6.33.3 The external enclosure of a unit containing *low voltage* circuits shall withstand an impact of 7 J without permanent distortion to the extent that spacings are reduced below the values specified in Spacings, Subsection 5.19, or transient distortion which results in contact with live parts and without causing openings which expose uninsulated *low voltage* live parts or causing more than a ± 25% change in sensitivity and/or range.

6.33.4 The impact is to be applied by means of a solid, smooth, steel sphere 50 mm in diameter having a mass of approximately 540 g. The sphere is to fall freely from rest through a vertical distance of 1300 mm. Any openings resulting from the impact are to be judged under the requirements in Clauses 5.3.2.1 and 5.3.2.3. An enclosure containing only *extra-low voltage* power limited parts shall be tested using an impact of 3 J. The vertical fall shall be 520 mm.

6.34 TESTS ON SPECIAL TERMINAL ASSEMBLIES

6.34.1 General

6.34.1.1 To determine its acceptability as a field wiring connection under Clauses 5.5.4.1 and 5.5.4.2, representative samples of the terminal assembly shall comply with the tests in Subsections 6.34.2, Disconnection and Reconnection; 6.34.3, Mechanical Secureness; 6.34.4, Flexing Test; 6.34.5, Millivolt Drop Test; and 6.34.6, Temperature Test.

6.34.2 Disconnection and Reconnection

6.34.2.1 If a wire to be disconnected for testing or routine servicing and then reconnected, each terminal shall be subjected to 20 disconnections and 20 reconnections prior to the tests described in Subsections 6.34.3, Mechanical Secureness; 6.34.4, Flexing Test; 6.34.5, Millivolt Drop Test; and 6.34.6, Temperature Test.

6.34.3 Mechanical Secureness

6.34.3.1 A terminal connection shall withstand the application of a straight pull of 22 N, applied for 1 min to the wire in the direction which would most likely result in pullout, without separating from the wire.

6.34.3.2 Six samples of the terminal are to be connected to the wire sizes with which they are intended to be used, in accordance with the manufacturer's instructions. If a special tool is required to assemble the connection it shall be employed. Each sample is to be subjected to a gradually increasing pull on the wire until the test pull of 22 N is reached.

6.34.4 Flexing Test

6.34.4.1 The wire attached to a terminal shall withstand an average of five right angle bends without breaking.

6.34.4.2 Six terminal assemblies, employing the maximum wire size and six with the minimum wire size shall be subjected to this test. The terminal shall be rigidly secured so as to prevent any movement. With the wire in 13 N tension and held to a point 75 mm from the terminal-to-wire junction the wire shall be bent at a right angle from the nominal wire position. The wires shall be assembled to the terminals using any special tool required as per the

manufacturer's instructions. The tension on the wire shall hold the wire in a rigid position during the flexing trials.

6.34.5 Millivolt Drop Test

6.34.5.1 The voltage drop across a terminal connection using the maximum and minimum wire sizes intended to be employed with the terminals connected in series, shall be not greater than 300 m V with the maximum current of the circuit flowing through the terminal connection at the rated voltage of the circuit.

6.34.5.2 Six terminal assemblies employing the maximum wire sizes and six assemblies employing the minimum wire sizes shall be subjected to this test. The wires shall be assembled to the terminals using any special tool, if required, according to the manufacturer's instructions. The voltage drop shall then be measured using a high impedance millivoltmeter with the maximum current, as specified by the manufacturer, flowing through the connection.

6.34.6 Temperature Test

6.34.6.1 The maximum temperature rise on a terminal junction with the maximum and minimum wire sizes with which the terminal is employed, connected in turn, shall be not greater than 30°C based on an ambient temperature of 25°C.

6.34.6.2 Six terminal assemblies employing the maximum wire size and six employing the minimum size shall be subjected to this test. The wire shall be assembled to the terminals using any special tools, if required, according to the manufacturer's instructions. The maximum current to which the wire will be subjected in service shall then be passed through the terminal connection. The maximum temperature rise shall then be measured by the thermocouple method in accordance with the Temperature Test, Subsection 6.21, after temperatures have stabilized.

