



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: OCT 26 2000

TO : The Commission
Sadye E. Dunn, Secretary

FROM : Michael S. Solender, General Counsel *MS*
Stephen Lemberg, Assistant General Counsel *SL*
Patricia M. Pollitzer, Attorney *PM*

SUBJECT : Revision of Garage Door Operator Standard
NOV - 7 2000

BALLOT VOTE due: _____

Attached is a draft final rule that would revise the Commission's garage door operator standard to reflect changes UL has made to its standard upon which the Commission standard was based.

Please indicate your vote on the following options.

I. Approve the draft Federal Register notice without change.

Signature

Date

II. Approve the draft Federal Register notice with the following changes (please specify):

Signature

Date

Page 1 of 2

NOTE: This document has not been
reviewed or accepted by the Commission.

Initial *rh* Date *10/26/00* CPSC Hotline: 1-800-638-CPSC(2772) ★ CPSC's Web Site: <http://www.cpsc.gov>

CPSA 6 (b)(1) Cleared
10/27/00
No Mfrs/Prvtlbrs or
Products Identified
Excepted by *[Signature]*
Firms Notified
Comments Processed

TAB C

UL 325

Door, Drapery, Gate, Louver,
and Window Operators and
Systems

This document only contains the
entrapment provisions of UL 325 that
apply to Automatic Residential Garage
Door Openers

These provisions were extracted from
the February 25, 2000 version of the
standard

3 Glossary

3.5 RESIDENTIAL GARAGE-DOOR OPERATOR – A vehicular door operator serving a residential building of one to four single family units.

3.22 INHERENT ENTRAPMENT SENSOR SYSTEM – An automatic sensor system, examples being a photoelectric sensor, an edge sensor, or similar entrapment protection device, which senses entrapment of a solid object and is incorporated as a permanent and integral part of an operator.

3.22 revised February 25, 2000

3.23 ENTRAPMENT – The condition when an object is caught or held in a position that increases the risk of injury.

Added 3.23 effective September 18, 1998

5 Units of Measurement

5.1 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.

5.1 revised February 25, 2000

17.3 The functioning of a motor-protective device, whether such device is required or not, shall not result in a risk of fire, electric shock, or injury to persons.

PROTECTION AGAINST RISK OF INJURY TO PERSONS

25 General

25.1 If an automatically-reset protective device is employed, automatic restarting of a motor shall not result in a risk of injury to persons.

25.2 An appliance is considered to comply with the requirement in 25.1 if some means is provided to prevent the motor from restarting when the protector closes.

25.3 Parts supported or actuated hydraulically shall not develop a risk of injury to persons due to pressure loss.

25.4 An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to cause a risk of injury to persons in normal maintenance or use.

25.5 An electronic or solid-state circuit that performs a back-up, limiting, or other function intended to reduce the risk of fire, electric shock, or injury to persons, including entrapment protection circuits, shall comply with the requirements in the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991, including environmental and stress tests appropriate to the intended usage of the end-product.

25.6 The following test parameters are to be used in the investigation of the circuit covered by 25.5 for compliance with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991:

- a) With regard to electrical supervision of critical components, an operator being inoperative with respect to downward movement of the door meets the criteria for trouble indication.
- b) A field strength of 3 volts per meter is to be used for the Radiated EMI Test.
- c) The Composite Operational and Cycling Test is to be conducted for 14 days at temperature extremes of minus 35°C (minus 31°F) and 70°C (158°F).
- d) Exposure Class H5 is to be used for the Humidity Test.
- e) A vibration level of 5g is to be used for the Vibration Test.
- f) When a Computational Investigation is conducted, λ_p shall not be greater than 6 failures/ 10^6 hours for the entire system. For external secondary entrapment protection devices that are sold separately, λ_p shall not be greater than 0 failures/ 10^6 hours. For internal secondary entrapment protection devices whether or not they are sold separately, λ_p shall not be greater than 0 failures/ 10^6 hours. The Operational Test is to be conducted for 14 days.

Exception: An external secondary entrapment protection device that is sold separately, and that has a λ_p greater than 0 failures/ 10^6 hours meets the intent of the requirement when for the combination of the operator and the specified external secondary entrapment protection device λ_p does not exceed 6 failures/ 10^6 hours. See 53.3.3 – 53.3.5.

- g) When the Demonstrated Method Test is conducted, the multiplier is to be based on the continuous usage level, and a minimum of 24 units for a minimum of 24 hours per unit are to be tested.
- h) The Endurance Test is to be conducted concurrently with the Operational Test. The control shall perform its intended function while being conditioned for 14 days in an ambient air temperature of 60°C (140°F), or 10°C (18°F) greater than the operating temperature of the control, whichever is higher. During the test, the control is to be operated in a manner representing the opening and closing of the door at a rate of one open-close operation per minute.
- i) For the Electrical Fast Transient Burst Test, test level 3 is to be used for residential garage door operators and all other indoor use operators. For all other operators, test level 4 is to be used.

Revised 25.6 effective March 1, 2000

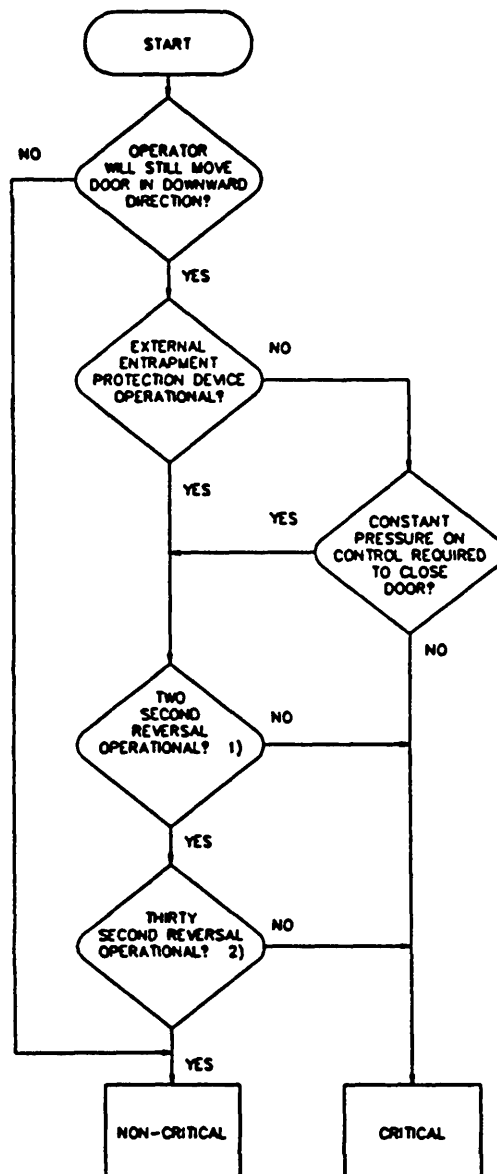
25.7 In the evaluation of entrapment protection circuits used in residential garage door operators, the critical condition flow chart shown in Figure 25.1 shall be used to:

- a) Conduct a failure-mode and effect analysis (FMEA),
- b) In investigating the performance during the Environmental Stress Tests, and
- c) During the Power Cycling Tests in accordance with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

25.7 revised September 18, 1998

Figure 25.1
Critical condition flow chart for residential garage door operator entrapment protection devices and functions

Figure 25.1 revised September 18, 1998



SM395

NOTES -

1) See 31.2.1.

