



# UL 201

## STANDARD FOR SAFETY

### Garage Equipment

[ULNORM.COM](https://ulnorm.com) : Click to view the full PDF of UL 201 2023

[ULNORM.COM](https://ULNORM.COM) : Click to view the full PDF of UL 201 2023

UL Standard for Safety for Garage Equipment, UL 201

Third Edition, Dated March 31, 2015

### **Summary of Topics**

***This revision of ANSI/UL 201 dated April 7, 2023 includes added language to include electronic and web-based instruction manuals; [85.1](#), [85.1A](#), [85.1B](#), [85.5](#) and [85.6](#).***

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated December 2, 2022 and March 3, 2023.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of ULSE Inc. (ULSE).

ULSE provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will ULSE be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if ULSE or an authorized ULSE representative has been advised of the possibility of such damage. In no event shall ULSE's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold ULSE harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

[ULNORM.COM](https://ulnorm.com) : Click to view the full PDF of UL 201 2023

**MARCH 31, 2015**  
(Title Page Reprinted: April 7, 2023)



**ANSI/UL 201-2023**

1

## **UL 201**

### **Standard for Garage Equipment**

First Edition – December, 1994  
Second Edition – January, 2005

#### **Third Edition**

**March 31, 2015**

This ANSI/UL Standard for Safety consists of the Third edition including revisions through April 7, 2023.

The most recent designation of ANSI/UL 201 as an American National Standard (ANSI) occurred on April 7, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in ULSE's Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

Our Standards for Safety are copyrighted by ULSE Inc. Neither a printed nor electronic copy of a Standard should be altered in any way. All of our Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of ULSE Inc.

**COPYRIGHT © 2023 ULSE INC.**

No Text on This Page

[ULNORM.COM](https://ulnorm.com) : Click to view the full PDF of UL 201 2023

## CONTENTS

### INTRODUCTION

1	Scope .....	7
2	Components .....	8
3	Units of Measurement .....	8
4	Undated References .....	8
5	Glossary .....	8

### CONSTRUCTION

6	General .....	11
7	Assembly .....	12
8	Frame and Enclosure Construction .....	12
	8.1 General .....	12
	8.2 Fire enclosures .....	13
	8.3 Electrical enclosures .....	16
	8.4 Mechanical enclosures .....	16
	8.5 Metallic enclosures .....	17
	8.6 Non-metallic enclosures .....	17
9	Flammability of Materials and Components .....	17
	9.1 General .....	17
	9.2 Flammability .....	18
10	Accessibility of Uninsulated Live Parts, Film-Coated Wire, and Moving Parts .....	18
11	Protection Against Corrosion .....	25
12	Supply Connections .....	25
	12.1 Cord connected equipment .....	25
	12.2 Strain relief .....	26
	12.3 Bushings .....	26
	12.4 Permanently connected equipment .....	27
	12.5 Wiring compartments .....	27
	12.6 Wiring terminals and leads .....	27
13	Internal Wiring .....	28
	13.1 Mechanical protection .....	28
	13.2 Wiring insulation .....	28
	13.3 Splices and connections .....	28
14	Interconnecting Cords and Cables .....	29
15	Grounding and Bonding .....	30
	15.1 Grounding .....	30
	15.2 Bonding .....	32
16	Current Carrying Parts .....	33
17	Separation of Circuits .....	33
18	Insulating Material .....	33
19	Motors .....	34
	19.1 Construction .....	34
	19.2 Location .....	34
	19.3 Brush wear out .....	34
	19.4 Motor overload protection .....	34
20	Capacitors .....	35
21	Lampholders .....	36
22	Printed Wiring Boards .....	36
23	Receptacles .....	36
24	Switches and Controls .....	37
	24.1 General .....	37