6.35 MARKING PERMANENCY TESTS

6.35.1 General

6.35.1.1 To determine if a directly applied marking, or a marking plate secured by cement or adhesive complies with Clause 9.6, representative samples are to be subjected to the tests outlined in Clauses 6.35.1.2 through 6.35.3.1.

6.35.1.2 In each test, three samples of the marking or marking plates are to be applied to the same test surfaces as employed in the intended application.

6.35.1.3 The marking or marking plate is considered to comply with the requirements if, immediately following removal from each test medium and after being exposed to room temperature for 24 h following removal from each test medium:

A Each sample of the marking plate demonstrates good adhesion and the edges are not curled;

B The marking or marking plate resists defacement or removal as demonstrated by scraping across the test panel with a flat metal blade 2 mm thick, held at a right angle to the test panel; and

C The printing is legible and is not defaced by rubbing with thumb or finger pressure.

6.35.2 Oven Aging

6.35.2.1 Three samples of the test panels are to be placed in an air oven maintained at a temperature of 87°C for 240 h (10 d).

6.35.3 Immersion

6.35.3.1 Three samples of the test panels are to be placed in a controlled atmosphere maintained at 32 ±2°C with a 93 ±2% relative humidity for 24 h.

6.36 ADHESIVE TEST

6.36.1 Following installation in accordance with the installation instructions, *intrusion detection units* intended to be secured to a mounting surface by an adhesive shall remain firmly attached when subjected to conditions specified in Clauses 6.36.1 through 6.36.8.

6.36.2 Following each test condition described in Clauses 6.36.3 through 6.36.7, security of the adhesive bond shall be determined by dropping a 19 by 150 by 300 mm, 370 ±60 g pine board from a height of 300 mm in a direction parallel to the glass so as to impact the side of the sensor. The product shall be allowed to return to room temperature prior to this test.

6.36.3 The security of the adhesive bond shall not be impaired by soaking in water at 20 to 25ºC for 24 h. Prior to inspecting, the sample shall be removed from the water, mounted vertically and allowed to dry.

6.36.4 The security of the adhesive bond shall not be impaired by exposure to a temperature of 66ºC for 24 h.

6.36.5 The security of the adhesive bond shall not be impaired by exposure to a temperature of -40ºC for 24 h.

6.36.6 The security of the adhesive bond shall not be impaired by exposure to air at 100% relative humidity, maintained at a temperature of 30 ±2ºC for 24 h.

6.36.7 The security of the adhesive bond shall not be impaired by the application of window cleaning liquids to the detector and surrounding glass surface. The glass surface shall be mounted in a vertical position and the cleaning liquid applied so as to completely saturate the detector and surrounding glass surface. The cleaning liquid shall not be wiped away, and other applications shall be made, with 5 min between applications, until a total of four applications have been made. The test in Clause 6.36.2 shall not be conducted for at least 24 h after the last application. The following window cleaning liquids shall be used:

A Commercial foaming type spray without ammonium hydroxide (NH_4OH); and

B Solution of ammonia water consisting of one part of an ammonium hydroxide (NH_4OH) 30 ±3% solution with eight parts distilled water.

6.36.8 The detector shall be capable of supporting a static load of 220 N applied at the point of contact in a direction parallel to the surface of the glass for a period of 1 min.

6.36.9 Partial or complete dislodgement of the detector shall be considered as indicating an inadequate adhesive bond.

6.36.10 The requirements of Clauses 6.36.2 and 6.36.8 shall not apply if electrical supervision is provided so as to initiate an alarm or trouble signal in the event of a complete or partial dislodgement of the detector.

