WDMA TECHNICAL INTERPRETATION 02-01

Approved: 8/03

DATE OF INQUIRY: 5-29-02

PERTINENT SPECIFICATION: ANSI/AAMA/NWWDA 101/I.S. 2-97, AAMA 910-93, AAMA 103.3-93, ANSI/AAMA/WDMA 101/I.S. 2/NAFS-02.

SECTION(S) IN QUESTION: Auxiliary test sections of respective documents.

INTERPRETATION REQUESTED: The attached drafts are proposed revisions to the existing documents referenced above. It is requested that they replace the appropriate sections in the referenced documents.

SUGGESTED INTERPRETATION: After reviewing the auxiliary tests in the referenced documents, it was discovered there were discrepancies between various versions of the same tests. In particular, there were differences in the direction of loading in the Hold Open Arm/Stay Bar Test which could cause a product loaded according to one interpretation to fail but when loaded according to a different interpretation to pass the test. The description in the text of the test did not match the drawing of the load application and the drawing itself was unclear. Variations in other versions of this test found in other documents provided a consensus of the intent of the authors. A panel of experts was convened to review all auxiliary tests for consistency and clarity. The attached drafts reflect the findings of that panel. In order to clarify the intent of the tests the drawings were redrawn with extra views as required to more accurately reflect the intent of the standards. The purpose of each test was added to the beginning of the text and a more standard format of test descriptions was adopted. It is suggested that these format changes clarify the intent of each of the tests and that they be adopted as editorial changes to all referenced documents.

REVIEWED BY: In addition to the review panel, the revisions proposed have been reviewed two times by members of the AAMA Document Management Committee and the WDMA Technical Committees. The suggestions submitted in these review sessions have been incorporated into the attached pages.

REVIEWED/ APPROVED BY:

COMMITTEE	COMMENTS / ACTION	STATUS
JDMG		
WDMA	Approved by the WDMA Exterior Fenestration Standards Committee	Approved – 8/03
AAMA	Approved by the AAMA Document Management Committee as AAMA Technical Interpretation #63.	Approved – 10/02

5.3.6.3 SASH/PANEL TESTS

The tests in this section are designed to test the sash and/or panel strength, stiffness and construction. They are also designed to test the strength of the sash and/or panel corner joinery. The testing consists of torsional loading, racking of the sash in plane and concentrated loading of sash and/or panel components.

5.3.6.3.1 SASH/PANEL TORSION TESTS

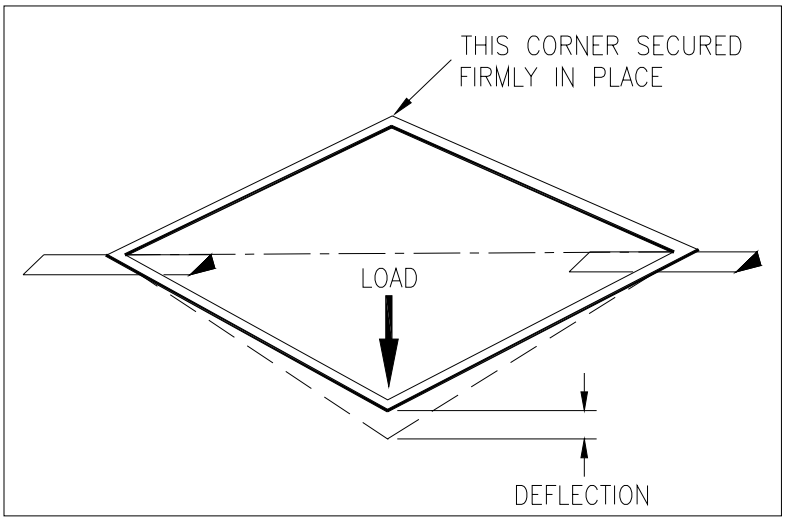

Figure 5.5

This test is performed on an unglazed sash. The sash is supported on fulcrums at diagonally opposite corners with a third corner diagonally opposite the loaded corner secured in the same plane by a fulcrum support block and clamp.