24.2	Location .....	37
24.3	Controls for solenoids, relay coils, and the like .....	37
24.4	Controls for motors .....	37
24.5	Controls for medium base lampholders.....	38
24.6	Actuation of switches and controls .....	38
25	Interlocks.....	38
26	Overload Protection.....	39
27	Information Technology Equipment.....	40
28	Transformers .....	40
28.1	General.....	40
28.2	Bobbin .....	40
28.3	Coil insulation.....	40
28.4	Margin tape.....	41
28.5	Testing.....	41
29	Secondary and Battery Circuits .....	42
30	Automobile Battery Circuits .....	43
31	Safety Circuits.....	43
32	Adhesives.....	43
33	Spacings .....	43

## PROTECTION AGAINST INJURY TO PERSONS

34	General .....	45
35	Sharp Edges.....	46
36	Guards .....	46
37	Rotating or Moving Parts.....	47
38	Parts Subject to Pressure.....	47
39	Pressure Relief Devices.....	48
40	Servicing .....	49
41	Stability .....	50
42	Mounting .....	50
43	Strength of Handles.....	50

## SPECIFIC REQUIREMENTS FOR EQUIPMENT

44	General .....	50
45	Wheel Balancers.....	50
46	Dynamometers .....	51
47	Battery Testers.....	51
48	Fluid Changing Equipment.....	51
49	Powered and Non-Powered Cabinets .....	51
50	Automotive Lifts .....	51

## PERFORMANCE

51	General .....	51
52	Input Test.....	52
53	Leakage Current Test .....	52
54	Dielectric Voltage Withstand Test.....	54
54.1	General.....	54
54.2	Primary circuits.....	54
54.3	Secondary circuits .....	55
54.4	Automobile ignition circuits .....	55
55	Humidity Conditioning.....	56
56	Starting Current Test.....	56

57	Normal Temperature Test.....	57
	57.1 General.....	57
	57.2 Maximum load.....	61
58	Grounding Circuit Reliability Test.....	62
59	Overspeed Test.....	62
60	Motor Tests.....	63
	60.1 General requirements.....	63
	60.2 Maximum temperature.....	63
	60.3 Running overload test for primary motors.....	63
	60.4 Locked rotor test for primary motors.....	64
	60.5 Running overload tests for secondary motors.....	64
	60.6 Locked rotor tests for secondary motors.....	64
	60.7 Electric strength.....	65
61	Stability Tests.....	65
	61.1 General.....	65
	61.2 Stabilizing means.....	65
	61.3 Ten degree tilt test.....	65
	61.4 Horizontal force test.....	65
	61.5 Downward force test.....	66
62	Loading Tests.....	66
	62.1 General.....	66
	62.2 Shelf and drawer loading test.....	66
	62.3 Section loading test.....	67
63	Mounting Tests.....	68
64	Handle Strength Test.....	68
65	Strain Relief Test.....	68
	65.1 General.....	68
	65.2 Pull force relief test.....	68
	65.3 Push-back relief test.....	69
66	Tests for Switches, Controls, Interlocks, and Overload Protective Devices.....	69
	66.1 Controls for solenoids, relay coils, and the like.....	69
	66.2 Controls for motors.....	69
	66.3 Switches for tungsten filament lamps.....	70
	66.4 Interlocks.....	70
	66.5 Reliability.....	70
	66.6 Endurance.....	70
	66.7 Overload protective devices.....	70
67	Hydrostatic Pressure Device.....	71
68	Low-Voltage, Limited-Energy Measurements.....	71
	68.1 General.....	71
	68.2 Open circuit voltage measurement.....	71
	68.3 Short circuit current measurement.....	71
	68.4 Maximum power measurement.....	71
69	Strength of Enclosure Tests.....	72
	69.1 General.....	72
	69.2 Stress relief test.....	72
	69.3 Impact test.....	73
	69.4 Drop test.....	74
70	Abnormal Operation Tests.....	74
	70.1 General.....	74
	70.2 Test conditions.....	75
71	Cable Arcing Test.....	76
72	Spill Test.....	76
73	Sharp Edge Test.....	77
74	Test for Liquid Crystal Displays.....	77
75	Pressure Relief Test.....	77