7. OUTDOOR USE EQUIPMENT

7.1 GENERAL

7.1.1 In addition to the requirements of Section 5, Construction; and Section 6, *Performance*; equipment intended to be used *outdoor*s shall also comply with the requirements of Subsections 7.2, Construction, through 7.4, Marking.

7.2 CONSTRUCTION

7.2.1 General

7.2.1.1 An enclosure exposed to weather shall be constructed to prevent the wetting of live parts as specified in Clauses 7.2.1.2 and 7.2.1.3.

7.2.1.2 To determine compliance with Clause 7.2.1.1 a complete assembly, with supply conduit connections but without pipe thread compounds, is to be subjected to the Rain Test, Subsection 7.3.1.

7.2.1.3 Enclosures for electrical *components* shall have provision for drainage if knockouts or unthreaded openings in the enclosure are employed.

7.2.1.4 Cabinets and enclosures shall have a thickness of not less than 0.81 mm if uncoated sheet steel, not less than 0.86 mm if zinc coated sheet steel, and not less than 1.14 mm if copper, brass, or aluminum.

7.2.1.5 Enclosures thinner than that indicated in Clause 7 .2.1.4 and that comply with Tables 2 or 3, whichever applies, are acceptable if they are protected by an outer cabinet.

7.2.1.6 Sheet steel cabinets and enclosures, employing panels consisting of more than one sheet of lesser thickness than specified in Clause 7.2.1.4, may be used if the construction is found to be equivalent, in mechanical strength and corrosion resistance, to a single sheet of steel of the thickness stated in Clause 7.2.1.4.

7.2.2 Corrosion Protection

7.2.2.1 The requirements of Clause 7.2.2.2 are not applicable to a metal part, such as a decorative grille, that is not required for compliance with the requirements in this Standard.

7.2.2.2 Sheet steel cabinets and electrical enclosures exposed to the effects of weather shall be protected against corrosion as specified in Clause 7.2.1.1 or by other metallic or non-metallic coatings which have been shown to give equivalent protection, as determined by compliance with, Subsection 7.3.4, Corrosion Tests.

7.2.2.3 Nonferrous cabinets and enclosures may be employed without special corrosion protection. The thickness of the material is to be judged on the basis of its strength.

7.2.2.4 Nonmetallic cabinets and enclosures shall comply with the requirements of the Mechanical Strength Tests for Enclosures, Subsection 6.33. If the cabinet or enclosure is exposed to weather and composed of polymeric material, it shall be subjected to the Ultraviolet Light and Water Exposure Test, Subsection 7.3.5, before being subjected to the Mechanical Strength Tests for Enclosures, Subsection 6.33.

7.2.2.5 If gaskets are required to seal electrical enclosures against the entry of rain and condensate, they shall be held in place by mechanical fasteners or adhesives, except as indicated in Clause 7.2.2.6, and shall comply with the requirements of the Accelerated Aging Test for Gaskets, Sealing Compounds, and Adhesives, Subsection 7.3.6. Gaskets shall be neoprene, rubber or thermoplastic. Other materials may be used if they have equivalent properties.

7.2.2.6 If a gasket is prevented from displacement either by its location, its placement, or by other *components* in the enclosure when the cover is removed, and if the gasket is reengaged in the intended manner when the cover is replaced, that gasket is not required to be held by mechanical fasteners or adhesives.

7.2.3 Field-Wiring Connections

7.2.3.1 Openings provided for *low voltage* or other than power-limited field-wiring connections shall be acceptable for connection of conduit and shall be not less than 22 mm in diameter.

7.2.3.2 The openings shall be threaded unless they are located below the lowest uninsulated live part within the enclosure or their location prevents drainage into the enclosure along the outside surface of a field-supplied wireway. Threaded holes for conduit shall be provided with a conduit end stop unless the thread is tapered.

7.2.4 Internal Wiring

7.2.4.1 The internal wiring shall be constructed and assembled so as to reduce the risk of electric shock as a result of exposure to weather.