A concentrated load (P), acting at the unrestrained corner of the sash for a period of 10 seconds shall not cause a deflection measured to the nearest 0.25 mm (0.01 in.) at the unrestrained corner greater than indicated in the following table:

Sash Type	Performance Class	Load (P)		Deflection Limit	
		N	(lbs)	mm	(in)
Awning, Hopper, Projected	HC & AW	70	(15)	33.3 • A	(0.12 • B)
Dual Action Hinged Glass Door	HC	70	(15)	57.8 • A	(0.21 • B)
Vertical/Horizontal Pivoted	C	70	(15)	29.5 • A	(0.11 • B)
Vertical/Horizontal Pivoted	HC & AW	70	(15)	18.1 • A	(0.07 • B)
Top Hinged	C	70	(15)	59.3 • A	(0.22 • B)
Top Hinged	HC & AW	70	(15)	57.8 • A	(0.21 • B)
Dual Action	HC & AW	70	(15)	57.8 • A	(0.21 • B)
Casement	HC & AW	90	(20)	51.2 • A	(0.19 • B)
Where A is the area of the tested sash in (m2) and B is the area of the tested sash in (ft2).					

Table 5.4

This test shall be repeated for each different design of operable sash of the test specimen.

5.3.6.3.2 SASH VERTICAL DEFLECTION TEST

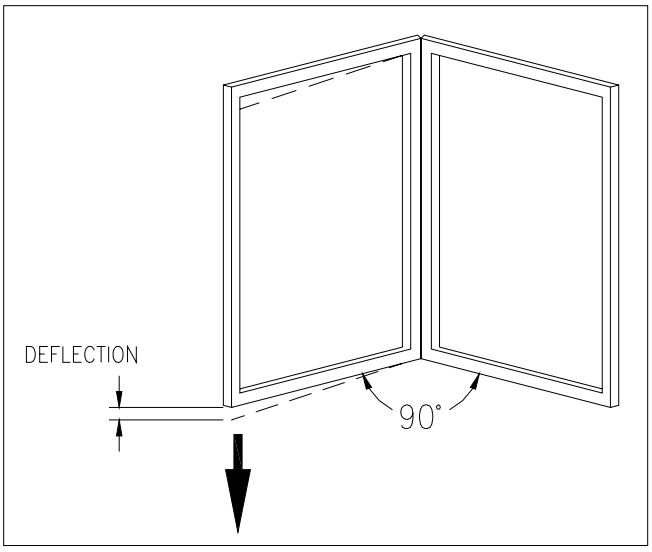

Figure 5.6

With the glazed test specimen installed vertically per the manufacturer's recommendations, the operable sash shall be opened 90° or to the limit of its travel, whichever is less. If necessary, lateral movement of the sash shall be permitted to be restrained by a single point guide placed anywhere over the height of the sash, provided that such a guide provides no resistance to vertical movement.

A downward vertical pre-load force of 70 N (15 lb.) shall be applied for a period of 10 seconds no more than 50 mm (2 in) inboard of the outer free edge by means of weights, a hydraulic cylinder, or other suitable arrangement and shall then be removed, at which time deflection-measuring devices shall be zeroed. The downward vertical force shall then be increased to the load indicated in the following table:

Sash Type	Performance Class	Load (P)		Deflection Limit	
		N	(lbs)	mm	(in)
Casement	R & LC	200	(45)	20 mm per meter of sash width	(0.25 in per foot)
Casement	C, HC & AW	270	(60)	20 mm per meter of sash width	(0.25 in per foot)

Table 5.5

The vertical deflection of the lower outer corner shall be measured at 60 ± 5 seconds after the full load has been applied and while it is still applied.

The load shall then be removed and the test specimen examined for distortion or failure. At the conclusion of the test, the test specimen shall properly close and operate. Also, there shall be no glazing breakage.

This test shall be repeated for each different design of operable sash in the test specimen.

5.3.6.3.4 SASH/PANEL CONCENTRATED LOAD TEST on LATCH RAIL

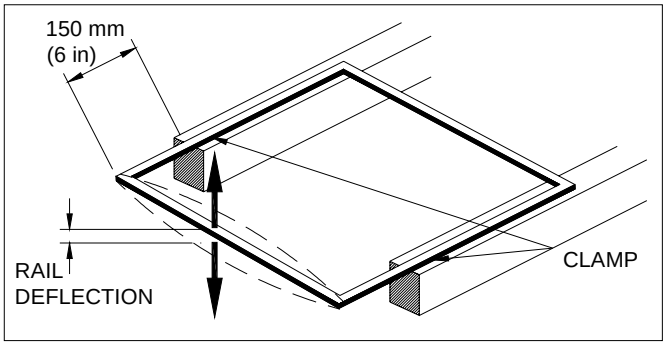

Figure 5.7 – Sash/Panel Concentrated Load Test (Perpendicular Load)