2) See 31.2.6.

31 Residential Garage Door Operator and Door Operator Systems

31.1 General

31.1.1 A residential garage door operator system shall be supplied with primary inherent entrapment protection that complies with the requirements as specified in 31.2.1– 31.2.8.

31.1.1 revised September 18, 1998

31.1.2 In addition to the primary inherent entrapment protection as required by 31.1.1, a residential garage door operator shall comply with one of the following:

a) Shall be constructed to:

- 1) Require constant pressure on a control to lower the door,
- 2) Reverse direction and open the door to the upmost position when constant pressure on a control is removed prior to operator reaching its lower limit, and
- 3) Limit a portable transmitter, when supplied, to functioning only to cause the operator to open the door;

b) Shall be provided with a means for connection of an external secondary entrapment protection device as described in 31.3.1 – 31.3.3; or

c) Shall be provided with an inherent secondary entrapment protection device as described in 31.3.1, 31.3.2, and 31.3.4.

31.1.2 revised September 18, 1998

31.1.3 *Revised and relocated as 45.5 effective March 1, 2000*

31.1.4 *Revised and relocated as 45.6 effective March 1, 2000*

31.1.5 *Revised and relocated as 31.2.8 September 18, 1998*

31.1.6 In the case of a door operator system that relies on the operator mounted to the header of the door for compliance with the requirements in this Standard, the door shall comply with the requirements in Specifications for Sectional Overhead Type Doors, ANSI/DASMA 102-1996. A pinch point shall not be contacted by the probe illustrated in Figure 9.1 using the procedures described in paragraphs 9.3, 9.4, 9.5, and 9.7. In addition, a section joint of a residential sectional garage door, that admits a 0.35 inch (9 mm) diameter rod that is 3.9 inches (100 mm) long, shall also admit a 1.0 inch (25 mm) diameter rod that is 3.9 inches (100 mm) long, at all positions of the door. Rubber or textile coverings or shields, when used to cover the joint, shall pass the same test. Evaluation of pinch points shall be made with the door installed on all track configurations supplied with the door.

31.1.6 added September 18, 1998

31.2 Inherent entrapment protection

31.2.1 Other than for the first 1 foot (305 mm) of travel as measured over the path of the moving door, both with and without any external entrapment protection device functional, the operator of a downward moving residential garage door shall initiate reversal of the door within 2 seconds of contact with the obstruction as specified in 31.2.2. After reversing the door, the operator shall return the door to, and stop the door at, the full upmost position. Compliance shall be determined in accordance with 31.2.2 – 31.2.8.

Exception: The door operator is not required to return the door to, and stop the door at, the full upmost position when an inherent entrapment circuit senses a second obstruction or a control is actuated to stop the door during the upward travel.

31.2.1 revised February 25, 2000

31.2.2 A solid object is to be placed on the floor of the test installation and at various heights under the edge of the door and located in line with the driving point of the operator. When tested on the floor, the object shall be 1 inch (25.4 mm) high. In the test installation, the bottom edge of the door under the driving force of the operator is to be against the floor when the door is fully closed.

Exception: For operators other than those attached to the door, a solid object is not required to be located in line with the driving point of the operator. The solid object is to be located at points at the center and within 1 foot of each end of the door.

31.2.2 revised September 18, 1998

31.2.3 An operator is to be tested for compliance with 31.2.1 for 50 open-and-close cycles of operation while the operator is connected to the type of residential garage door with which it is intended to be used or with the doors specified in 31.2.5. For an operator having a force adjustment on the operator, the force is to be adjusted to the maximum setting or at the setting that represents the most severe operating condition. Any accessories having an effect on the intended operation of entrapment protection functions that are intended for use with the operator, are to be attached and the test is to be repeated for one additional cycle.

31.2.3 revised September 18, 1998

31.2.4 For an operator that is to be adjusted (limit and force) according to instructions supplied with the operator, the operator is to be tested for 10 additional obstruction cycles using the solid object described in 31.2.2 at the maximum setting or at the setting that represents the most severe operating condition.

31.2.4 revised September 18, 1998

31.2.5 For an operator that is intended to be used with more than one type of door, one sample of the operator is to be tested on a sectional door with a curved track and one sample is to be tested on a one-piece door with jamb hardware and no track. For an operator that is not intended for use on either or both of these types of doors, a one-piece door with track hardware or a one-piece door with pivot hardware shall be used for the tests. For an operator that is intended for use with a specifically dedicated door or doors, a representative door or doors shall be used for the tests. See the marking requirements in 53.3.1.

31.2.5 revised September 18, 1998

31.2.5A An operator, using an inherent entrapment protection system that monitors the actual position of the door, shall initiate reversal of the door and shall return the door to, and stop the door at, the full upmost position in the event the inherent door operation "profile" of the door differs from the originally set parameters. The entrapment protection system shall monitor the position of the door at increments not greater than 1 inch (25.4 mm).

Exception: The door operator is not required to return the door to, and stop the door at, the full upmost position when an inherent entrapment circuit senses an obstruction or a control is actuated to stop the door during the upward travel.

31.2.5A added September 18, 1998

31.2.6 An operator, using an inherent entrapment protection system that does not monitor the actual position of the door, shall initiate reversal of the door and shall return the door to, and stop the door at, the full upmost position, when the lower limiting device is not actuated within 30 seconds or less following the initiation of the close cycle.

Exception: The door operator is not required to return the door to, and stop the door at, the full upmost position when an inherent entrapment circuit senses an obstruction or a control is actuated to stop the door during the upward travel. When the door is stopped manually during its descent, the 30 seconds shall be measured from the resumption of the close cycle.

31.2.6 revised September 18, 1998

31.2.7 To determine compliance with 31.2.5A or 31.2.6, an operator is to be subjected to 10 open-and-close cycles of operation while connected to the door or doors specified in 31.2.3 and 31.2.5. The cycles are not required to be consecutive. Motor cooling-off periods during the test meet the intent of the requirement. The means supplied to comply with 31.2.1 and 31.3.1 are to be inoperative or defeated during the test. An obstructing object is to be used so that the door is not capable of activating a lower limiting device.

31.2.7 revised September 18, 1998

31.2.8 During the closing cycle, the system providing compliance with 31.2.1 and 31.2.5A or 31.2.1 and 31.2.6 shall function regardless of a short- or open-circuit anywhere in any low-voltage external wiring, any external entrapment devices, or any other external component.