76	Maximum Angular Momentum Measurement.....	77
77	Abnormal Heat.....	77
78	Durability Test.....	78
79	Insulation Resistance Test.....	78
80	Wood Flammability Test for Cabinets.....	79

## MARKINGS

81	General.....	79
82	Identifying and Rating Information.....	80
83	Cautionary Markings.....	81
84	Receptacles and Accessories.....	84

## INSTRUCTIONS

85	Instruction Manual.....	84
----	-------------------------	----

## Appendix A Measurement instrument for earth leakage current tests

ULNORM.COM : Click to view the full PDF of UL 201 2023

## INTRODUCTION

### 1 Scope

1.1 These requirements cover equipment intended for use indoors in an automotive repair facility. Products covered by this standard are as indicated in [1.2](#). This equipment is intended to be installed and used in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 These requirements cover the following:

a) Equipment used in servicing and repairing automobiles, such as dynamometers, battery testers, roll-up brake lathes, distributor testers, driveway signals, engine analyzers, exhaust emissions testers, generator-alternator-regulator testers, growlers, ignition testers, rectifier diode testers, timing lights, fluid changing equipment, tire changers, tune-up testers, wheel alignment and balance equipment, and other similar equipment primarily for use in garages and service stations. These devices may be provided as a system of devices, including a console that houses control and utilization equipment for the system.

b) Powered and nonpowered tool cabinets, which may or may not be provided with a work surface. These products are intended to store tools in a repair facility or residential location.

c) Electrical requirements for equipment and systems used to provide power or control for automotive lifts.

1.3 With reference to [1.2\(b\)](#), powered cabinets shall be powered by an electrical source not exceeding 240 Vac, and shall be cord connected. All other equipment covered by this standard is intended to be supplied by a power source not exceeding 600 Vac, and may be cord connected or permanently wired.

1.4 With reference to [1.2\(c\)](#), the electrical system of electrically powered or controlled automotive lifts shall be shown to comply with UL 201. Automotive lifts as a complete system are not covered by this Standard and shall comply with the Standard for Automotive Lifts – Safety Requirements for Construction, Testing and Validation, ANSI/ALI/ALCTV, which contains additional requirements for automotive lifts, including such additional electrical requirements for automotive lifts that are intended to be installed out-of-doors.

1.5 Equipment intended for use in Class I, Division 1, and Class I, Division 2 hazardous locations as defined in the National Electrical Code, ANSI/NFPA 70, is investigated under these requirements, and, in addition, is investigated with respect to its acceptability for the particular application.

1.6 These requirements do not cover arc-welders, automotive battery chargers, electric or pneumatic tools, vacuum cleaners, equipment using refrigerants, or other equipment that is used in an automotive service or repair facility, but is covered by individual requirements.

1.7 These requirements do not cover portable tool chests or toolboxes intended to be transported by hand.

1.8 These requirements do not cover flammable liquid storage cabinets.

1.9 These requirements do not cover battery chargers, battery testers, or other equipment intended for the servicing of electric vehicles or electric vehicle battery packs.

## 2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirements 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.

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

2.4 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.

## 3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3.2 Values of voltage and current are rms values, unless otherwise indicated.

## 4 Undated References

4.1 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.

## 5 Glossary

5.1 For the purpose of this standard, the following definitions apply.

5.2 **ACCESSIBLE PART** – A part located so that it is able to be contacted by a person, either directly or by means of a probe.

5.3 **AUTOMATICALLY CONTROLLED EQUIPMENT** – Equipment is considered to be automatically controlled if:

- a) The repeated starting of the equipment, beyond one complete predetermined cycle of operation to the point where some form of limit switch opens a circuit, is independent of any manual control;
- b) During any single predetermined cycle of operation, the motor is caused to stop and restart one or more times;
- c) Upon energizing the equipment, the initial starting of the motor may be intentionally delayed beyond normal conventional starting; or
- d) During any single predetermined cycle of operation, automatic changing of the mechanical load may reduce the motor speed sufficiently to reestablish starting-winding connections to the supply circuit.