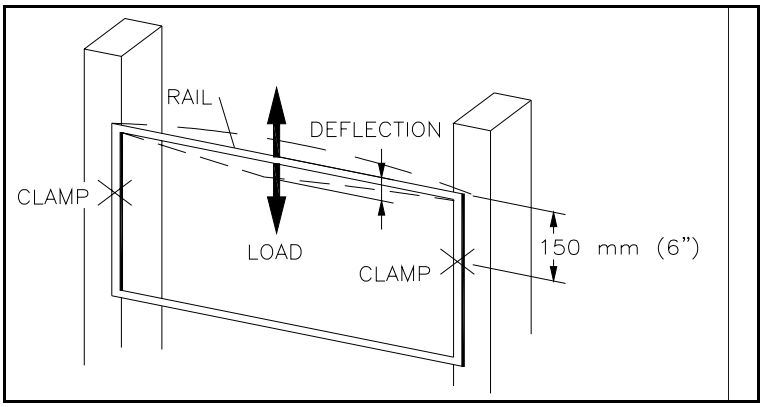

Figure 5.8

Support each unglazed sash or panel by clamping the stiles, 150 mm (6 in) from the latch, to the horizontal supports under the jambs.

A concentrated load (P) applied to the center of the span of the latch rail, parallel to the plane of the sash, first in one direction then in the opposite direction, shall not cause a deflection at the point of load application greater than shown in the table measured to the nearest 0.25 mm (0.01 in). Each different design of operable sash in the test specimen shall be tested.

A concentrated load (P) applied to the center of the span of the latch rail, perpendicular to the plane of the sash, first in one direction then in the opposite direction, shall not cause a deflection at the point of load application greater than shown in the table measured to the nearest 0.25 mm (0.01 in). Each different design of operable sash in the test specimen shall be tested.

Sash Type	Performance Class	Load Direction	Load (P)		Deflection Limit	
			N	(lbs)	mm	(in)
Awning, Hopper, Projected	HC & AW	Horizontal	(135)	30	1.5	(0.06)
Awning, Hopper, Projected	HC & AW	Vertical	(135)	30	1.5	(0.06)
Dual Action Hinged Glass Door	R, LC, C & HC	Horizontal	(135)	30	1.5	(0.06)
Dual Action Hinged Glass Door	R	Vertical	(135)	30	1.5	(0.06)
Dual Action Hinged Glass Door	LC & C	Vertical	(230)	50	3.3	(0.13)
Dual Action Hinged Glass Door	HC	Vertical	(400)	90	6.3	(0.25)
Vertical/Horizontal Pivoted	C	Horizontal	(230)	50	1.5	(0.06)
Vertical/Horizontal Pivoted	HC & AW	Horizontal	(270)	60	1.5	(0.06)
Vertical/Horizontal Pivoted	C	Vertical	(230)	50	0.8	(0.03)
Vertical/Horizontal Pivoted	HC & AW	Vertical	(270)	60	0.8	(0.03)
Top Hinged	C, HC & AW	Horizontal	(135)	30	1.5	(0.06)
Top Hinged	C	Vertical	(230)	50	3.3	(0.13)
Top Hinged	HC & AW	Vertical	(400)	90	6.3	(0.25)
Dual Action Window	R, LC, C & HC	Horizontal	(135)	30	1.5	(0.06)

Dual Action Window	R	Vertical	(135)	30	1.5	(0.06)
Dual Action Window	LC	Vertical	(180)	40	2.3	(0.09)
Dual Action Window	C	Vertical	(230)	50	3.3	(0.13)
Dual Action Window	HC	Vertical	(400)	90	6.4	(0.25)