31.1.5 revised and relocated as 31.2.8 September 18, 1998

31.3 Secondary entrapment protection

31.3.1 A secondary entrapment protection device supplied with, or as an accessory to, an operator shall consist of:

- a) An external photoelectric sensor that, when activated, results in an operator that is closing a door to reverse direction of the door and the sensor prevents an operator from closing an open door,
- b) An external edge sensor installed on the edge of the door that, when activated, results in an operator that is closing a door to reverse direction of the door and the sensor prevents an operator from closing an open door,
- c) An inherent door sensor independent of the system used to comply with Section 31.2 that, when activated, results in an operator that is closing a door to reverse direction of the door and the sensor prevents an operator from closing an open door, or
- d) Any other external or internal device that provides entrapment protection equivalent to (a), (b), or (c).

31.3.1 revised September 18, 1998

31.3.2 With respect to 31.3.1, the operator shall monitor for the presence and correct operation of the device, including the wiring to it, at least once during each close cycle. In the event the device is not present or a fault condition occurs which precludes the sensing of an obstruction, including an open- or short-circuit in the wiring that connects an external entrapment protection device to the operator and the device's supply source, the operator shall be constructed such that:

a) A closing door shall open and an open door shall not close more than 1 foot (305 mm) below the upmost position, or

b) The operator shall function as required by 31.1.2(a).

31.3.2 revised February 25, 2000

31.3.3 An external entrapment protection device shall comply with the applicable requirements in Sections 32– 34 of this Standard.

31.3.3 revised September 18, 1998

31.3.4 An inherent secondary entrapment protection device shall comply with the applicable requirements in Door Sensors, Section 42A. Software used in an inherent entrapment protection device shall comply with the Standard for Safety Related Software, UL 1998.

31.3.4 added September 18, 1998

31.4 Additional features

31.4.1 A means to manually detach the door operator from the door shall be supplied. The gripping surface (handle) shall be colored red and shall be easily distinguishable from the rest of the operator. It shall be capable of being adjusted to a height of 6 feet (1.8 m) above the garage floor when the operator is installed according to the instructions specified in 51.3.1 and 51.4.1(4). The means shall be constructed so that a hand firmly gripping it and applying a maximum of 50 pounds (223 N) of force shall detach the operator with the door obstructed in the down position. The obstructing object, as described in 31.2.2, is to be located in several different positions. A marking with instructions for detaching the operator shall be supplied. The marking shall comply with 52.1 – 52.8.

Exception: A means to manually detach the door operator from the door is not required for a door operator that is not directly attached to the door and that controls movement of the door so that:

a) The door is capable of being moved open from any position other than the last (closing) 2 inches (50.8 mm) of travel, and

b) The door is capable of being moved to the 2-inch point from any position between closed and the 2-inch point.

31.4.1 revised September 18, 1998

31.4.2 Actuation of a control that initiates movement of a door shall stop and may reverse the door on the down cycle. On the up cycle, actuation of a control shall stop the door but not reverse it.

31.4.3 A residential garage door operator when tested as described in 39.1 shall have a maximum appliance current draw, excluding lamps or external devices, of not more than 5 amperes.

31.4.3 revised November 24, 1997

31.4.4 An operator shall be constructed so that adjustment of limit, force or other user controls and connection of external entrapment protection devices can be accomplished without exposing normally enclosed live parts or wiring. See 9.7.

EXTERNAL ENTRAPMENT PROTECTION DEVICES

32 All Devices

32.1 General

32.1.1 An external entrapment protection device shall perform its intended function when tested in accordance with 32.1.2 – 32.1.4.

32.1.2 The device is to be installed in the intended manner and its terminals connected to circuits of the operator as indicated by the installation instructions.

Effective date of 32.1.2 changed from July 16, 1999 to March 1, 2000

32.1.3 The device is to be installed and tested at minimum and maximum heights and widths representative of recommended ranges specified in the installation instructions. For doors, if not specified, devices are to be tested on a minimum 7-foot (2.1-m) wide door and maximum 20-foot (6.1-m) wide door.

Effective date of 32.1.3 changed from July 16, 1999 to March 1, 2000

32.1.4 If powered by a separate source of power, the power-input supply terminals are to be connected to supply circuits of rated voltage and frequency.

32.1.5 An external entrapment protection device requiring alignment, such as a photoelectric sensor, shall be provided with a means, such as a visual indicator, to show proper alignment and operation of the device.

32.2 Current protection test

32.2.1 There shall be no damage to the entrapment protection circuitry if low voltage field-wiring terminals or leads are shorted or miswired to adjacent terminals.

32.2.2 To determine compliance with 32.2.1, an external entrapment protection device is to be connected to an operator or other source of power in the intended manner, after which all connections to low-voltage terminals or leads are to be reversed as pairs, reversed individually, or connected to any low-voltage lead or adjacent terminal.

Effective date of 32.2.2 changed from July 16, 1999 to March 1, 2000

32.3 Water exposure tests

32.3.1 Revised and relocated as 32.3.1.1 effective March 1, 2000

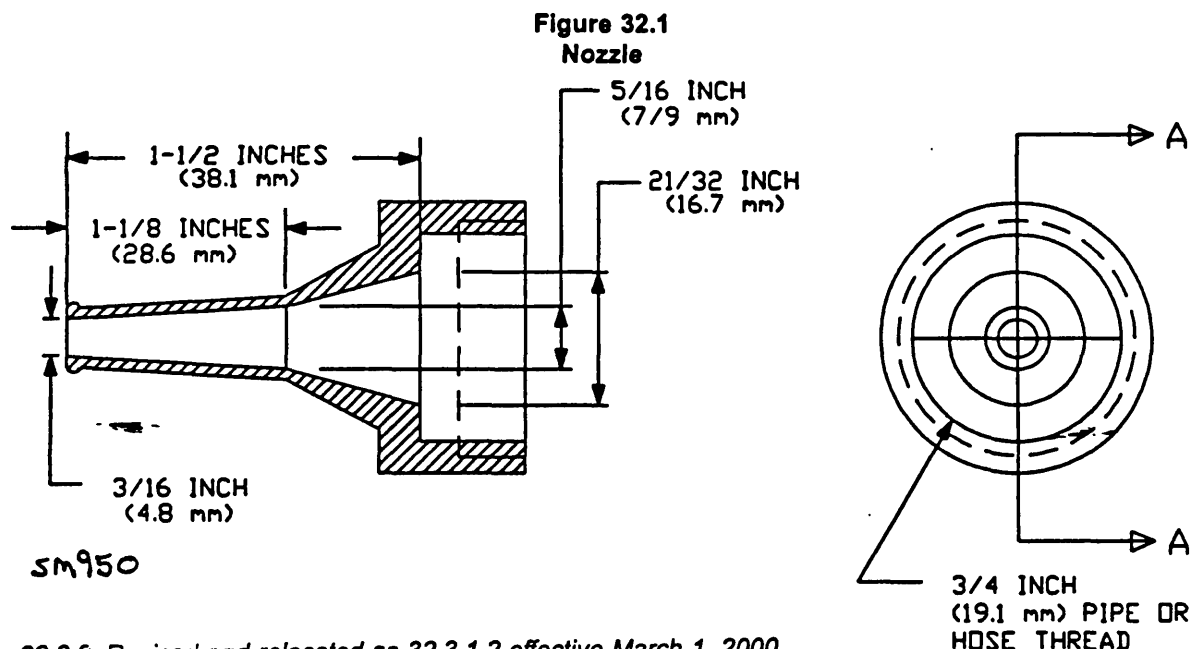
32.3.1 Splash test

32.3.1.1 An external entrapment protection device intended to be installed inside a garage 3 feet (914 mm) or less above the floor shall withstand indirect water spray as described in 32.3.1.2 without resulting in a risk of electric shock and shall function as intended. After exposure to the water spray, the external surface of the device is to be dried before determining its functionality.

