



# Standard Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact<sup>1</sup>

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*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope

1.1 These test methods determine the ability of sliding door assemblies to restrain, delay, or frustrate forced entry.

1.2 For purposes of these test methods, sliding door assemblies are defined as described in 1.2.1 – 1.2.4 and as shown in Fig. 1. Sliding door assemblies with a combination of operable panels and fixed panels (lites) shall be classified and tested separately for each type.

1.2.1 *Type A*—A sliding door assembly which incorporates one or more sliding panels that *lock to the jamb*.

1.2.2 *Type B*—A sliding door assembly which incorporates one or more sliding panels that *lock to an intermediate jamb*.

1.2.3 *Type C*—A sliding door assembly which incorporates one or more sliding panels that *abut and lock to other panels*.

1.2.4 *Type D*—A sliding door assembly which incorporates one or more fixed or stationary panels that are *designed not to open*.

NOTE 1—See Fig. 1 for graphic depiction of sliding door assembly types.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee E06 on Performance of Buildings and are the direct responsibility of Subcommittee E06.51 on Performance of Windows, Doors, Skylights and Curtain Walls.

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## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

E631 *Terminology of Building Constructions*

2.2 *AAMA Standard*:<sup>3</sup>

AAMA 1303.5 *Voluntary Specifications for Forced Entry Resistant Aluminum Sliding Glass Doors*

2.3 *CAWM Standards*:<sup>3</sup>

CAWM 300-96 *Forced Entry Resistance Tests for Sliding Glass Doors*

CMBSO 1-79 *California Model Building Security Ordinance*

## 3. Terminology

3.1 *Definitions*—Definitions for standard terminology can be found in Terminology E631.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *door frame assembly, n*—the combination of a head, sill, and jambs surrounding and supporting fixed and sliding panels.

3.2.2 *fixed jamb stile, n*—vertical members of fixed or stationary panels adjacent to any jamb.

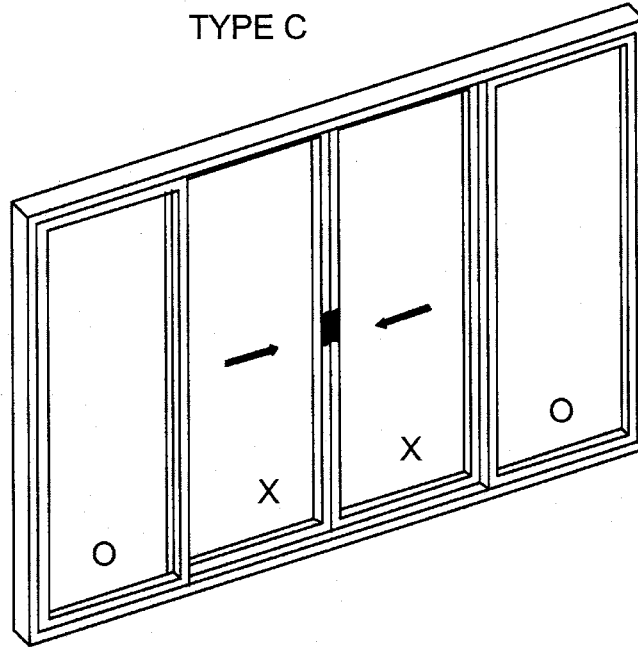
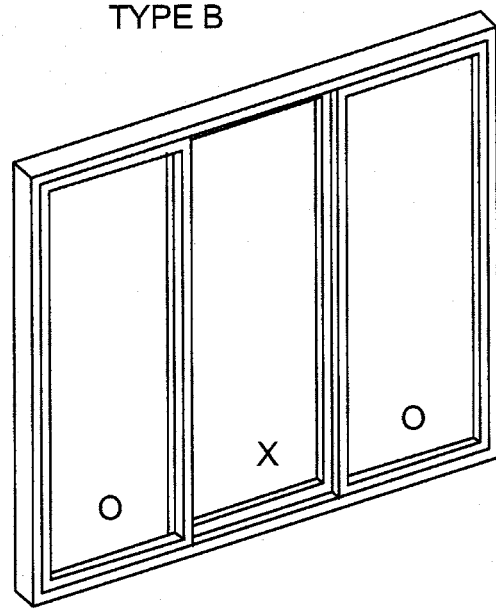
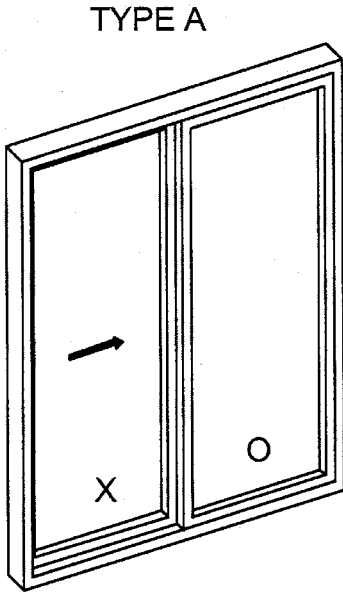
3.2.3 *intermediate jamb, n*—vertical member of a frame other than the outermost vertical members.

3.2.4 *locking device(s) (lock), n*—one or more components of a sliding door assembly intended to resist opening of the sliding door panel from the exterior.

3.2.5 *sliding door assembly, n*—a combination of one or more sliding door panels with or without one or more fixed panels within a common frame.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from the American Architectural Manufacturers Association (AAMA), 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268, http://www.aamanet.org.



O - Non-operating Door Panel  
X - Operating Door Panel

FIG. 1 Typical Horizontal Sliding Door Assembly Types (viewed from the exterior)

## 4. Summary of Test Method

4.1 The procedure consists of mounting a sliding door specimen into a test assembly fixture which in turn is mounted to a wall support fixture, and, after removing all exterior fasteners and loose component items, specified loads and forces are applied to the sliding door test specimen in a prescribed sequence. Following removal of all loads, a determination is made whether or not entry can be gained through the sliding door test specimen from the exterior.

## 5. Significance and Use

5.1 These test methods are intended to establish a measure of resistance for sliding door assemblies subjected to attacks (other than impacting glazing materials) by unskilled or opportunistic burglars. Resistance to higher levels of force generated by skilled burglary attack requires methods, such as alarms, communication, or apprehension systems, or special security glazing materials more sophisticated than those evaluated by these test methods. Technicians performing the test should understand the intent of this test method and should be trained on the execution and pass/fail criteria.