Table 5.7

5.3.6.3.5 VERTICAL CONCENTRATED LOAD TEST

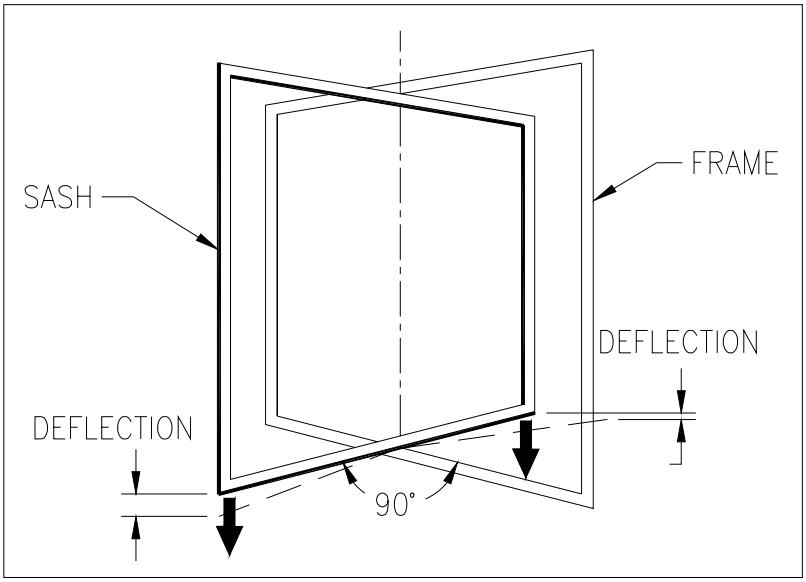

Figure 5.9

This test is performed on an unglazed sash and is designed to determine the deflection of the sash in the open position. The window shall be mounted in a test rack and supported around its entire perimeter. The sash shall be opened 90° with respect to the frame.

Two concentrated loads (P) are applied at the midpoints of the sash between the pivot and the innermost extremity of the sash stiles. The loads shall be applied in a downward direction, parallel to the plane of the sash for a period of 10 seconds. Deflection shall be measured to the nearest 0.25 mm (0.01 in.) at each corner and shall not exceed the deflection indicated in the following table:

Sash Type	Performance Class	Load (P)		Deflection Limit	
		N	(lbs)	Mm	(in)
Vertically Pivoted	C	(230)	50	1 mm	(0.04)
Vertically Pivoted	HC & AW	(270)	60	1 mm	(0.04)

Table 5.8

The test shall be repeated for each different design of operable sash of the test specimen.

5.3.6.4 FRAME TESTS

The tests in this section are designed to test the strength and stiffness of intermediate framing members. They are also designed to test the strength of the frame corner joinery. The testing consists of torsional loading, and concentrated loading of frame components.

5.3.6.4.1 TORSION LOAD TEST on INTERMEDIATE FRAME RAILS

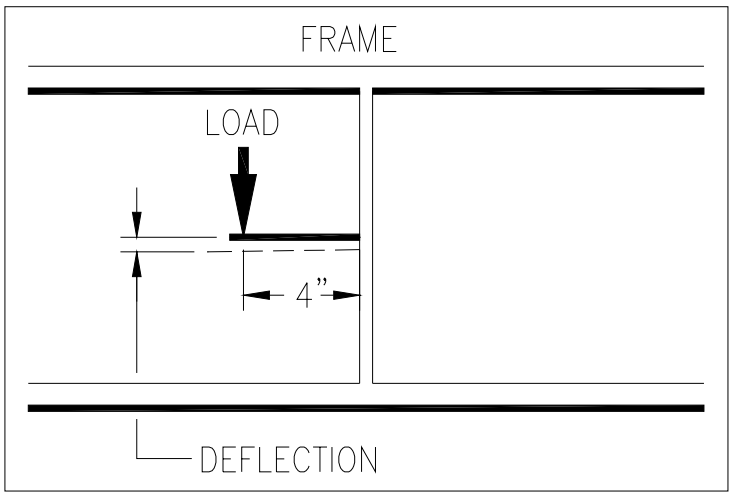

Figure 5.10

Place an unglazed test specimen in a horizontal position.

Apply for a duration of 10 seconds a 4.5 N • m (40 in • lb.) torque (T) [45 N (10 lb.) on a 100 mm (4 in) lever arm measured from the extremity of the rail], at the center of the span of each intermediate horizontal rail, first in one direction, then in the opposite direction. The vertical deflection at the point of load application shall be not greater than shown in the table measured to the nearest 0.25 mm (0.01 in).