32.3.1 revised and relocated as 32.3.1.1 effective March 1, 2000

32.3.1.2 External entrapment protection devices are to be indirectly sprayed using a hose having the free end fitted with a nozzle as illustrated in Figure 32.1 and connected to a water supply capable of maintaining a flow rate of 5 gallons (19 liters) per minute as measured at the outlet orifice of the nozzle. The water from the hose is to be sprayed, from all sides and at any angle, against the floor under the device in a manner that results in water spray on the enclosure of electrical components. The nozzle is not to be brought closer than 10 feet (3.05 m) horizontally to the device. The water is to be sprayed for 1 minute.

32.3.2 revised and relocated as 32.3.1.2 effective March 1, 2000



32.3.2 Revised and relocated as 32.3.1.2 effective March 1, 2000

33 Photoelectric Sensors

33.1 Normal operation test (doors, vertical lift gates, and vertical pivot gates)

33.1.1 When installed as described in 32.1.1 – 32.1.4, a photoelectric sensor shall sense an obstruction as described in 33.1.2 that is to be placed on a level surface below the door or gate. The sensor is to be tested with the obstruction at a total of five different locations over the width of the door or gate opening. The locations shall include distances 1 inch (25.4 mm) from each end, 1 foot (305 mm) from each end, and the midpoint.

Revised 33.1.1 effective March 1, 2000

32.5 Resistance to Impact test

32.5.1 An external entrapment protection device employing a polymeric or elastomeric material as a functional part shall be subjected to the impact test specified in 32.5.2. As a result of the test:

- a) There shall not be cracking or breaking of the part, and
- b) The part shall operate as intended.

A part that is dislodged, is not cracked or broken, and is capable of being restored to its original condition meets the intent of the requirement.

32.5.1 revised September 18, 1998

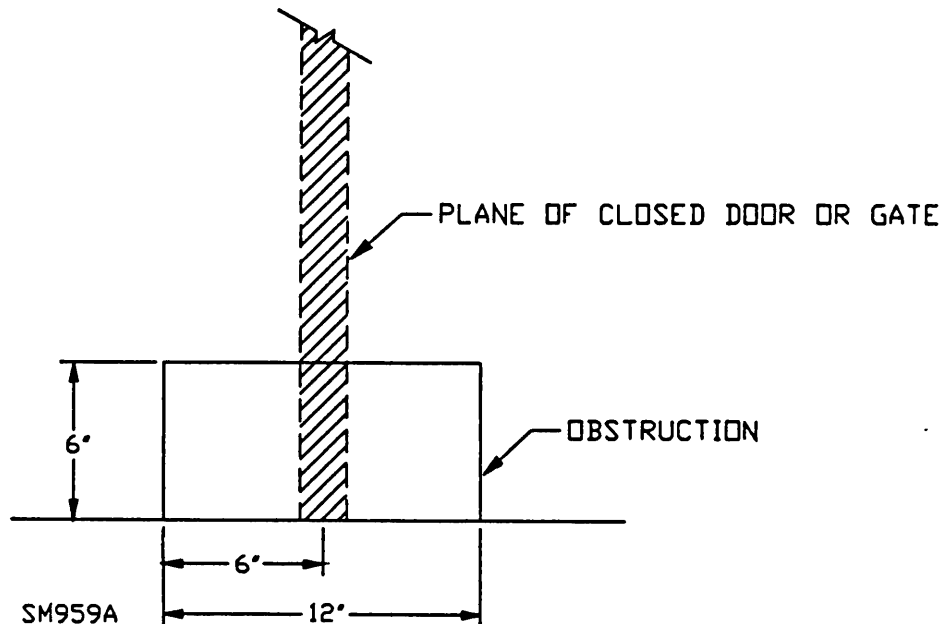
32.5.2 Samples of the external entrapment protection device are to be subjected to the Impact Test described in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. The external entrapment protection device is to be subjected to 5 foot-pound (6.8 J) impacts. Three samples are to be tested, each sample being subjected to three impacts at different points.

33.1.2 The obstruction noted in 33.1.1 shall consist of a white vertical surface, 6 inches (152 mm) high by 12 inches (305 mm) long. The obstruction is to be centered under the door or gate perpendicular to the plane of the door or gate when in the closed position. See Figure 33.1.

Revised 33.1.2 effective March 1, 2000

Figure 33.1
Stationary obstruction

Effective date of Figure 33.1 changed from July 1, 1999 to March 1, 2000



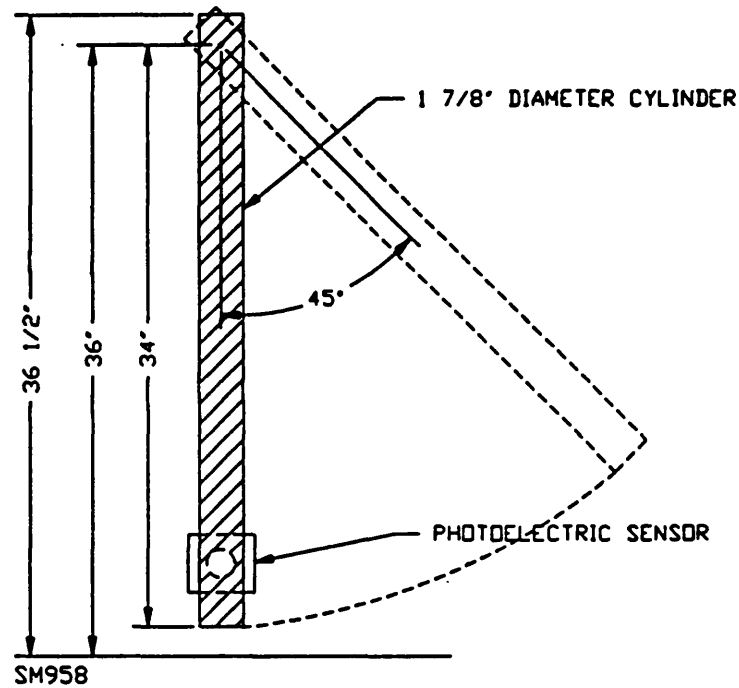
33.2 Sensitivity test

33.2.1 When installed as described in 32.1.1 – 32.1.4, a photoelectric sensor shall sense the presence of a moving object when tested according to 32.2.2.