5.2 Entry through a sliding door assembly can be accomplished by impacting or removing glazing materials. This method does not evaluate glazing materials for breakage or de-glazing. Other standards must be used to evaluate forced entry by impacting or removing glazing.

5.3 Acceptance criteria for performance levels are a matter for authorities having specific jurisdiction to establish. Suggested guidelines are found in [Annex A1](#).

## 6. Test Criteria

6.1 *Sliding Door Test Specimen*—The same sliding door assembly shall be used for all testing and shall contain panels having the greatest height and width for which approval is sought. Each unique panel/frame arrangement and locking arrangement shall be tested.

6.1.1 The construction of the sliding door test specimen, including all hardware, components, and arrangement of panels shall be representative of that for which acceptance is desired.

6.1.2 The sliding door test specimen shall consist of the entire assembled unit, including frame, glazing, and anchorage as supplied by the manufacturer for installation in the building.

6.1.3 Unless otherwise specified, the test specimen shall contain the weakest code compliant safety glazing for testing and shall be single glazed if designed for either single or double glazing, or double glazed if designed exclusively for multiple glazing. Products tested with glazing materials other than the weakest code compliant safety glazing shall qualify only the specific glazing material tested.

6.1.4 Sliding door assemblies tested with more than one locking device shall not qualify sliding door assemblies with fewer locking devices, regardless of size.

6.2 *Performance Criteria*—The performance level is attained if all locking devices remain engaged and entry cannot be gained during the test or upon removal of loads. If during testing, any component, including the glazing material, fails, allowing entry, this shall be considered a failure to attain the

performance level. Glazing which breaks, but does not allow entry, shall not be considered a failure to attain the performance level.

6.3 *Multiple Panels*—Sliding door assemblies with a combination of operable panels and fixed panels (lites) shall be classified and tested separately for each panel type. If multiple panels within a sliding door assembly are identical in construction and locking condition, only one panel need be tested.

6.4 *Test Sequence*—Perform the tests for each sliding door test specimen in the sequence as outlined in Section 10. The sequence for testing multiple panels shall be at the discretion of the testing agency.

6.5 *Loading*—Apply test loads and forces at a rate not to exceed 10 lb/s (45 N/s). Maintain performance loads for a period of  $60 \pm 5$  s.

6.6 *Load Removal*—At the conclusion of each test, remove all loads before starting the next test.

## 7. Apparatus

7.1 *Instrumentation*—Load and time measuring devices with an accuracy of  $\pm 2\%$  of the full scale shall be incorporated in the test setups. The scale ranges used shall assure that the performance levels are within an accuracy of  $\pm 5\%$ .

7.2 *Load Attachments*—Brackets, fasteners, or other devices used in performing these tests shall be designed and attached so as to minimize their influence on the test results.

7.3 *Test Frame*—The test fixture shall be designed and constructed to accept and rigidly secure the sliding door specimen and to provide rigid points of anchor for all test loads described in 10.3. The load bearing members of the test fixture shall be constructed to limit deflection of such members to a maximum of  $\frac{1}{8}$  in. (3 mm) under full prescribed load.

7.4 *Tools for Disassembly*—The following tools shall be used for disassembly of the test specimen:

7.4.1 A spatula, putty knife, or other non-cutting tool with a thin blade,  $0.024 \pm 0.004$  in. ( $0.6 \pm 1$  mm) thick,  $0.78 \pm 0.08$  in. ( $20 \pm 2$  mm) wide, and  $3.5 \pm 0.4$  in. ( $90 \pm 10$  mm) long. (A Warner model #604 Putty Knife is known to meet these specifications.)<sup>4</sup>

7.4.2 Any non-powered, straight, or Phillips head screwdriver appropriate to the mechanical fastener with a maximum length of 6 in. (150 mm).

7.4.3 Standard slot-type pliers with a 6 to 7 in. (150 to 175 mm) overall length.

7.5 *Tools for Hardware Manipulation*—The following tools shall be used for manipulation of the locks of the test specimen:

7.5.1 A spatula, putty knife, or other non-cutting tool with a thin blade,  $0.024 \pm 0.004$  in. ( $0.6 \pm 0.1$  mm) thick,  $0.78 \pm 0.08$  in. ( $20 \pm 2$  mm) wide, and  $3.5 \pm 0.4$  in. ( $90 \pm 10$  mm) long.<sup>4</sup>

<sup>4</sup>The sole source of supply of the Warner model #604 known to the committee at this time is Warner Manufacturing Company, 13435 Industrial Park Blvd., Plymouth, MN 55441. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,<sup>1</sup> which you may attend.

7.5.2 A piece of black annealed 16 gage wire at least long enough to reach from the point of insertion to the locking device(s).<sup>5</sup>

## 8. Hazards

8.1 Glass breakage may occur during the application of loads or forces required by these test methods. Take adequate precautions to protect personnel from broken glass.

8.2 Locking devices, glass, and other sliding door test specimen components may suddenly fail when loads and forces are applied during these test methods, causing panels to open rapidly. Take adequate precautions to protect personnel from rapidly moving weights and sliding door test specimen components.

## 9. Preparation

9.1 Mount the sliding door test specimen into a 2 by 4 or 2 by 6 in. (40 by 100 or 40 by 150 mm) lumber surround fixture, in accordance with the manufacturer's written installation instructions. Additional attachment means are permitted between the lock jamb and the test frame provided such means do not increase the strength of the connection between locking devices and the sliding door members beyond the door manufacturer's installation specifications.

9.2 Install the sliding door assembly specimen into the test fixture.

9.3 Close and lock the sliding door test specimen. Submit each operable unit to five cycles of opening, closing, and locking prior to testing.

## 10. Procedure

10.1 The disassembly test, hardware manipulation test, and panel manipulation test referenced in the following parts of Section 10 are fully described in Annex A2.

10.1.1 Without in any other manner intentionally damaging the sliding door test specimen, remove from the sliding door test specimens all screws, glazing beads, and any other members or other mechanical fasteners that can be removed readily from the exterior within a time limit of 5 min using the tools stipulated in 7.4.