Sash Type	Performance Class	Torsion Load (T)			Deflection Limit
		N – m	(in - lbs)	mm	(in)
Awning, Hopper, Projected	HC & AW	4.5	(40)	1.5	(0.06)

Table 5.9

1.3.6.4.2 VERTICAL CONCENTRATED LOAD TEST on HORIZONTAL INTERMEDIATE MULLIONS

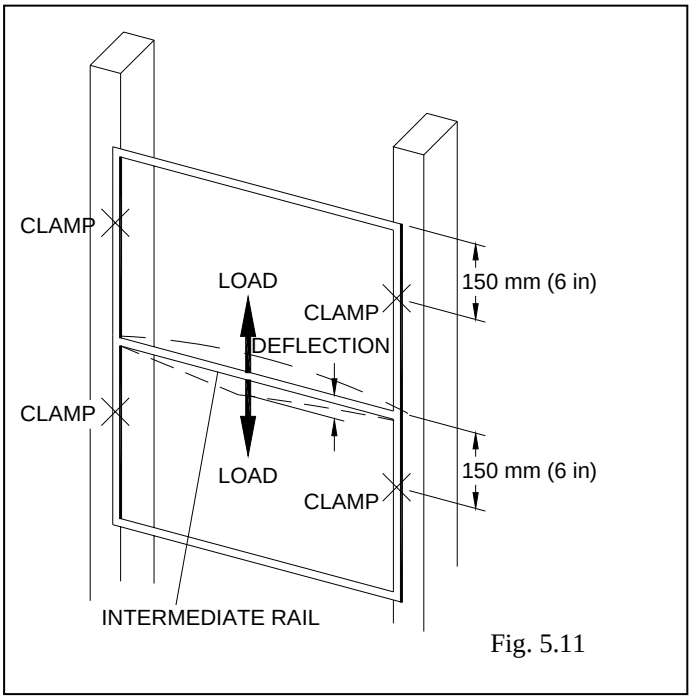

Figure 5.11

Clamp the jambs of the unglazed test specimen to a vertical support 150 mm (6 in.) from the test rails.

A concentrated load (P) applied for a duration of 10 seconds at the center of the span of any intermediate rail parallel to the plane of the window, first in one direction then in the opposite direction, shall not cause a deflection at the point of load application greater than shown in the table measured to the nearest 0.25 mm (0.01 in).

Sash Type	Performance Class	Load (P)			Deflection Limit
		N	(lbs)	mm	(in)
Awning, Hopper, Projected	HC & AW	135	(30)	1.5	(0.06)

Table 5.10

5.3.6.5 HARDWARE LOAD TESTS

The tests in this section are designed to test the strength and stiffness of hardware devices used in fenestration assemblies. They are also designed to test the reaction of the hardware to loading not normally encountered in the use of windows, skylights and doors. The testing consists of blocked operation and abnormal loading conditions which might occur during the handling, installation and operation of the assemblies.

5.6.3.5.1 DISTRIBUTED LOAD TEST

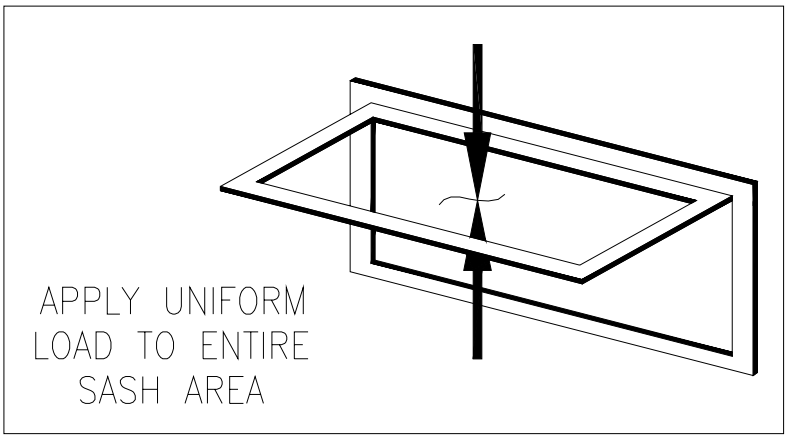

Figure 5.12

(Operable casement windows with rotary-operating hardware only)

The glazed test specimen shall be securely fastened in a vertical plane so that the sash, when opened to its full extent, will be horizontal. The sash and hardware shall be strong enough to support a 10-second duration uniform load as indicated in the following table:

Sash Type	Performance Class	Load (P)	
		Pa	(psf)
Casement	R	240	(5.00)
Casement	LC, C, HC & AW	300	(6.24)
The load specified includes the weight of the glazed sash.			

Table 5.11

At the conclusion of the test, the rotary-operator shall properly and fully close the sash. There shall be no failure of screws or track or hinge, or permanent deformation of support arms.