33.2.2 The moving object is to consist of a 1-7/8 inch (47.6 mm) diameter cylindrical rod, 34-1/2 inches (876 mm) long, with the axis point being 34 inches (864 mm) from the end. The axis point is to be fixed at a point centered directly above the beam of the photoelectric sensor 36 inches (914 mm) above the level surface below the door or gate. The photoelectric sensor is to be mounted at the highest position as recommended by the manufacturer. The rod is to be swung as a pendulum through the photoelectric sensor's beam from a position 45 degrees from the plane of the door or gate when in the closed position. See Figure 33.2.

Effective date of 33.2.2 changed from July 1, 1999 to March 1, 2000

Figure 33.2
Moving obstruction



33.2.3 The test described in 33.2.2 is to be conducted at three points over the width of the door or gate opening, at distances of 1 foot (305 mm) from each end and the midpoint.

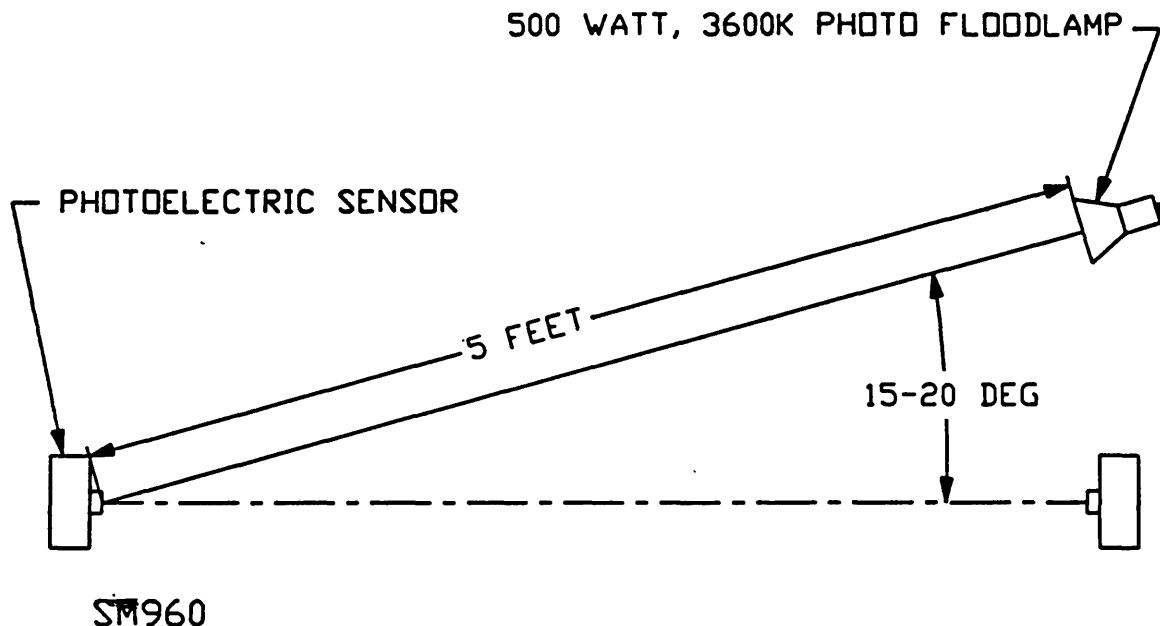
Effective date of 33.2.3 changed from July 16, 1999 to March 1, 2000

33.3 Ambient light test

33.3.1 A photoelectric sensor shall operate as specified in 31.3.1 and 31.3.2 when subjected to ambient light impinging at an angle of 15 to 20 degrees from the axis of the beam when tested according to 33.3.2 and, if appropriate, 33.3.3.

33.3.2 To determine compliance with 33.3.1, a 500 watt, 3600K Photo Floodlamp, type DXC RFL-2, is to be energized from a 120-volt, 60-hertz source. The lamp is to be positioned 5 feet from the front of the receiver and aimed directly at the sensor at an angle of 15 to 20 degrees from the axis of the beam. See Figure 33.3.

Figure 33.3
Ambient light test



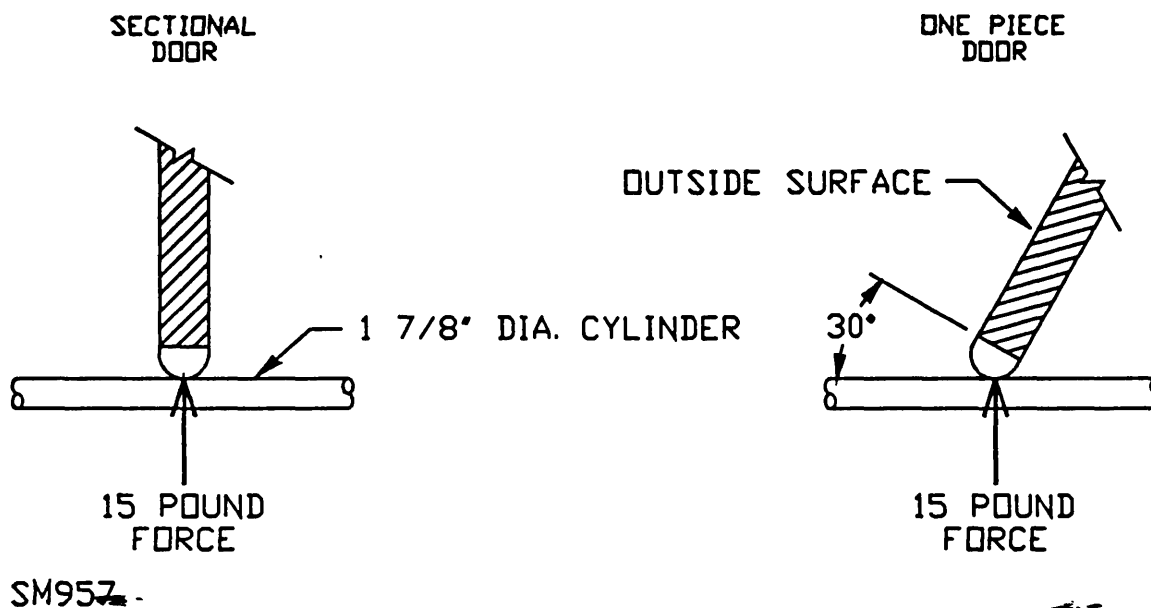
33.3.3 If the photoelectric sensor uses a reflector, this test is to be repeated with the lamp aimed at the reflector.