### 10.2 Type A Sliding Door Assembly:

10.2.1 Perform the disassembly test defined in Annex A2, A2.1. Following the completion of the disassembly test perform tests A1 through A7 as defined in Annex A2 for the performance grade desired using the loads and times indicated in Table A1.1 in Annex A1. At the completion of tests A1 through A7 perform the hardware manipulation test and the panel manipulation test defined in Annex A2, A2.2, and A2.3.

### 10.3 Type B Sliding Door Assembly:

10.3.1 Perform the disassembly test defined in Annex A2, A2.1. Following the completion of the disassembly test perform tests B1 through B7 as defined in Annex A2 for the performance grade desired using the loads and times indicated in Table A1.1 in Annex A1. At the completion of tests B1 through B7 perform the hardware manipulation test and the panel manipulation test defined in Annex A2, A2.2, and A2.3.

### 10.4 Type C Sliding Door Assembly:

10.4.1 Perform the disassembly test defined in Annex A2, A2.1. Following the completion of the disassembly test perform tests C1 through C7 as defined in Annex A2 for the performance grade desired using the loads and times indicated in Table A1.1 in Annex A1. At the completion of tests C1 through C7 perform the hardware manipulation test and the panel manipulation test defined in Annex A2, A2.2, and A2.3.

### 10.5 Type D Sliding Door Assembly:

10.5.1 Perform the disassembly test defined in Annex A2, A2.1. Following the completion of the disassembly test perform tests D1 through D3 as defined in Annex A2 for the performance grade desired using the loads and times indicated in Table A1.1 in Annex A1. At the completion of tests C1 through C7 perform the hardware manipulation test and the panel manipulation test defined in Annex A2, A2.2, and A2.3.

## 11. Report

11.1 The report shall contain a description of the results of the test(s) performed in accordance with these test methods.

11.2 The report shall include at least the following:

- 11.2.1 Identification of the sliding door test specimen;
- 11.2.2 Type, size, location, and number of locking devices and other hardware;
- 11.2.3 Type, location, and number of installation fasteners;
- 11.2.4 Type and thickness of glazing material;
- 11.2.5 Bill of materials;
- 11.2.6 Assembly drawings;
- 11.2.7 Performance level, loads, and times (L1, L2, L3, L4, T1) used;
- 11.2.8 A statement as to whether the sliding door specimen complies or not and the grade at which it complies;
- 11.2.9 A description of the method of installation or installation fastening; and
- 11.2.10 A description of the test equipment used.

## 12. Precision and Bias

12.1 These test methods do not generate numerical values. They establish a pass/fail condition which cannot generate numerical values for precision and bias.

## 13. Keywords

13.1 doors; fenestration; forced entry resistance; laboratory method; sliding glass doors

<sup>5</sup> The properties of black annealed 16 gage wire are described in *Machinery's Handbook*, 22nd Edition, Available from Industrial Press, Inc., 200 Madison Ave., New York, NY 10016-4078.

**ANNEXES**
**(Mandatory Information)**
**A1. SUGGESTED MEASURED PERFORMANCE**
**TABLE A1.1 Suggested Measured Performance<sup>A</sup>**

Load Identification	Grade 10	Grade 20	Grade 25	Grade 30	Grade 40
T1	5 min	5 min	5 min	10 min	10 min
L1	300 lbf (1334 N)	500 lbf (2224 N)	800 lbf (3559 N)	800 lbf (3559 N)	1100 lbf (4893 N)
L2	175 lbf (778 N)	200 lbf (890 N)	200 lbf (890 N)	400 lbf (1779 N)	550 lbf (2447 N)
L3	30 lbf (133 N)	50 lbf (222 N)	50 lbf (222 N)	100 lbf (445 N)	150 lbf (667 N)
L4	50 lbf (222 N) plus weight of panel	50 lbf (222 N) plus weight of panel	50 lbf (222 N) plus weight of panel	50 lbf (222 N) plus weight of panel	50 lbf (222 N) plus weight of panel

<sup>A</sup> It is suggested that [Table A1.1](#) be used with the understanding that five levels of load identification are established with load identification 40 being the highest and 10 being the lowest. Use of load identifications should be selected in accordance with security objective desired. Grade 25 parallels the requirements of CMBSO 1-79 and CAWM 300-96.

**A2. TESTS**
**A2.1 Disassembly Test**

A2.1.1 Remove from the door test specimen all screws, glazing beads, and any other members or other mechanical fasteners that can be removed readily from the exterior within a time limit of 5 min using the tools stipulated in [7.4](#). Removal of the indicated parts shall be done carefully so as not to cause collateral damage to the specimen.

**A2.2 Hardware Manipulation Test**

A2.2.1 Examine the door test specimen and determine a method of inserting the tools in [7.5](#) from the outside so as to contact the locking device(s). Using one technician only, attempt to gain entry by manipulating the locking device(s) with these tools in any combination without intentionally removing material from the panel or frame to facilitate access to the locking devices. Conduct this test continuously for a time limit of (T1). Manipulation of the locking devices shall be done in a manner that will not cause collateral damage to the specimen.

**A2.3 Panel Manipulation Test**

A2.3.1 While attempting to open the sliding door assembly, lift, push, pull or otherwise manipulate by hand from the exterior all panels to the full confines of the frame. This test shall be conducted continuously for a time limit of (T1).

**A2.4 Type A Sliding Door Assembly Tests**

A2.4.1 Perform the disassembly test defined in [Annex A2](#), section [A2.1](#).

A2.4.2 *Test A1*—With the sliding panels in the test position, a concentrated load (L1) shall be applied separately to each member incorporating a locking device, at a point on the panel

member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel. The load shall be distributed evenly between the interior and exterior sides of the locking device so as to minimize rotation. (Two equal concentrated loads which together equal L1.) (See [Fig. A2.1](#).)

A2.4.3 *Test A2*—With the sliding panels in the test position, a concentrated load (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the interior side of the sliding door test specimen. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See [Fig. A2.2](#).)

A2.4.4 *Test A3*—With the sliding panels in the test position, a concentrated load (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the exterior side of the sliding door test specimen. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See [Fig. A2.3](#).)

