry of uninsulated high-voltage parts. See Figure 6.1 for examples of acceptable top cover constructions.



6.1.9 An opening in the side of the enclosure shall be located and sized to reduce the likelihood of:

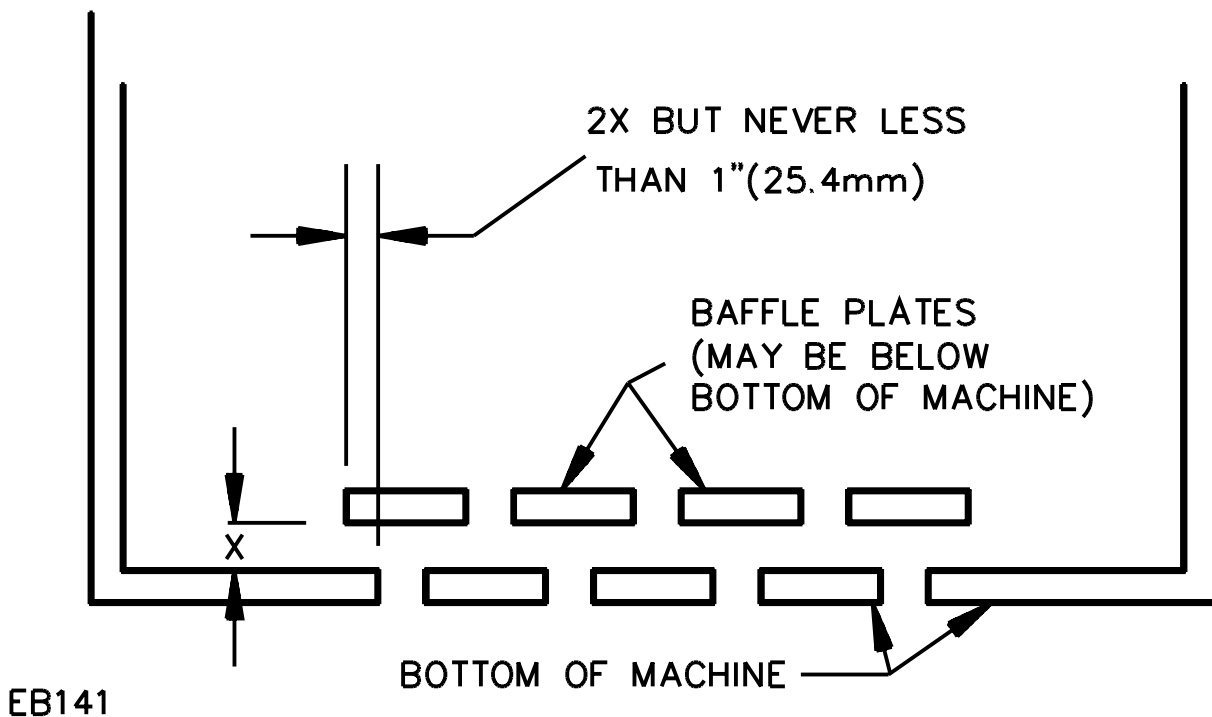
- a) Entry of a foreign object and
- b) Contact with internal parts by persons.

Louver openings may be used if shaped to deflect external falling objects outward. See Figure 6.2 for examples of louver constructions that may be used.



6.1.10 Openings shall not be provided in the bottom panels or protective pans under areas containing materials not classified V-1 or less flammable, in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, unless constructed in a manner that prevents materials from falling directly from the interior of the unit onto the supporting surface or onto any other location under the unit. Figure 6.3 illustrates a type of baffle that complies with this requirement. A second construction that complies with this requirement is a 0.040 inch (1.02 mm) thick sheet steel bottom panel in which round holes of 5/64 inch (2.0 mm) maximum diameter are spaced no closer together than 1/8 inch (3.2 mm) center-to-center. See the Abnormal Operation Tests, Section 49.

Figure 6.3
Bottom panel baffles



6.1.11 The bottom of the enclosure under areas containing only materials classified V-1 or less flammable, in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, may have openings not larger than 1/16 square inch (40 mm²).

6.1.12 Openings may be used without limitation on the size or number in areas that contain only:

- a) CTFE, FEP, PVC, TFE, and neoprene-insulated wire cable and
- b) Plugs and receptacles.

6.1.13 An opening in the enclosure shall not permit access to a relay, terminal, control, or related component that might be subject to tampering.

6.1.14 Fasteners requiring the use of a tool or key shall be used for an enclosure if access is not required for intended operation of the unit.

6.1.15 An enclosure intended for recessed mounting and having a front panel that is intended to be flush with the surface of the wall shall not have:

- a) A nonfunctional opening or
- b) Openings that vent into concealed spaces of a building structure, such as into hollow spaces in the wall, when the unit is mounted as intended.

Exception: The requirement in (b) does not apply to an opening for a mounting screw or nail or for a manufacturing operation (such as paint drainage) if the opening has no dimension greater than 17/64 inches (6.75 mm) or an area greater than 0.055 square inch (35.48 mm²), and there is no more than one mounting screw hole for each 12 inches (305 mm) of length of mounting surface, or fraction thereof.