34 Edge Sensors

34.1 Normal operation test

34.1.1 When installed on a representative door edge, an edge sensor shall actuate upon the application of a 15 pound (66.7 N) or less force in the direction of the application. For an edge sensor intended to be used on a sectional door, the force is to be applied by the longitudinal edge of a 1-7/8 inch (47.6 mm) diameter cylinder placed across the sensor so that the axis is perpendicular to plane of the door. For an edge sensor intended to be used on a one piece door, the force is to be applied so that the axis is at an angle 30 degrees from the direction perpendicular to the plane of the door. See Figure 34.1.

Figure 34.1
Edge sensor normal operation test



34.1.2 With respect to the test of 34.1.1, the test is to be repeated at various representative points of the edge sensor across the width of the door.

Exception: The edge sensor need not be sensitive to actuation 2 inches (50.4 mm) or less from each end of the intended width of the door opening.

34.2 Endurance test

34.2.1 An edge sensor system and associated components shall withstand 30,000 cycles of mechanical operation without failure. For this test, the edge sensor is to be cycled by the repetitive application of the force as described in 34.1.1. The force is to be applied to the same location for the entire test. For an edge sensor system employing integral electric contact strips, this test shall be conducted with the contacts connected to a load no less severe than it controls in the operator. For the last 50 cycles of operation, the sensor shall function as intended when connected to an operator.

34.3 Elastomeric material conditioning test

34.3.1 An elastomeric material used as a functional part of an edge sensor shall function as intended when subjected to:

- a) Accelerated Aging Test of Gaskets, Section 44, and
- b) Puncture Resistance Test, Section 47.

34.3.2 An elastomeric material used for a functional part that is exposed to outdoor weather conditions when the door is in the closed position shall have physical properties as specified in Table 44.1 after being conditioned in accordance with the Ultraviolet Light Exposure Test described in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

35 Trial Installation

35.1 To determine whether the installation instructions in the instruction manual comply with the requirements in 51.1.1– 51.1.3, 51.3.1, and 51.3.2, a trial installation is to be made using the instruction manual.

Effective date of 35.1 changed from July 16, 1999 to March 1, 2000

42A Inherent Secondary Force Activated Door Sensors

42A.1 Normal operation test

42A.1.1 A force activated door sensor of a door system installed according to the installation instructions shall actuate when the door applies a force of 15 pound (66.7 N) or less in the down or closing direction and when the door applies a force of 25 pound (111.2 N) or less in the up or opening direction. For a force activated door sensor intended to be used in an operator intended for use only on a sectional door, the force is to be applied by the door against the longitudinal edge of a 1-7/8 inch (47.6 mm) diameter cylinder placed across the door so that the axis is perpendicular to the plane of the door. See Figure 34.1. The weight of the door is to be equal to the maximum weight rating of the operator.

42A.1.1 added September 18, 1998

42A.1.2 The test described in 42A.1.1 is to be repeated and measurements made at various representative points across the width and height of the door. For this test, a force activated door sensor system and associated components shall withstand a total of 9 cycles of mechanical operation without failure with the force applied as follows:

- a) At the center at points one, three, and five feet (304.8 mm, 914.4 mm and 1.5 m) from the floor,
- b) Within 1 foot (304.8 mm) of the end of the door, at points one, three, and five feet from the floor,
- c) Within 1 foot of the other end of the door at points one, three, and five feet from the floor.

The cycles are not required to be consecutive. Continuous operation of the motor without cooling is not required.

42A.1.2 added September 18, 1998

42A.2 Adjustment of door weight

42A.2.1 With the door at the point and at the weight determined by the tests of 42A.1.2 and 42A.2.2 to be most severe, the door sensor and associated components shall function as intended after 50 cycles of operation.

42A.2.1 added September 18, 1998

42A.2.2 At the point determined by the test in 42A.1.1 and 42A.1.2 to be the most severe, weight is to be added to the door in 5.0-pound (2.26-Kg) increments and the test repeated until a total of 15.0 pounds (6.78 kg) has been added to the door. Before performing each test cycle, the door is to be cycled 2 times to update the profile. Similarly, starting from normal weight plus 15.0 pounds, the test is to be repeated by subtracting weight in 5.0-pound increments until a total of 15.0 pounds has been subtracted from the door.

42A.2.2 added September 18, 1998

45.5 A mechanical switch or a relay used in an entrapment protection circuit of an operator shall withstand 100,000 cycles of operation controlling a load no less severe (voltage, current, power factor, inrush, and similar ratings) than it controls in the operator, and shall function normally upon completion of the test.

31.1.3 revised and relocated as 45.5 effective March 1, 2000

45.6 In the event malfunction of a switch or a relay (open or short) described in 45.5 results in loss of any entrapment protection required by 30A.1.1, 31.2.1, 31.2.5A, 31.2.6, or 31.3.1, the door or gate operator shall become inoperative at the end of the opening or closing operation; or for a door operator only, the door operator shall move the door to, and stay within, 1 foot (305 mm) of the uppermost position.

31.1.4 revised and relocated as 45.6 effective March 1, 2000

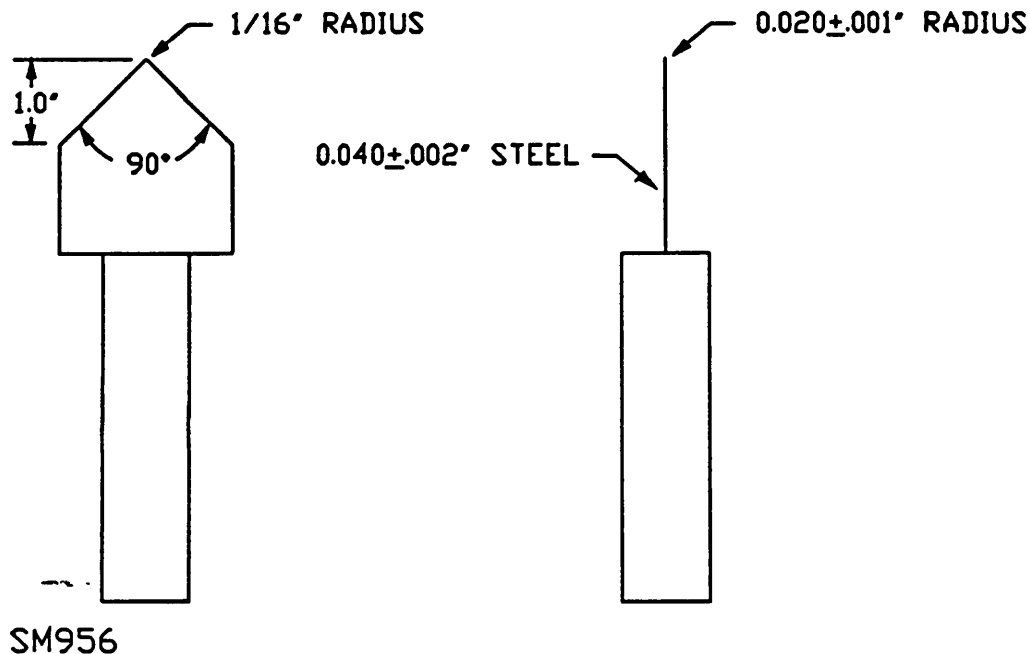
47 Puncture Resistance Test

47.1 After being subjected to the test described in 47.2, an elastomeric material that is a functional part of an edge sensor shall:

- a) Not be damaged in a manner that would adversely affect the intended operation of the edge sensor, and
- b) Maintain enclosure integrity if it serves to reduce the likelihood of contamination of electrical contacts.