5.4 BARRIER – A part providing protection against direct contact from any usual direction of access.

5.5 BONDED (BONDING) – The permanent joining of metallic parts to form an electrically conductive path that provides electrical continuity and the capacity to conduct any current likely to be imposed without a risk of electric shock, fire, or injury to persons.

5.6 BONDING JUMPER – A conductor, including a strap or similar part that is used to provide the required electrical conductivity between metal parts required to be electrically connected.

5.7 CABINET – Equipment that is provided with shelves and/or drawers intended to house hand tools or similar devices for permanent or temporary storage. This equipment may be provided with an electrical connection such that power can be made available within the cabinet and provide power to systems within the cabinet, such as convenience receptacles.

5.8 CLASS 2 SOURCE – A source having a limited voltage and energy capacity. Requirements for voltage and energy are as indicated in 29.4. See the Low-Voltage, Limited-Energy Measurements, Section [68](#).

5.9 CONSOLE – Equipment that is intended to house electrical or electronic equipment for the purpose of control, utilization, or diagnostic functions and is associated with an overall system, such as a wheel alignment system, automotive lift, or similar equipment.

5.10 DECORATIVE PARTS – A part of the equipment, outside the fire enclosure, which has no safety function.

5.11 ELECTRICAL ENCLOSURE – A part of the equipment intended to reduce the risk of contact with parts at potentials other than low-voltage, limited-energy circuits.

5.12 ENCLOSURE – A part of the equipment providing one or more of the functions described in [5.11](#), [5.14](#), or [5.23](#).

5.13 EQUIPMENT GROUNDING CONDUCTOR – The conductor used to connect the non-current carrying metal parts of equipment, raceways, and other enclosures, to the system grounded conductor, the grounding electrode, or both, at the service equipment or at the source of a separately derived system.

5.14 FIRE ENCLOSURE – A part of the equipment intended to minimize the spread of fire or flames from within.

5.15 GROUND – A conducting connection, whether intentional or not, between an electrical circuit and the earth.

5.16 GROUNDED – Connected to earth.

5.17 GROUNDED CONDUCTOR – A system or circuit conductor that is intentionally grounded.

5.18 HIGH VOLTAGE CIRCUIT – A circuit having a potential in excess of 2500 volts peak.

5.19 IN-SERIES MOTOR – A motor connected directly to the line voltage supply.

5.20 ISOLATING TRANSFORMER – A device that consists of a primary winding electrically connected to the supply wiring, and one or more secondary windings which are not conductively connected to the primary windings, and as such are isolated from the supply wiring.

5.21 LEAKAGE CURRENT – Any currents, including capacitively coupled currents, which may be conveyed between exposed conductive surfaces of equipment and ground or other conductive surfaces of equipment.

5.22 LOW-VOLTAGE, LIMITED-ENERGY CIRCUIT – A circuit involving a potential of not more than 30 volts rms (42.4 volts peak) or a direct voltage of not more than 60 volts and supplied by a battery, a Class 2 source, or a combination of an isolating transformer and a fixed impedance that, as a unit, limits the available energy as described in [29.4](#).

5.23 MECHANICAL ENCLOSURE – A part of the equipment intended to reduce the risk of injury due to mechanical and other physical hazards.

5.24 OPERATOR ACCESS AREA – An area in which, under normal operating conditions, one of the following applies:

- a) Access can be gained without the use of a tool;
- b) The means of access is deliberately provided to the operator; or
- c) The operator is instructed to enter regardless of whether or not a tool is needed to gain access.

5.25 PORTABLE EQUIPMENT – Equipment that is moved to the workpiece or other location in order to perform the function for which it is intended. Generally, portable equipment is hand-held or hand-supported.

5.26 PRESSURE-RELIEF DEVICE – A pressure-actuated valve or rupture member designed to relieve excessive pressures automatically.