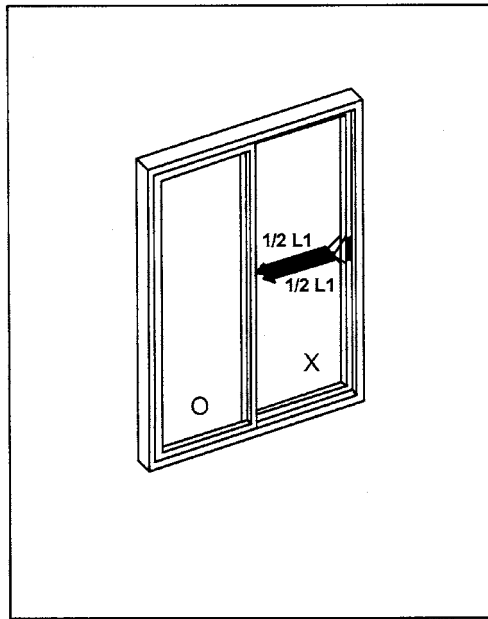


FIG. A2.1 Test A1

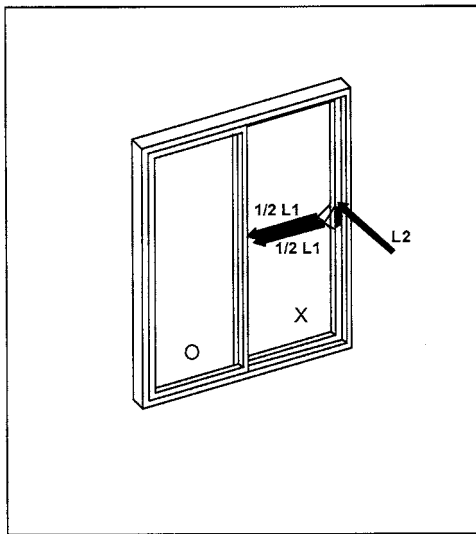


FIG. A2.2 Test A2

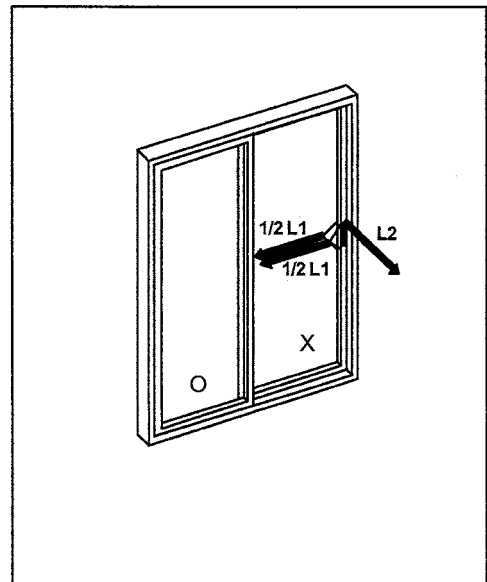


FIG. A2.3 Test A3

A2.4.5 *Test A4*—With the sliding panels in the test position, a concentrated load (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the interior side of the sliding door test specimen and, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Where more than one primary lock is

used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.4.)

A2.4.6 *Test A5*—With the sliding panels in the test position, a concentrated load (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device, in the direction perpendicular to the plane of the glazing material toward the exterior

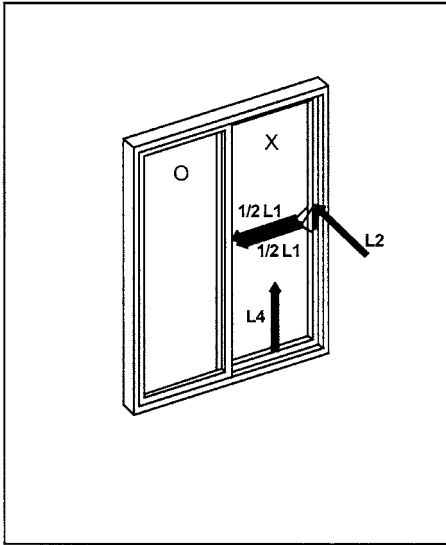


FIG. A2.4 Test A4

panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the interior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.6.)

A2.4.8 Test A7, Outside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, a concentrated load (L1) shall be applied separately to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the exterior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.7.)

A2.4.9 After completion of Tests A1 through A7 and with all loads removed, perform the hardware manipulation test and the panel manipulation test.

**A2.5 Type B Sliding Door Assembly Tests**

A2.5.1 Perform the disassembly test defined in Annex A2, section A2.1.

side of the sliding door test specimen and, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.5.)

A2.4.7 Test A6, Inside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, a concentrated load (L1) shall be applied separately to each member incorporating a locking device, at a point on the