47.2 A sample of the edge sensor is to be installed in the intended manner on a representative door edge. The probe described in Figure 47.1 is to be applied with a 20 pound-force (89N) to any point on the sensor that is 3 inches or less above the floor when the door is fully closed. For each type of door, the force is to be applied in the direction specified in the Edge Sensor Normal Operation Test, Figure 34.1. The test is to be repeated on three locations on each surface of the sensor being tested.

Figure 47.1
Puncture probe



47.3 The test is to be repeated on an additional sample cooled to a temperature of 0.0°C (32.0°F) and maintained at this temperature for 3 hours. While the sample is still cold, it is to be subjected to the puncture resistance tests described in 47.1 and 47.2.

48 Permanence of Marking Tests

48.1 A marking that is required to be permanent shall be molded, die-stamped, paint-stenciled, stamped or etched metal that is permanently secured, or indelibly stamped lettering on a pressure-sensitive label secured by adhesive that, upon investigation, is found to be acceptable for the application. Ordinary usage, handling, storage, and the like of a product are considered in the determination of the permanence of a marking.

48.2 Unless rated for the application, a pressure-sensitive label or a label that is secured by cement or adhesive and that is required to be permanent shall comply with the applicable requirements in the Standard for Marking and Labeling Systems, UL 969. The label shall be evaluated for exposure to:

- a) High humidity,
- b) Occasional exposure to water, and
- c) Minimum temperature of minus 40°C (minus 40°F).

A label used on a product or device anticipated to be exposed to the weather shall be evaluated for outdoor use.

48.2 revised September 18, 1998

INSTRUCTION MANUAL

51 Details

51.1 General

51.1.1 An appliance shall be provided with an instruction manual. The instruction manual shall give instructions for the installation, operation, and user maintenance of the appliance.

51.1.7 Where a minimum letter height is specified, the height of the largest letter shall be used to determine letter height, unless stated otherwise. Numbers and all other letters shall be proportional.

51.1.7 added September 18, 1998

51.3 Residential garage doors and door operators

51.3.1 Instructions that clearly detail installation and adjustment procedures required to effect proper operation of the safety means included shall be provided with each door operator.

51.3.2 A residential garage door or door operator shall be provided with complete and specific instructions for the correct adjustment of the control mechanism and the need for periodic checking and, if needed, adjustment of the control mechanism so as to maintain satisfactory operation of the door.

51.3.3 The instruction manual shall include the important instructions specified in 51.4.1 and 51.5.1. All required text shall be legible and contrast with the background. Upper case letters of required text shall be no less than 5/64 inch (2.0 mm) high and Lower case letters shall be no less than 1/16 inch (1.6 mm) high. Headings such as "IMPORTANT INSTALLATION INSTRUCTIONS", "IMPORTANT SAFETY INSTRUCTIONS", "SAVE THESE INSTRUCTIONS" and the words "WARNING - To reduce the risk of severe injury or death to persons:" shall be in letters no less than 3/16 inch (4.8 mm) high.

51.3.4 The instructions listed in 51.4.1 and 51.5.1 shall be in the exact words specified or shall be in equally definitive terminology to those specified. No substitutes shall be used for the word "WARNING". The items may be numbered. The first and last items specified in 51.5.1 shall be first and last respectively. Other important and precautionary items considered appropriate by the manufacturer may be inserted.

51.3.5 The instructions listed in 51.4.1 shall be located immediately prior to the installation instructions. The instructions listed in 51.5.1 shall be located immediately prior to user operation and maintenance instructions. In each case, the instructions shall be separate in format from other detailed instructions related to installation, operation and maintenance of the appliance. All instructions, except installation instructions, shall be a permanent part of the manual(s).

51.4 Installation Instructions

51.4.1 The installation instructions shall include the following or equivalent text:

IMPORTANT INSTALLATION INSTRUCTIONS

WARNING – To reduce the risk of severe injury or death:

1. READ AND FOLLOW ALL INSTALLATION INSTRUCTIONS.

2. Install only on a properly balanced garage door. An improperly balanced door has the potential to inflict severe injury. Have a qualified service person make repairs to cables, spring assemblies, and other hardware before installing the opener.

3. Remove all ropes and remove or make inoperative all locks connected to the garage door before installing opener.

4. Where possible, install the door opener 7 feet or more above the floor. For products having an emergency release, mount the emergency release 6 feet above the floor.

5. Do not connect the opener to source of power until instructed to do so.

6. ~~Locate~~ Locate the control button: (a) within sight of door, (b) at a minimum height of 5 feet so small children are not able to reach it, and (c) away from all moving parts of the door.

7. Install the Entrapment Warning Label next to the control button in a prominent location. Install the Emergency Release Marking. Attach the marking on or next to the emergency release.

8. After installing the opener, the door must reverse when it contacts a 1-1/2 inch high object (or a 2 by 4 board laid flat) on the floor.

51.4.1 revised September 18, 1998

51.5 User Instructions

51.5.1 The user instructions shall include the following or equivalent text:

IMPORTANT SAFETY INSTRUCTIONS

WARNING – To reduce the risk of severe injury or death:

1. READ AND FOLLOW ALL INSTRUCTIONS.

2. Never let children operate or play with door controls. Keep the remote control away from children.

3. Always keep the moving door in sight and away from people and objects until it is completely closed. NO ONE SHOULD CROSS THE PATH OF THE MOVING DOOR.

4. Test door opener monthly. The garage door MUST reverse on contact with a 1-1/2 inch high object (or a 2 by 4 board laid flat) on the floor. After adjusting either the force or the limit of travel, retest the door opener. Failure to adjust the opener properly increases the risk of severe injury or death.

5. For products having an emergency release, when possible, use the emergency release only when the door is closed. Use caution when using this release with the door open. Weak or broken springs are capable of increasing the rate of door closure and increasing the risk of severe injury or death.

6. **KEEP GARAGE DOORS PROPERLY BALANCED.** See owner's manual. An improperly balanced door increases the risk of severe injury or death. Have a qualified service person make repairs to cables, spring assemblies, and other hardware.

7. **SAVE THESE INSTRUCTIONS.**

51.5.1 revised September 18, 1998

52 Field Installed Labels

52.1 A residential garage door operator shall be provided with labels for field installation and constructed as specified in 52.3 – 52.9. The labels shall be acceptable for permanent installation. The instruction manual shall specify where the labels are to be located.