5.27 PRIMARY CIRCUIT – A circuit involving a potential of not more than 600 volts that is directly connected to the supply circuit.

5.28 PROTECTIVE GROUNDING – A system for connecting noncurrent carrying conductive parts of the equipment to ground.

5.29 RACEWAY – A completely enclosed channel intended specifically for the holding and routing of wiring, excluding communication and low voltage wiring unless provisions for such are provided. A raceway provides mechanical protection to the enclosed wiring.

5.30 RATED CURRENT – The input current of the equipment as declared by the manufacturer.

5.31 RATED FREQUENCY – The primary power frequency as declared by the manufacturer.

5.32 RATED FREQUENCY RANGE – The primary power frequency range as declared by the manufacturer, expressed by its lower and upper rated frequencies.

5.33 RATED VOLTAGE – The primary power voltage as declared by the manufacturer.

5.34 RATED VOLTAGE RANGE – The primary power voltage range as declared by the manufacturer, expressed by its lower and upper rated voltages.

5.35 REMOTELY CONTROLLED EQUIPMENT – Equipment that is not within the sight of the operator at the location of the starting device.

5.35.1 REPAIR GARAGE, MAJOR – A building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms.

From NFPA 70®, National Electrical Code®, 2020 edition. Copyright© 2019, National Fire Protection Association. For a full copy of NFPA 70, please go to [www.nfpa.org](http://www.nfpa.org).

5.35.2 REPAIR GARAGE, MINOR – A building or portion of a building used for lubrication, inspection and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air-conditioning refrigerants), brake system repairs, tire rotation, and similar routine maintenance work, including associated floor space used for offices, parking, or showrooms.

From NFPA 70®, National Electrical Code®, 2020 edition. Copyright© 2019, National Fire Protection Association. For a full copy of NFPA 70, please go to [www.nfpa.org](http://www.nfpa.org).

5.36 SAFETY CIRCUIT – Any primary or secondary circuit that is relied upon to reduce the risk of fire, electric shock, or injury to persons.

5.37 SECONDARY CIRCUIT – A circuit supplied from a secondary winding of an isolating transformer.

5.38 SERVICE ACCESS AREA – An area, other than an operator access area, where it is necessary for service personnel to have access even with the equipment switched on.

5.39 SUPPLY CIRCUIT – The branch circuit supplying electrical energy to the equipment.

5.40 TOOL – A screwdriver or any other object which may be used to operate a latch, screw, or similar fixing means.

5.41 TRADE SIZE – A term used to distinguish between actual sizes and industry standard approximations for that size.

5.42 UNINSULATED LIVE PART – A part involving a risk of fire or electric shock that is bare or has insulation that is not rated for the end use operating conditions, such as voltage, temperature, or the like.

5.43 USER SERVICING – The replacing, cleaning, or adjusting done by the user as described in Servicing, Section 41.

## CONSTRUCTION

### 6 General

6.1 All equipment shall be investigated for use indoors, with an operating ambient range of 5 – 40°C (41 – 104°F). Other environmental conditions specified by the manufacturer in the user manual shall also be considered.

6.2 Each electrical device provided as part of the overall equipment (e.g. printers, docking stations) shall have an appropriate electrical rating for the application.

6.3 Unless otherwise noted, all equipment is intended for use in a non-classified (ordinary) location. This can be accomplished by the physical location of installation where the equipment is intended to be used within a repair facility, or by integral construction features that allow the equipment to be used outside of the classified area as defined by the National Electrical Code, NFPA 70. For equipment that is intended to

be used within the classified area as defined by NFPA 70, additional hazardous location requirements shall be applied to verify the safe operation within that classified (hazardous) location. The area classification that applies is as defined for either a major repair garage or a minor repair garage. The area classification for a minor repair garage is less stringent than for a major repair garage and may include ordinary locations within the minor repair garage. All equipment intended for use within a minor repair garage shall be marked in accordance with [83.12.1](#). Equipment that is not marked in this manner can be installed in either a major or minor repair garage.