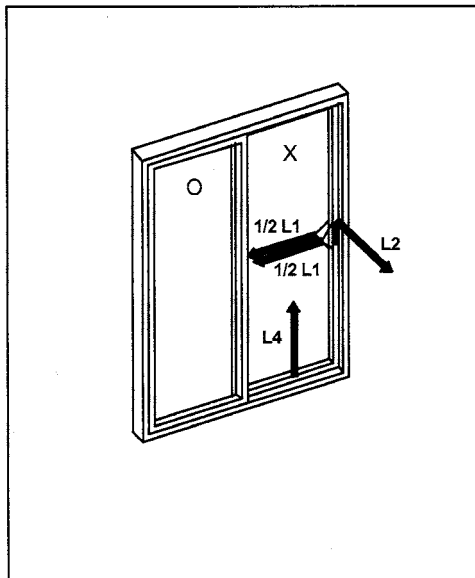


FIG. A2.5 Test A5

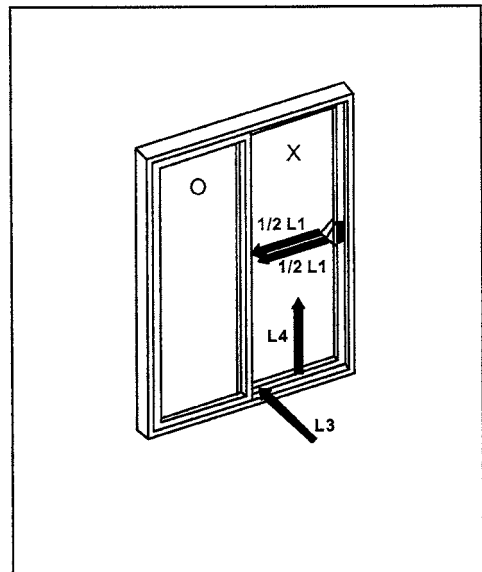


FIG. A2.6 Test A6—Inside Sliding Panels

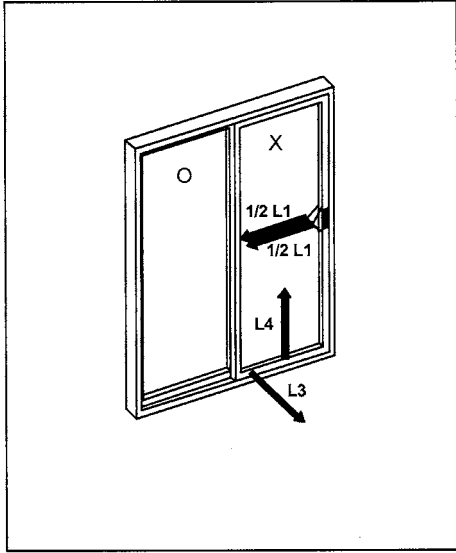


FIG. A2.7 Test A7—Outside Sliding Panels

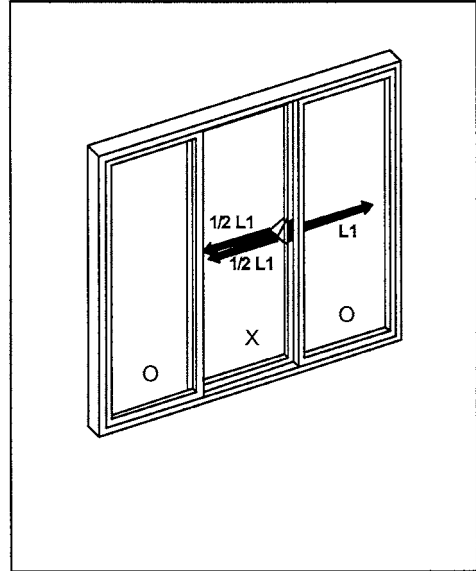


FIG. A2.8 Test B1

A2.5.2 *Test B1*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. The load shall be distributed evenly between the interior and exterior sides of the locking device so as to minimize rotation. (Two equal concentrated loads which together equal L1.) (See Fig. A2.8.)

NOTE A2.1—The application of the (L1) loads singly or eccentrically will tend to deglaze the adjacent fixed panel that could affect the results of the test adversely. In order to alleviate this situation, apply the second reactive load (L1) before the first load (L1), or apply both loads in equal stages so that the results are not adversely affected by deglazing of the fixed panel.

A2.5.3 *Test B2*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the interior side of the sliding door test specimen. Apply the first load (L1)

at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.9.)

A2.5.4 *Test B3*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the exterior side of the sliding door test specimen. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both



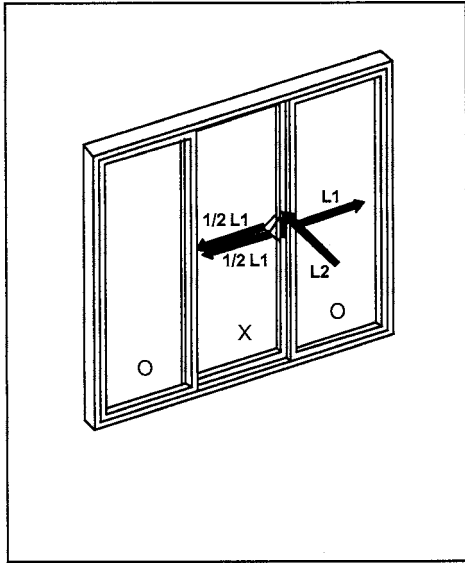


FIG. A2.9 Test B2

confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.11.)

A2.5.6 Test B5—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the exterior side of the sliding door test specimen and, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or

loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.10.)

A2.5.5 Test B4—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the

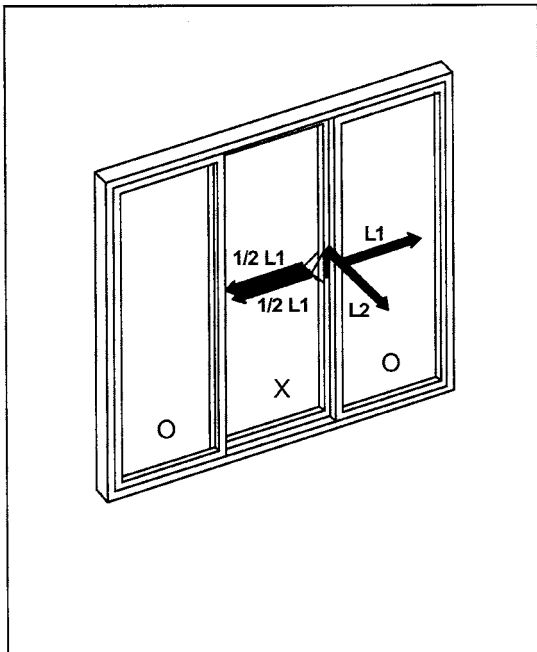


FIG. A2.10 Test B3

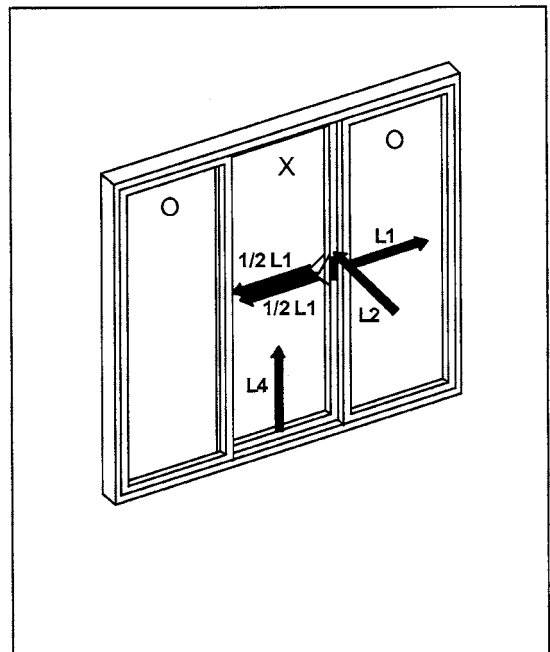


FIG. A2.11 Test B4

handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.12.)

A2.5.7 Test B6, Inside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the interior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is

attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.13.)