6.2 Cast metal

6.2.1 The thickness of cast metal for an enclosure shall be at least the applicable value specified in Table 6.1.

Exception: Cast metal of lesser thickness may be used if it provides equivalent mechanical strength considering the shape, size, and function of the enclosure.

Table 6.1
Cast-metal electrical enclosures

Use, or dimensions of area involved ^a	Minimum thickness			
	Die-cast metal,		Cast metal of other than the die-cast type,	
	inch	(mm)	inch	(mm)
Area of 24 square inches (155 cm ²) or less having no dimension greater than 6 inches (152 mm)	1/16	1.6	1/8	3.2
Area greater than 24 square inches (155 cm ²) or having any dimension greater than 6 inches (152 mm)	3/32	2.4	1/8	3.2
At a threaded conduit hole	1/4	6.4	1/4	6.4
At an unthreaded conduit hole	1/8	3.2	1/8	3.2
^a The area limitation for metal 1/16 inch (1.6 mm) thick may be obtained by the provision of reinforcing ribs subdividing a larger area.				

6.2.2 If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, there shall not be less than 3-1/2 nor more than five threads in the metal, and the construction shall be such that a standard conduit bushing can be attached as intended.

6.2.3 If threads for the connection of conduit are tapped only part of the way through a hole in an enclosure wall, there shall not be less than 3-1/2 full threads in the metal, and there shall be a smooth, rounded inlet hole that affords protection to the conductors equivalent to that provided by a standard conduit bushing.

6.3 Sheet metal

6.3.1 The thickness of sheet metal used for the enclosure shall be at least the applicable value specified in Table 6.2 or 6.3.

Exception: Sheet metal of lesser thickness may be used if it provides equivalent mechanical strength considering the shape, size, and function of the enclosure.

Table 6.2
Minimum thickness of sheet metal for electrical enclosures carbon steel or stainless steel

Without supporting frame ^a		With supporting frame or equivalent reinforcing ^a		Minimum thickness uncoated,		Minimum thickness metal coated,	
Maximum width, ^b inches (cm)	Maximum length, ^c inches (cm)	Maximum width, ^b inches (cm)	Maximum length, ^c inches (cm)				
4.0 10.2	Not limited	6.25 15.9	Not limited	0.020	0.51	0.023	0.58
4.75 12.1	5.75 14.6	6.75 17.1	8.25 21.0				
6.0 15.2	Not limited	9.5 24.1	Not limited	0.026	0.66	0.029	0.74
7.0 17.8	8.75 22.2	10.0 25.4	12.5 31.8				
8.0 20.3	Not limited	12.0 30.5	Not limited	0.032	0.81	0.034	0.86
9.0 22.9	11.5 29.2	13.0 33.0	16.0 40.6				
12.5 31.8	Not limited	19.5 49.5	Not limited	0.042	1.07	0.045	1.14
14.0 35.6	18.0 45.7	21.0 53.3	25.0 63.5				
18.0 45.7	Not limited	27.0 68.6	Not limited	0.053	1.35	0.056	1.42
20.0 50.8	25.0 63.5	29.0 73.7	36.0 91.4				
22.0 55.9	Not limited	33.0 83.8	Not limited	0.060	1.52	0.063	1.60
25.0 63.5	31.0 78.7	35.0 88.9	43.0 109.2				
25.0 63.5	Not limited	39.0 99.1	Not limited	0.067	1.70	0.070	1.78
29.0 73.7	36.0 91.4	41.0 104.1	51.0 129.5				
33.0 83.8	Not limited	51.0 129.5	Not limited	0.080	2.03	0.084	2.13
35.0 88.9	47.0 119.4	54.0 137.2	66.0 167.6				
42.0 106.7	Not limited	64.0 162.6	Not limited	0.093	2.36	0.097	2.46
47.0 119.4	59.0 149.9	68.0 172.7	84.0 213.4				
52.0 132.1	Not limited	80.0 203.2	Not limited	0.108	2.74	0.111	2.82
60.0 152.4	74.0 188.0	84.0 213.4	103.0 261.6				
63.0 160.0	Not limited	97.0 246.4	Not limited	0.123	3.12	0.126	3.20
73.0 185.4	90.0 228.6	103.0 261.6	127.0 322.6				

^a A supporting frame is a structure of angle or channel or a folded rigid section of sheet metal which is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and which has sufficient torsional rigidity to resist the bending moments which may be applied via the enclosure surface when it is deflected. Constructions that are considered to have equivalent reinforcing may be accomplished by designs that will produce a structure which is as rigid as one built with a frame of angles or channels. Constructions considered to be without supporting frame include:

- 1) Single sheet with single formed flanges (formed edges);
- 2) A single sheet which is corrugated or ribbed; and
- 3) An enclosure surface loosely attached to a frame, for example, with spring clips.

^b The width is the smaller dimension of a rectangular sheet metal piece which is part of an enclosure. Adjacent surfaces of an enclosure may have supports in common and be made of a single sheet.