7.2.4.2 The wiring between electrical *component* enclosures shall comply with the requirements of CSA Standard C22.2 No. 38, Thermoset Insulated Wires and Cables.

7.2.4.3 The entrance of a wiring assembly into an electrical enclosure (such as conduit connections) shall be constructed to exclude water.

7.2.4.4 Wires not intended for use in wet locations and cords shall be routed and supported so that they will not be immersed in water.

7.2.5 Components, Electrical Insulating Material

7.2.5.1 Nonabsorptive electrical insulation shall be used in the construction of electrical *components*. Untreated fibre, is an example of a material that shall not be used.

7.2.5.2 Vulcanized fibre on electrical *components* is acceptable if *components* are not wetted as a result of the Rain Test, Subsection 7.3.1.

7.3 PERFORMANCE

7.3.1 Rain Test

7.3.1.1 If the equipment is exposed to outside weather conditions its exposed sections shall withstand a rain exposure for 1 h without creating an electrical shock or affecting its operation. The assembly shall also comply with Clause 7.3.1.9 after the tests.

7.3.1.2 All electrical *components* shall be energized and the unit tested in its intended position and under the conditions that could cause the entrance of water into or on electrical *components*. It may be necessary to operate the unit under various modes of operation or to de-energize the unit if additional water entry could result. Each exposure is to be for 1 h, and if more than one exposure is required, the unit is to be prepared for test as indicated in Clause 7.3.1.4 before repeating the test.

7.3.1.3 Field-wiring connections are to be made in accordance with the wiring method specified for the unit. Openings intended to terminate conduit are to be sealed. Openings intended for the entry of a conductor(s) for a *extra-low voltage* circuit are not sealed unless seals are provided as a part of the unit.

7.3.1.4 The unit is to be examined to determine that all electrical parts are not wetted and that there is no accumulation of water within the enclosures of electrical parts prior to rain exposure. See also Clauses 7.3.1.5.

7.3.1.5 Drying of the unit prior to the second or subsequent exposure is not required if, without such preparation, the unit complies with the requirement in Clause 7.3.1.6.

7.3.1.6 After each rain exposure, the unit is to have an insulation resistance between live parts and dead-metal parts no less than 50 kΩ. The insulation resistance is measured 1 min after application of the voltage obtained by using the series-voltmeter method, or equivalent means, and a 250 V dc circuit. The voltmeter shall have a minimum internal resistance of 30 kΩ.

7.3.1.7 After measurement of the insulation resistance, the complete unit is to be subjected to the Dielectric Voltage Withstand Test, Subsection 6.19.

7.3.1.8 The rain test apparatus is to consist of three spray heads mounted in a water supply pipe rack as shown in Figure 15. Spray heads are to be constructed in accordance with the details shown in Figure 16. The water pressure for all tests is to be maintained at 35 kPa (gauge) at each spray head. The distance between the centre nozzle and the unit is to be approximately 900 mm. The unit is to be brought into the focal area of the three spray heads in

such a position and under such conditions that the greatest quantity of water will enter the unit. The spray is to be directed at an angle of 45° to the vertical toward the louvers or other openings closest to live parts.

7.3.1.9 The test is not to result in the entrance of water into enclosures above the lowest electrical *component* other than insulated wire or in wetting live parts.

Exception: Water may enter an enclosure above the lowest electrical *component* if the point of entrance is not in proximity to live parts and live parts are not wetted during the Rain Test.

7.3.2 Dust Test

7.3.2.1 The sensitivity and/or range of an *intrusion detection unit* intended to be used *outdoor*s shall not be impaired by an accumulation of dust. Sensitivity and/or range measurements following this test shall not indicate a change greater than ±25%.

7.3.2.2 To determine compliance with Clause 7.3.2.1, a sample in its intended mounting position is to be placed, de-energized in an air tight chamber having an internal volume of at least 0.085 m^3.