## 7 Assembly

7.1 Equipment shall be completely wired with all internal splices and electrical connections made before the equipment leaves the factory. Equipment may be shipped unassembled provided no internal wiring connections are to be made in the field, unless these connections are made by connectors or appliance couplers.

*Exception: This requirement does not apply to field wiring connections for permanently connected products.*

7.2 Any equipment that requires assembly in the field to any degree shall be provided with installation instructions detailing all assembly steps. See Instruction Manual, Section [84](#).

7.3 Equipment shall be so assembled that it will not be affected adversely by the vibration of normal operation. Brush caps in motors shall be tightly threaded or otherwise designed to prevent loosening.

7.4 All uninsulated live parts shall be enclosed in the final assembly.

7.5 An uninsulated live part shall be secured so that it will be prevented from turning or shifting in position, if such motion would result in a reduction of spacings below the minimum acceptable values.

7.6 A switch, lampholder, attachment plug receptacle, motor attachment plug, or similar component shall be mounted securely and shall be prevented from turning, see [7.7](#).

*Exception: A lampholder for a non-replaceable lamp, such as a neon pilot or indicator light in which the lamp is sealed in a non-removable enclosure, need not be prevented from turning if rotation cannot reduce spacings below the minimum required.*

7.7 A means for preventing the turning mentioned in [7.6](#) shall consist of more than friction between surfaces – for example, a properly applied lock washer is acceptable as the means for preventing turning of a small stem mounted switch or other device having a single hole mounting means.

7.8 Means shall be provided to reduce the risk of contact between the enclosure of equipment and a light fixture, other than at the intended mounting means. The means provided shall have the strength and rigidity to reduce the risk of distortion which facilitates installation in a manner other than as intended.

## 8 Frame and Enclosure Construction

### 8.1 General

8.1.1 The enclosure of garage equipment shall be formed and assembled so that it has the strength and rigidity required to resist the abuses to which it may be subjected without resulting in a risk of fire, electrical shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other defects.

8.1.2 Materials used to form an enclosure shall be metallic or nonmetallic. Metallic and nonmetallic materials shall comply with the applicable requirements in this standard. Additionally, nonmetallic materials shall comply with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

8.1.3 Nonpowered cabinets are not required to comply with the enclosure requirements in this section.

## 8.2 Fire enclosures

8.2.1 The fire enclosure of all equipment shall prevent molten metal, burning insulation, flaming particles, or similar materials from falling on combustible materials outside the enclosure.

8.2.2 A fire enclosure is required to cover all parts that are not contained within a low-voltage, limited-energy circuit. This includes components, wiring, motors, transformers, and the like.