Each different design of operable sash of the test specimen shall be tested. The load shall be applied first in one direction, and then in the opposite direction.

5.3.6.5.2 STABILIZING ARM LOAD TEST

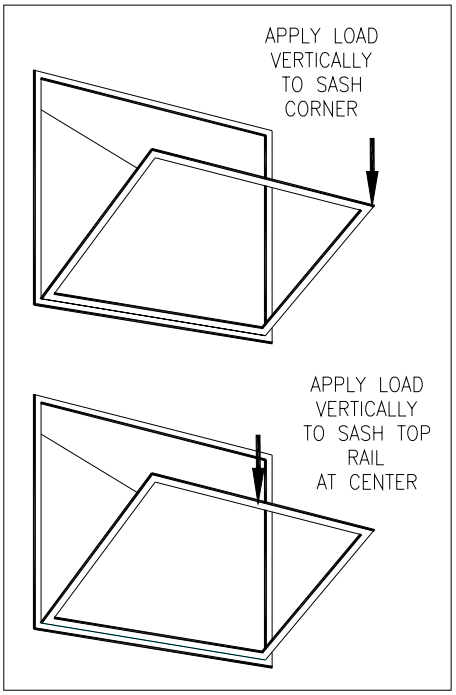

Figure 5.13

Mount the completely assembled glazed window or door vertically. Open the operable sash or panel inward from the top, to the full ventilating position with the sash or panel supported solely by the stabilizing arm at one jamb. A concentrated load acting vertically downward for a duration of 10 seconds as indicated in the table, shall be applied at each upper operable sash or panel corner separately. After load removal, there shall be no damage to the window or door frame, operable sash or, components, glass, stabilizing arm or hardware components, and the product shall function normally.

Sash Type	Performance Class	Load (P)		Point of Load Application
		N	(lbs)	
Dual Action Hinged Glass Door	R	445	(100)	Panel Corners
Dual Action Hinged Glass Door	LC, C & HC	890	(200)	Panel Corners
Dual Action Hinged Glass Door	R	890	(200)	Top Rail
Dual Action Hinged Glass Door	LC, C & HC	1780	(400)	Top Rail
Dual Action Window	R	445	(100)	Sash Corners
Dual Action Window	LC, C & HC	890	(200)	Sash Corners
Dual Action Window	R	890	(200)	Top Rail
Dual Action Window	LC, C & HC	1780	(400)	Top Rail

Table 5.12

5.3.6.5.3 BALANCE ARM LOAD TEST

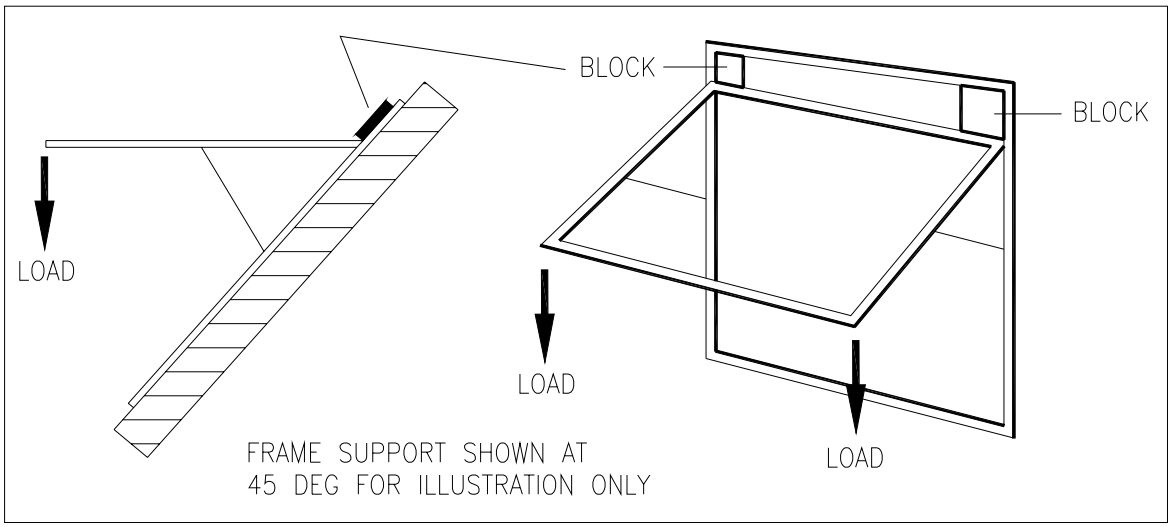

Figure 5.14

If two or more sash are included in the test specimen, compare the balance arm materials and cross sections, pivots, etc. If judged equal, test the largest sash only. Otherwise, test all arms.