A2.5.8 Test B7, Outside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, two concentrated loads (L1) shall be applied separately to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the exterior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is

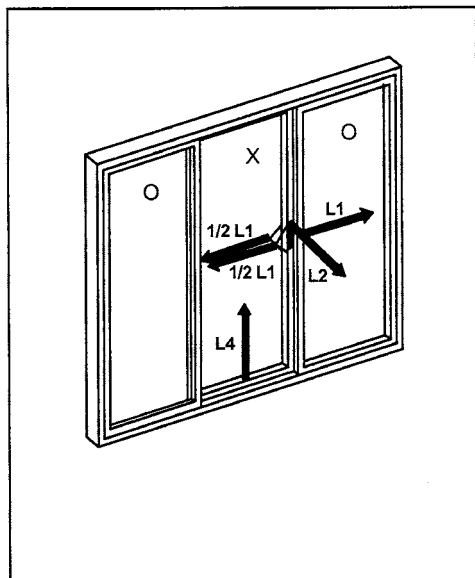


FIG. A2.12 Test B5

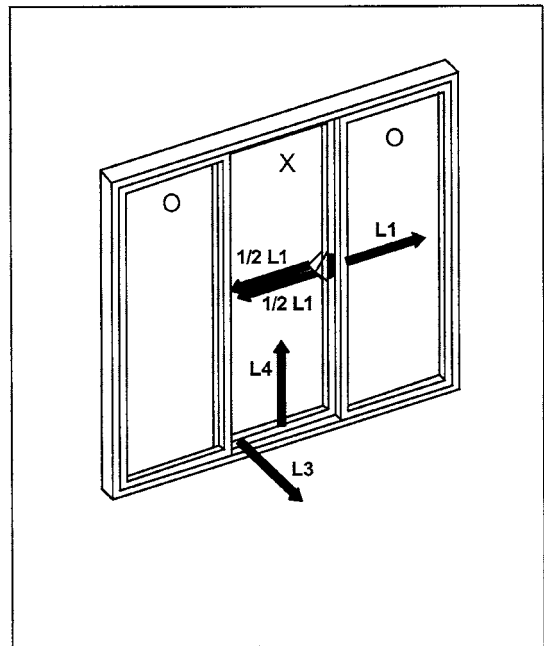


FIG. A2.13 Test B6—Inside Sliding Panels

used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1.) (See Fig. A2.14.)

A2.5.9 After completion of Tests B1 through B7 and with all loads removed, perform the hardware manipulation test and the panel manipulation test.

**A2.6 Type C Sliding Door Assembly Tests**

A2.6.1 Perform the disassembly test.

A2.6.2 *Test C1*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. The load shall be distributed evenly between the interior and exterior sides of the locking device so as to minimize rotation. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.15.)

NOTE A2.2—The application of the (L1) loads singly or eccentrically

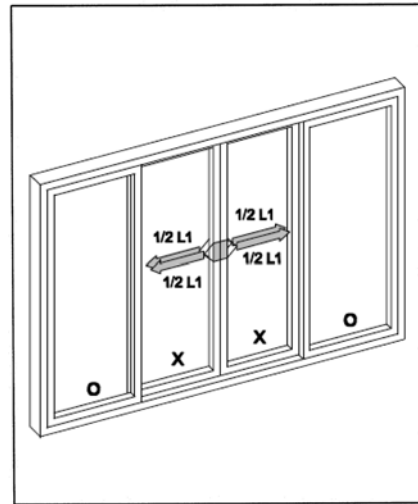


FIG. A2.15 Test C1

will tend to deglaze the adjacent fixed panel that could affect the results of the test adversely. In order to alleviate this situation, apply the second reactive load (L1) before the first load (L1), or apply both loads in equal stages so that the results are not adversely affected by deglazing of the fixed panel.

A2.6.3 *Test C2*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the interior side of the sliding door test specimen. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.16.)

A2.6.4 *Test C3*—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an

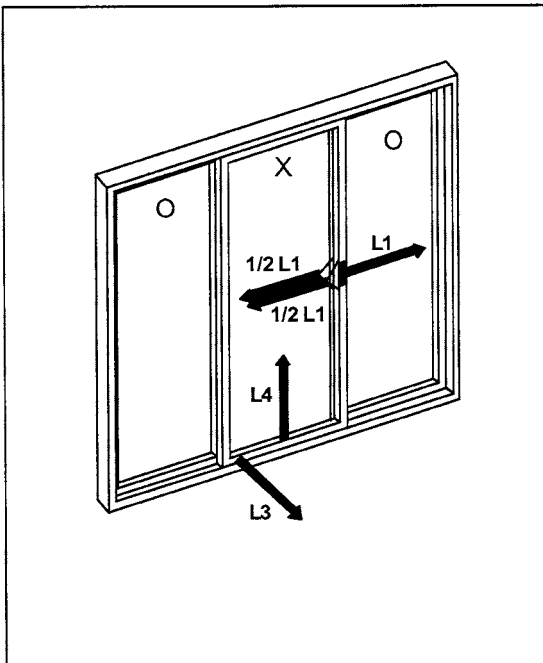


FIG. A2.14 Test B7—Outside Sliding Panels

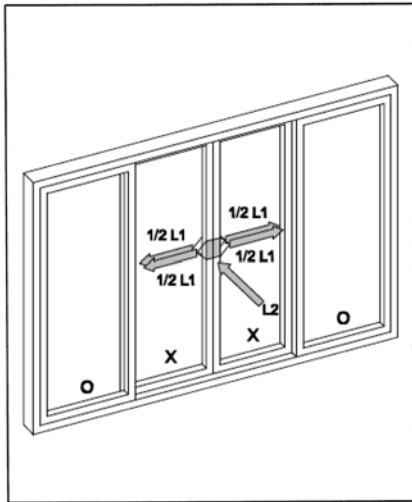


FIG. A2.16 Test C2

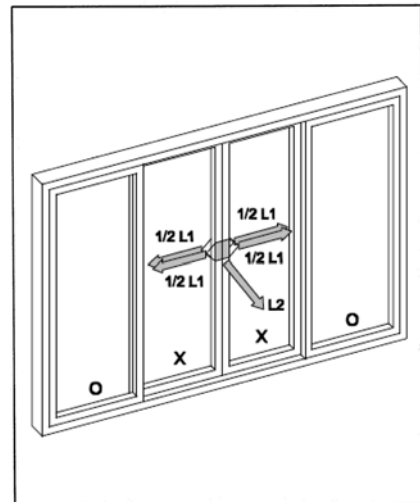


FIG. A2.17 Test C3

additional concentrated load (L2) is applied to the panel member containing the locking device in the direction perpendicular to the plane of the glazing material toward the exterior side of the sliding door test specimen. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.17.)