7.3.2.3 Approximately 60 g of cement dust, maintained at 20 to 50% relative humidity and capable of passing through 75 micron screen, is to be circulated for 1 h by means of compressed air or a blower so as to completely envelop the sample in the chamber. The air flow is to be maintained at an air velocity of approximately 0.25 m/s.

7.3.2.4 Following the exposure to dust, the unit is to be removed carefully, mounted in its intended position, and energized from a source of supply in accordance with Clause 6.1.3.1, and shall comply with the requirements of the Sensitivity and Range Tests, Subsection 6.6.

7.3.3 Variable Ambient Test

7.3.3.1 A product intended for *outdoor* use shall function as intended at the test voltage, with its related equipment connected, and at ambient temperatures of –40 ±2°C and +66° ±2°C.

7.3.3.2 The exposure to either of the temperatures specified in Clause 7.3.3.1 is to be 4 h or more.

7.3.4 Corrosion

7.3.4.1 General

7.3.4.1.1 The operation of a device shall not be adversely affected following exposure to salt spray, hydrogen sulphide, and sulphur dioxide-carbon dioxide environments. A different sample shall be used for each environment. The salt spray environment shall be applied only to devices intended for mounting on exterior doors. The exposures shall be with the sample in the de-energized state. The test samples are to be suspended vertically in the test chamber for 240 h.

7.3.4.1.2 Following exposure to each environment, the sample shall be allowed to stabilize to room conditions and then shall comply with the requirements of the Dielectric Voltage Withstand Test, Subsection 6.19.

7.3.4.2 Salt Spray (Fog)

7.3.4.2.1 The apparatus for salt spray (fog) testing is to consist of a fog chamber having inside dimensions of 1200 by 900 by 800 mm, a salt-solution reservoir, a supply of conditioned compressed air, a dispersion tower that produces a salt fog, constructed in accordance with the Standard Practice for Operating Salt Spray (Fog) Testing, ASTM B117, sample supports, provision for heating the chamber, and necessary means of control.

7.3.4.2.2 The dispersion tower is to be located in the centre of the chamber and is to be supplied with humidified air at a pressure of 117 to 131 kPa (gauge) so that the salt solution is aspirated as a fine mist or fog into the interior of the chamber.

7.3.4.2.3 The salt solution is to consist of 5% by mass of common salt [sodium chloride (NaCl)] and distilled water. The pH value of the collected solution is to be between 6.7 and 7.2, at a relative density of 1.0255 to 1.0400 at 25°C. The temperature of the chamber is to be maintained at 35°C with a tolerance of +1 or –2°C throughout the test.

7.3.4.2.4 Drops of solution that accumulate on the ceiling or cover of the chamber are to be diverted from dropping onto the samples and drops of solution that fall from samples are not to be recirculated but are to be removed by a drain located at the bottom of the chamber.

7.3.4.3 Moist Hydrogen Sulphide-Air Mixture

7.3.4.3.1 The test samples are to be supported in a closed chamber having openings for gas inlet and outlet.

7.3.4.3.2 Hydrogen sulphide (H_2S) is to be supplied to the test chamber from a commercial cylinder containing this gas under pressure. An amount of hydrogen sulphide equivalent to 1% of the volume of the test chamber is to be introduced into the chamber. A small amount of water is to be maintained at the bottom of the chamber for humidity. The chamber is to be maintained at room temperature during the test period.

7.3.4.4 Moist Carbon Dioxide-Sulphur Dioxide-Air Mixture

7.3.4.4.1 The test samples are to be supported in a closed chamber having openings for gas inlet and outlet. A water jacket and thermostatically controlled heater are to be provided to maintain a temperature of 35 ±1°C.

7.3.4.4.2 Sulphur dioxide (SO_2) and carbon dioxide (CO_2) are to be supplied to the test chamber from commercial cylinders containing these gases under pressure. An amount of sulphur dioxide equivalent to 1% of the volume of the test chamber, and an equal volume of carbon dioxide are to be introduced into the chamber. A small amount of water is to be maintained at the bottom of the chamber for humidity.