Support the unglazed test specimen at 45o or to a maximum design opening, which ever is less, to the vertical and clamp the frame at its full height. Open the sash with the balance arms in compression, and block the sash in the level position at both friction shoes.

Apply a concentrated load (P) vertically downward at one free corner of the sash for 10 seconds. Then apply the concentrated load (P) vertically downward at the other free corner of the sash for 10 seconds. Remove all loads.

Sash Type	Performance Class	Load (P)		Point of Load Application
		N	(lbs)	
Awning, Hopper, Projected	HC	270	(60)	Opposite Sash Corners

Table 5.13

After removal of the loads, the balance arms shall function normally with no apparent damage.

5.3.6.5.4 HOLD OPEN ARM/STAY BAR TEST

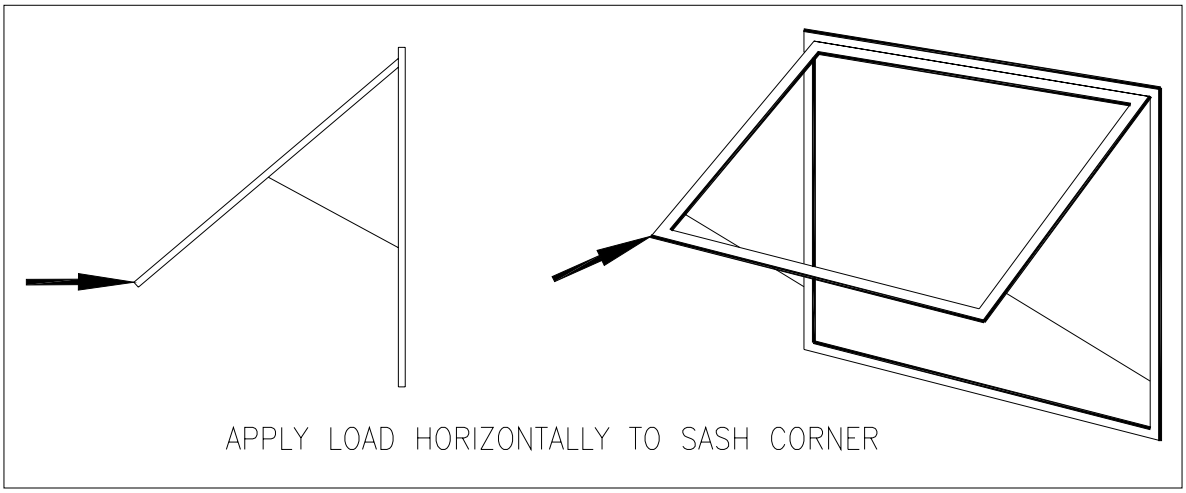

Figure 5.15

With the glazed sash opened to its fullest extent, a horizontal concentrated load (P) shall be applied for a duration of 10 seconds at one lower corner of the sash in the closing direction. After removal of the load, hold-open arms shall function normally.

Sash Type	Performance Class	Load (P)		Point of Load Application
		N	(lbs)	
Top Hinged	C & HC	445	(100)	Sash Corner

Table 5.14

5.3.6.5.5 HINGE TEST (Hinged Rescue Windows only)

After the air, water and structural tests have been performed, the hinged perimeter frame window assembly shall be subjected to 10 cycles of unlatching, opening to the full 90-degree position, closing and latching. At the conclusion of 10 cycles, there shall be no glass breakage or permanent damage to any fasteners, hardware parts, support arms or actuating mechanisms, and the hinged window assembly shall open, close and lock in its normal manner. The operation test must be conducted again with the heaviest glass configuration (if not already done).