A2.6.5 Test C4—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert

the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.18.)

A2.6.6 Test C5—With the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, from the exterior, to each member incorporating a locking device, at a point on the sash member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel, while, simultaneously, an additional concentrated load (L2) is applied to the panel

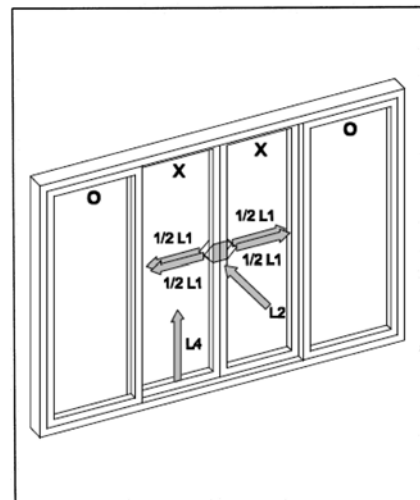


FIG. A2.18 Test C4

member containing the locking device in the direction perpendicular to the plane of the glazing material toward the exterior side of the sliding door test specimen and, simultaneously, lifting the sliding door panel vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4). Apply the lifting load at the mid-span of the bottom rail of the test panel. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.19.)

A2.6.7 Test C6, Inside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the interior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the

a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the meeting stile of the sliding panel that is adjacent to the sliding panel that contains the lock. Apply this load in such a manner as to exert the load on the meeting stile in a direction parallel to the plane of the glazing material and opposite to the first load (L1) in an effort to separate the engaged meeting stiles. The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.20.)

A2.6.8 Test C7, Outside Sliding Panels—With the sliding door panel lifted vertically to the uppermost limit within the confines of the sliding door frame assembly with a load (L4), while, simultaneously, with the sliding panels in the test position, two concentrated loads (L1) shall be applied separately, to each member incorporating a locking device, at a point on the panel member within 3 in. (75 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the panel and simultaneously applying a concentrated load (L3) in the direction perpendicular to the plane of the glazing material, toward the exterior side of the sliding door specimen, to the bottom rail on the same panel within 3 in. (75 mm) of the corner opposite the stile containing the locking device. Apply the first load (L1) at the stile in such a manner as to exert the load on the locking device or handle by straddling it at points on the sliding door panel member within 3 in. (75 mm) of each side of the locking device in a direction parallel to the plane of the glazing material that would tend to open the door. Apply the second load (L1) at the intermediate jamb in such a manner as to exert the load on the intermediate jamb in a direction parallel to the plane of the

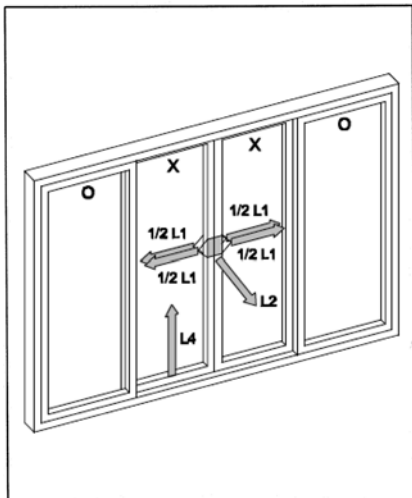


FIG. A2.19 Test C5

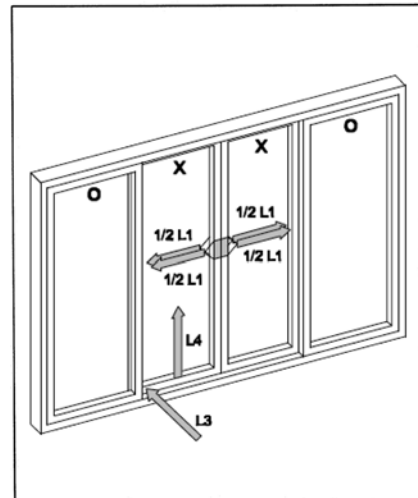


FIG. A2.20 Test C6—Inside Sliding Panels

glazing material and opposite to the first load (L1). The load attachment point for the second load shall be at the same height above the frame sill and in the same vertical plane as the load attachment points for the first load. Apply both loads simultaneously and equally. Where more than one primary lock is used, the loads shall be equally divided among the locks and shall be applied simultaneously. (Two equal concentrated loads which together equal L1 in opposing directions.) (See Fig. A2.21.)

A2.6.9 After completion of Tests C1 through C7 and with all loads removed, perform the hardware manipulation test and the panel manipulation test.

**A2.7 Type D Sliding Door Assemblies**

A2.7.1 Perform the disassembly test.

A2.7.2 *Test D1*—With the fixed panel in the test position, apply a concentrated load (L1) at the center of the fixed jamb stile in the direction parallel to the plane of the glazing material that would tend to separate the fixed panel from the jamb. (See Fig. A2.22.)

A2.7.3 *Test D2*—With the fixed panel in the test position, apply a concentrated load (L1) at the center of the fixed jamb stile in the direction parallel to the plane of the glazing material that would tend to separate the fixed panel from the jamb while, simultaneously, an additional concentrated load (L2) is applied to the center of the stile opposite the fixed jamb stile in the direction perpendicular to the plane of the glazing material, and in a direction that would tend to separate the stile from the member with which it mates. (See Fig. A2.23.)