52.2 If labels secured by adhesive are used, the instructions shall specify that an additional mechanical means shall be used to secure the labels to surfaces to which the adhesive will not adhere.

52.3 A residential garage door operator shall be provided with a cautionary label intended for permanent installation to identify the possible risk of entrapment. The instruction manual shall direct that the label be affixed near the wall-mounted control button.

52.4 The label required in accordance with 52.3 shall be in a vertical layout with three panels:

- a) A signal word panel,
- b) A pictorial panel, and
- c) A message panel.

Adjacent panels shall be delineated from each other by a bold black line. The entire label shall be surrounded by a black border and shall not be less than 5 inches (127 mm) wide by 6-1/4 inches (159 mm) long overall.

52.4 revised September 18, 1998

52.5 The signal word panel as specified in 52.4 shall contain the word "WARNING," in upper case letters, preceded by a safety alert symbol consisting of an orange exclamation mark on a black solid equilateral triangle background with the point of the triangle oriented upward. The word "WARNING" and the safety alert symbol shall be centered on one line and shall be in black letters at least 7/16 inch (11.1 mm) high on an orange background.

52.6 The pictorial panel as specified in 52.4 shall be positioned between the signal word panel and the message panel. The pictorial shall be black on a white background and shall clearly depict a child running toward or under a garage door. A red prohibition symbol (slash, oriented from the upper left to the lower right, through a circle) shall be superimposed over, and totally surround, the pictorial. The pictorial shall have an overall diameter of 1-7/8 inch (47.6 mm) minimum.

52.7 The message panel specified in 52.4 shall include the following statements and instructions or an equivalent wording:

- a) **POSSIBLE RISK AND CONSEQUENCE STATEMENT** – "There is a risk of a child becoming trapped under an automatic garage door resulting in severe injury or death."

b) AVOIDANCE STATEMENTS:

- 1) "Do not let children walk or run under a closing door."
- 2) "Do not let children operate door operator controls."
- 3) "Always keep a closing door within sight."
- 4) "In the event a person is trapped under the door, push the control button or use the emergency release."

Exception: For products not having an emergency release, the instructions shall omit "or use the emergency release."

c) INSTRUCTIONS:

- 1) "Test Door Operator Monthly: Use a 1-1/2-inch high object (or a 2 by 4 board laid flat) on the floor under the closing door. In the event the door does not reverse upon contact, adjust, repair, or replace the operator."
- 2) Additional instructions on not removing or painting over the label, mounting the label adjacent to the wall control, and mounting the wall control out of children's reach shall be supplied. These additional instructions shall be in less prominent lettering than the lettering for item 1.

52.7 revised September 18, 1998

52.8 The lettering of the message panel described in 52.7 shall be black on a white background and shall be in sans serif letters in combinations of upper case and lower case letters. The upper case letters of the Possible Risk and Consequence Statements and Avoidance Statements shall be 1/8 inch (3.18 mm) high minimum. The lettering of the Possible Risk and Consequence Statement shall be in italics, underlined, bold, or the like, and shall be double spaced from the Avoidance Statements so that it is more prominent than the Avoidance Statements. All other instructions shall be in letters less prominent than the Possible Risk and Consequence Statements and shall be separated with at least a single space between individual instructions.

52.9 A residential garage door operator shall be supplied with a cautionary marking attached to, or adjacent at all times to, the means supplied to detach the operator from the garage door. The marking shall include the following statement or the equivalent: "In the event the door becomes obstructed, detach door from operator as follows: (The method to detach the operator shall be shown on the marking)."

Exception: For a product complying with the Exception to 31.4.1, a cautionary marking is not required.

52.9 revised September 18, 1998

MARKING

53 Details

53.1 General

53.1.1 Unless specifically indicated otherwise, markings required in 53.1.2 – 53.4.8 and elsewhere in this standard shall be permanent in accordance with Permanence of Marking Tests, Section 48.

Revised 53.1.1 effective July 16, 1998

53.1.2 An appliance shall be plainly marked, at a location where the marking shall be readily visible – after installation, in the case of a permanently connected appliance – with:

- a) The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product is identified – hereinafter referred to as the manufacturer's name,
- b) The catalog number or the equivalent,
- c) The voltage, frequency, and input in amperes or watts, and
- d) The date or other dating period of manufacture not exceeding any three consecutive months. The ampere rating shall be included unless the full-load power factor is 80 percent or more, or, for a cord-connected appliance, unless the rating is 50 watts or less. The number of phases shall be indicated when an appliance is for use on a polyphase circuit. The date code repetition cycle shall not be less than 20 years.

Exception No. 1: The manufacturer's identification is not restricted from being in a traceable code when the appliance is identified by the brand or trademark owned by a private labeler.

Exception No. 2: The date of manufacture is not restricted from being abbreviated or in an established or otherwise accepted code.

53.1.2 revised September 18, 1998

53.1.3 If a manufacturer produces or assembles appliances at more than one factory, each finished appliance shall have a distinctive marking, which may be in code, to identify it as the product of a particular factory.

53.3 Specific appliances

53.3.1 The carton and the instruction manual for an operator shall be marked with the word "WARNING" and the following or the equivalent: "To reduce the risk of injury to persons – Use this operator only with (a) ____ door(s)."

53.3.2 For products with user adjustments, a residential garage door operator shall be marked with the word "WARNING" and the following or equivalent: "Risk of entrapment. After adjusting either the force or limits of travel adjustments, confirm that the door reverses on a 1-1/2 inch (or a 2 by 4 board laid flat) high obstruction on the floor."

53.3.2 revised September 18, 1998

53.3.3 A separately supplied accessory, including an external entrapment protection device, intended for installation with an appliance or appliances shall be marked with the manufacturer's name and catalog or model number and the type of appliance or appliances (such as a residential garage door operator) with which it is intended to be used.

53.3.3 revised September 18, 1998

53.3.4 An appliance provided with terminals or connectors for connection of a separately supplied accessory, such as an external entrapment protection device, shall be marked to identify the accessory intended to be connected to the terminals or connectors. The accessory identification shall be by manufacturer's name and catalog or model number or other means to allow for the identification of accessories intended for use with the appliance.

53.3.5 With reference to 53.3.3, instructions for installing a separately supplied accessory shall be provided. A statement shall be included in the instructions warning the user that the appliance must be disconnected from the source of supply before attempting the installation of the accessory.

53.3.12 A door or door operator as described in 30.1.1(c) shall be provided with a placard that is marked in letters at least 1/4 inch (6.4 mm) high with the word "WARNING" and the following statement or the equivalent: "To Prevent Entrapment – Do not start door downward unless doorway is clear." The placard shall be made of substantially rigid material such as vulcanized fiber, or the equivalent, to provide mechanical strength, and provided with at least two holes for wall mounting.

e. In paragraph (i) remove the initial word "A" and add, in its place "Except for door operators complying with § 1211.9(b) of this part, a".

Dated: _____

Sadye E. Dunn, Secretary
Consumer Product Safety Commission