8.2.3 Openings provided in the top of a fire enclosure shall comply with one of the following:

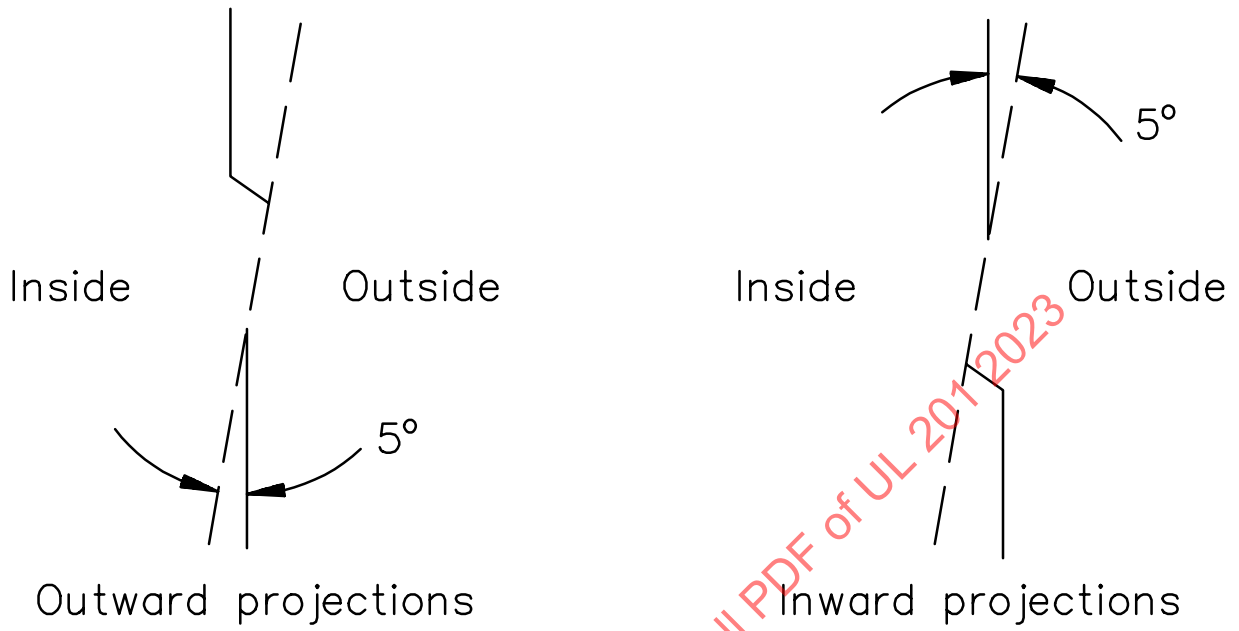
- a) Not exceed 5 mm (1/5 inch) in any dimension;
- b) Not exceed 1 mm (1/25 inch) in width regardless of length; or
- c) Be so constructed that direct, vertical entry of a falling object is prevented from reaching such bare parts by means of a trap or restriction.

8.2.4 Openings provided in the sides of a fire enclosure shall comply with one of the following:

- a) Not exceed 5 mm (1/5 inch) in any dimension;
- b) Not exceed 1 mm (1/25 inch) in width regardless of length;
- c) Be provided with louvers that are shaped to deflect outwards an external vertically falling object (see [Figure 8.1](#) for details); or
- d) Be so located that an object, upon entering the enclosure, is unlikely to fall on bare parts which are not considered low-voltage, limited energy (see [Figure 8.2](#) for details).

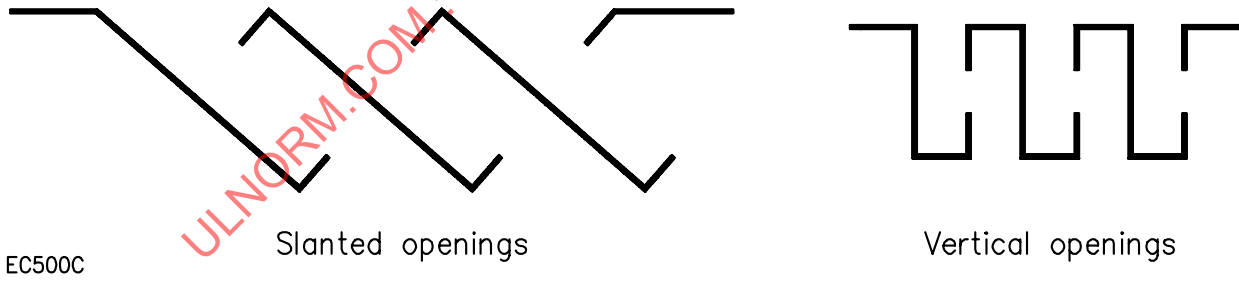
Where a portion of the side of a fire enclosure falls within the area traced out by the 5 degree angle in [Figure 8.3](#), the limitation in [8.2.5](#) on sizes of openings in bottoms of fire enclosures also apply to this portion of the side openings.

**Figure 8.1**  
**Example of louver design**



EC513A

**Figure 8.2**  
**Examples of enclosure side openings**



EC500C