A2.7.4 *Test D3*—With the fixed panel in the test position, apply a concentrated load (L1) at the center of the fixed jamb stile in the direction parallel to the plane of the glazing material

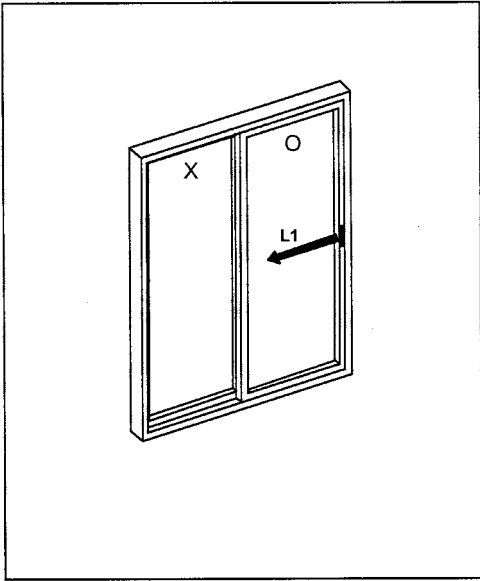


FIG. A2.22 Test D1

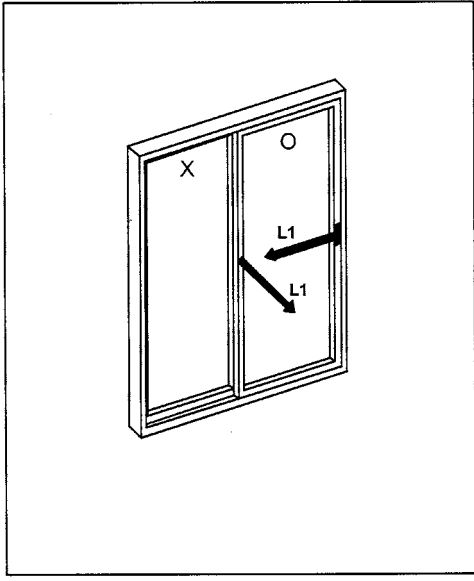


FIG. A2.23 Test D2

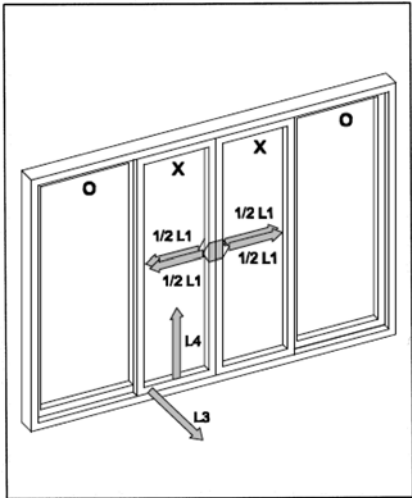


FIG. A2.21 Test C7—Outside Sliding Panels

that would tend to separate the fixed panel from the jamb, simultaneously, lift the fixed panel vertically to the uppermost limit within the confines of the door frame assembly with a load (L4). Apply the lifting load to the mid-span of the bottom rail of the fixed test panel. (See Fig. A2.24.)

A2.7.5 After completion of Tests D1 through D3 and with all loads removed, perform the hardware manipulation test and the sash manipulation test.

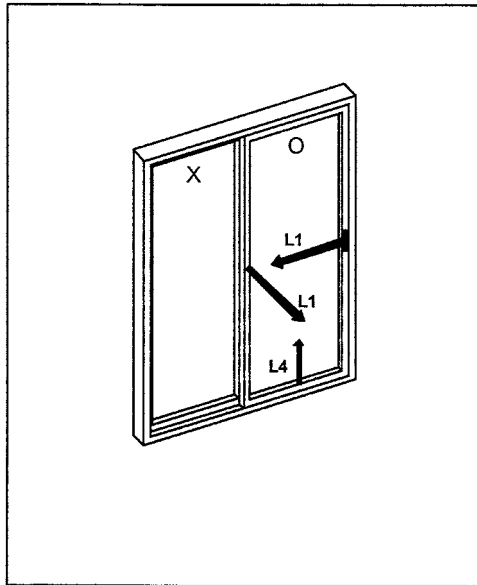


FIG. A2.24 Test D3

## APPENDIX

### (Nonmandatory Information)

#### X1. BACKGROUND INFORMATION

X1.1 A number of documents relative to forced entry resistance testing and test standards were reviewed in the development of these test methods, including those published by the American Architectural Manufacturers Association, California Association of Window Manufacturers, National Wood Window and Door Association, International Conference of Building Officials, and National Institute of Law Enforcement and Criminal Justice. In addition, available crime incident and attack reports were reviewed, such as the California Crime Technological Research Foundation Report. Based on the above information and actual designing and testing by manufacturers associated with door assemblies, these ASTM Door Test Methods were written.

X1.2 These test methods are designed to measure forced-entry resistance of door assemblies. They are not addressed to situations involving high crime areas or areas attacked by professional, sophisticated criminals. To protect against this type of crime, a multiple approach must be taken. This will often include alarm and other surveillance systems and specially designed doors, hardware, and burglary-resistance glazing materials, and, perhaps different test methods. Basically, this type of approach must be custom designed to meet the demands of the specific area or problem and is considered costly beyond the needs of the resident of a low-crime area.

X1.3 There are three existing test methods for forced entry resistance of doors that are known to be incorporated in Building Codes including this ASTM Test Method. The others include AAMA 1303.5-1976, Voluntary Specifications for

Forced Entry Resistant Aluminum Sliding Glass Doors and CAWM 300-96, Forced Entry Test for Sliding Glass Doors. The CAWM 300 document is the basis for the California Model Building Security Ordinance, CMBSO 1-79. The three standards are similar in scope and include test methods essentially identical in intent. This version of ASTM F842 can be considered to be consistent with the intent of both the AAMA and the CAWM test methods.

X1.4 However, the suggested measured performance levels provided in [Table A1.1](#) do not include the minimum performance requirements of AAMA 1303 or CAWM 300 at the Grade 10 level of Test Method F842. The user could specify performance levels higher than Grade 10 to assure the minimum performance levels for the AAMA and CAWM standards. It is suggested that the user specify Test Method F842, Grade 10, and add the other performance requirements indicated in the note following [Table A1.1](#) as required for a specific project. The AAMA and CAWM documents are to be retired from publication in 2003 and replaced by ASTM F842.

X1.5 In researching the revision of this test method ASTM received assistance from several police departments and from the statistics available through the FBI and the National Crime Center. It was evident that the mode of attempting a forced entry has changed over the years. Statistics at the time of the first edition of this standard indicated reluctance on the part of the inexperienced or casual burglar to break the glass in the door assembly or to make noise during the entry attempt. More recent information indicates that limited noise due to breaking

glass is accepted and that a prevalent means of forcing a door or window is to kick the panel or sash near the locking hardware. The burglar relies on quick entry and leaving the scene before the arrival of law enforcement officers more than

skill or stealth. For this reason the specifier may wish to include testing for glass breakage in their specification at the Grade 30 or Grade 40 performance.

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