7.3.5 Ultraviolet Light and Water Exposure Test

7.3.5.1 Polymeric materials and rubber compounds subject to direct exposure to *outdoor* environments shall comply with the requirements of Clauses 7.3.5.2 through 7.3.5.4, without evidence of deterioration to the extent that intended *performance* of the product may be impaired.

7.3.5.2 The samples are to be subjected to ultraviolet light (carbon arc) and water spray for 1000 h as described in Clauses 7.3.5.3 and 7.3.5.4.

7.3.5.3 The apparatus used is to provide ultraviolet light from two enclosed electric arcs formed between vertical carbon electrodes 12.7 mm in diameter, located at the centre of a revolvable vertical metal cylinder, that is 787 mm in diameter and 451 mm high. The current through the arcs is to be approximately 15 to 17 A ac and the potential across the arcs is to be approximately 120 to 145 V. The arcs are to be enclosed by clear globes of No. 9200-PX Pyrex glass.

7.3.5.4 The samples are to be mounted vertically on the inside of the cylinder, facing the arcs, and the cylinder is to be rotated around the arcs at 1 r/min. A system of nozzles is to be provided so that each sample is sprayed in turn with water as the cylinder revolves. During each 20 min operating cycle, each sample is to be exposed only to light from the arcs for 17 min and to both water spray and light for 3 min. The temperature within the cylinder while the apparatus is in operation is to be 63 ±5°C.

7.3.6 Accelerated Aging Test for Gaskets, Sealing Compounds, and Adhesives

7.3.6.1 Clauses 7.3.6.2 through 7.3.6.7 apply to gaskets and sealing compounds required for electrical enclosures as determined during the Rain Test, Subsection 7.3.1. Clause 7.3.6.8 applies to adhesives required to secure such gaskets to enclosures or covers.

7.3.6.2 Neoprene or rubber compounds, except foamed materials, shall have physical properties as specified in Table 13 before and after accelerated aging under the conditions specified in Table 14. The temperature specified in Table 14 corresponds to the maximum temperature rise measured on the gasket during the Temperature Test, Subsection 6.21.

7.3.6.3 Foamed neoprene or rubber compounds are to be subjected to accelerated aging under the conditions specified in Table 14. The *components* shall not harden or otherwise deteriorate to a degree which will impair their sealing properties.

7.3.6.4 Thermoplastic materials are to be subjected to accelerated aging under the conditions specified in Table 14. Thermoplastic material shall not deform, melt, or otherwise deteriorate to the extent that its sealing properties are affected. Solid PVC gasket material shall have physical properties as specified in Table 13 before and after the accelerated aging.

7.3.6.5 Tensile strength and elongation are to be determined using the test methods and apparatus described in the Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension, ASTM D412a.

7.3.6.6 Gaskets of materials other than those mentioned in Clauses 7.3.6.2 through 7.3.6.4 shall be nonabsorptive and shall provide resistance to aging and temperatures equivalent to the materials mentioned in Clauses 7.3.6.5 through 7.3.6.8.

7.3.6.7 Sealing compounds are to be applied to the surface they are intended to seal. A representative sample of the surface with the sealing compound applied is be subjected to accelerated aging under the conditions specified in Table 14 for air-circulated oven exposure. The sealing compound shall not melt, become brittle, or otherwise deteriorate to the extent that its sealing properties are affected, as determined by comparing an aged sample to an unaged specimen.

7.3.6.8 If gaskets are secured by adhesives, samples of the gasket adhesive and mounting surface are to be subjected to accelerated aging under the conditions specified in Table 14 for air-circulated oven exposure and immersion in distilled water for 3 days. The force required to peel the gasket from its mounting surface after the specified exposures shall be not

less than 50% of the value determined for "as-received" samples, and in no case shall the force be less than 9 N for each 25 mm of gasket width.

7.3.7 Marking Permanency Test - Outdoor Exposure

7.3.7.1 If a label is intended to be exposed to the weather, three panels (see Clause 6.35.1.3) are to be subjected to ultraviolet rays and water spray for 720 h (30 d).

7.3.7.2 The test cycle is to consist of exposure to ultraviolet rays for 102 min followed by exposure to ultraviolet rays and a fine spray of water for 18 min. See Subsection 7.3.5, Ultraviolet Light and Water Exposure Test.

7.4 MARKING

7.4.1 A nameplate on *outdoor* use equipment shall be of corrosion resistant material.

7.4.2 Among the factors taken into consideration when evaluating the acceptability of a nameplate secured by adhesives, is the resistance of the nameplate to defacement or removal at temperatures and in atmospheres to which it may be subjected under intended use. See Marking Permanency Tests, Subsection 6.35; and Marking Permanency Test-Outdoor Exposure, Subsection 7.3.7.

7.4.3 A unit or accessory that has been found to be acceptable for *outdoor* use shall be marked legibly with the wording "Outdoor Use" or similar wording on or near the nameplate.

8. CONSTRUCTION AND PERFORMANCE - SPECIFIC UNITS

8.1 INSTALLATION

8.1.1 An *intrusion detection unit* shall be installed in accordance with the instructions provided, observing all precautions and special conditions.

8.2 CONTROL

8.2.1 An *intrusion detection unit* shall provide for connection into an alarm system in accordance with the Standard for Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults, CAN/ULC-S302, or the Standard for the Installation and Classification of Residential Burglar Alarm Systems, CAN/ULC-S310.

8.2.2 *Intrusion detection unit*s and terminal panels which are intended to be located outside of the protected area shall be protected against tampering and unauthorized opening or removal from the mounting surface.

8.2.3 Clause 8.2.2 shall be interpreted to mean that units and terminal panels intended to be mounted on the exterior of a complete vault, complete safe, or No. 1 stockroom to which it

is connected shall be electrically protected so that no opening can be created of sufficient size to permit *defeat* of the system.

8.3 GLASS BREAKAGE DETECTOR

8.3.1 General

8.3.1.1 Glass breakage detectors shall detect breakage of any portion of a glass window(s) it is protecting. The detector may operate on the direct mounting or remote mounting (acoustic) principle.

8.3.1.2 The installation instructions shall be included with the glass breakage detector and shall provide the following information:

A Minimum and maximum glass size dimensions, thickness, and types that the sensor will consistently detect;

B Recommended mounting location and typical minimum/maximum detection range for glass parameters defined in Item A;

C Recommendations to insure correct operation in locations which include fixed or moveable window coverings, blinds, or glazing laminates/films;

D Procedures for testing detection range/coverage in the worst case conditions (i.e. in the presence of window coverings), and the model of tester required; and

E Recommendation for *false alarm* avoidance.

8.3.1.3 A field tester (glass break simulator) shall be provided to facilitate proper field installation. The field tester shall not be adjustable, but may be selectable to provide simulations of various glass types.

8.3.2 Sensitivity-Attack Test

8.3.2.1 The detector shall be tested in an enclosed environment as described in Figure 17. A test fixture as described in Figure 18 shall be used. The detector shall be installed in accordance with the manufacturer's instructions at the minimum and maximum rated ranges. The test shall be performed with the minimum glass size as specified by the manufacturer. All of the glass types specified by the manufacturer shall be tested.

8.3.2.2 An initial impact no less than 4 J shall be generated by a 540 g steel ball as described in Figure 18. The energy shall be progressively increased until the glass breaks.

8.3.2.3 The detector shall produce an alarm when the glass is broken, and may produce an alarm without actual glass breakage, using the test fixture described in Figure 18.

8.3.3 Stability-False Alarm Immunity Test

8.3.3.1 The detector shall not generate a *false alarm* when subjected to the environmental noise sources applied in the method described in Clauses 8.3.3.1 through