5.3.6.5.6 AWNING, HOPPER, PROJECTED HARDWARE LOAD TEST

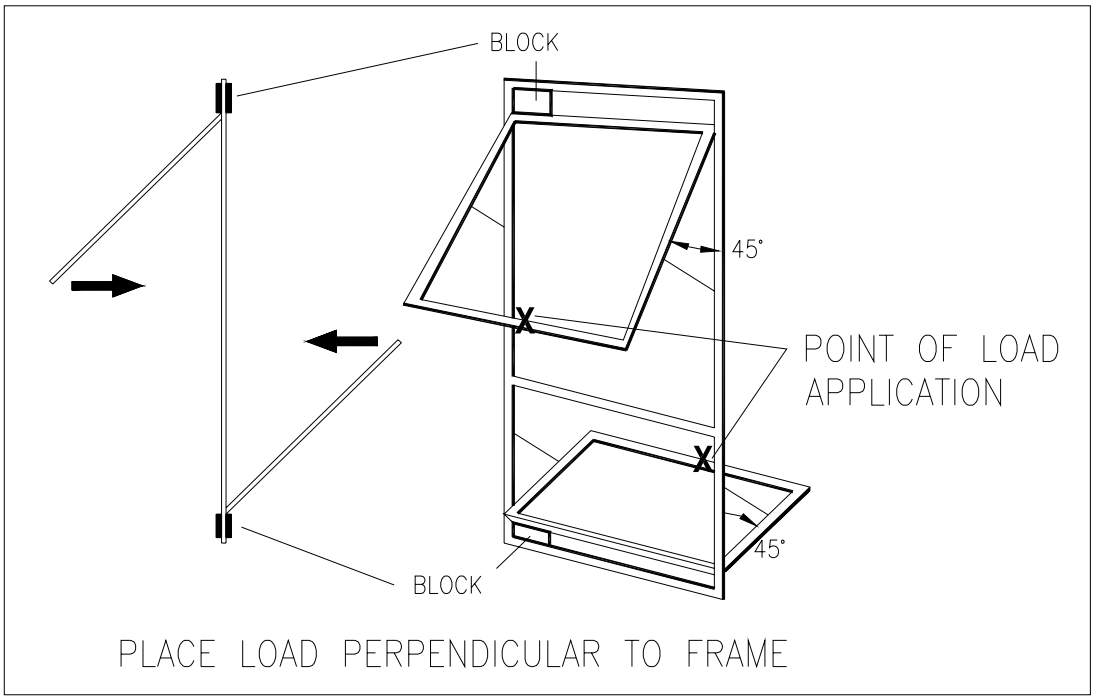

Figure 5.16

The glazed operable sash shall be opened to a 45° position or to the limit of its travel, whichever is less, and one side blocked in that position to prevent movement in a closing direction. The blocking shall extend no further outwards on the side sash member than the mounting point for the holding device.

A pre-load force of 15 N (3 lb) shall be applied for a period of 10 seconds to the midpoint of the sash member opposite the hinges, in a closing direction and perpendicular to the plane of the glazing. The load shall then be removed and the deflection-measuring devices shall be zeroed. The force shall then be increased to (P). The deflection of the outer corner of the operable light on the opposite side from the blocking, in the direction of the applied force, shall be measured at 60 ± 5 seconds after the full force has been applied and while it is still being applied. The deflection measured to the nearest 0.25 mm (0.01 in), shall not exceed the values indicated in the table below.

Sash Type	Performance Class	Load (P)		Deflection Limit	
		N	(lbs)	mm	(in)
Awning, Hopper, Projected	R & LC	70	(15)	Reported	Reported
Awning, Hopper, Projected	C	140	(30)	3.8 • A	(0.14 • B)
Where A is the area of the tested sash in (m^2) and B is the area of the tested sash in (ft^2).					

Table 5.15

At the conclusion of the test, the test specimen shall fully close and operate properly and shall show no distortion or failure. There shall be no glazing breakage.

This test shall be repeated for each different design of operable sash of the test specimen.

5.3.6.6 SAFETY DROP TEST (Non-hung vertical operating products only)

The test specimen shall be mounted in a test fixture.

The test specimen shall be examined to identify the two adjacent preset sash or sliding door panel retention positions with the maximum spacing. The operable sash or sliding door panel shall be raised to the upper of these two positions, and then allowed to "free fall". This procedure shall be conducted a minimum of one time for each operable sash or sliding door panel. When dropped, the sash or sliding door panel shall automatically stop at the lower of the two preset positions. There shall be no breakage or permanent deformation of any part of the test specimen that would impair its operation. There shall be no glazing breakage.

Where a manufacturer offers or specifies either interior or exterior removable multiple glazing panels (RMGP's) in the primary sash or panels, and it is desired to achieve conformance to this specification both with and without the RMGP's installed, all safety drop tests shall be conducted with all RMGP's installed.

5.3.6.7 UNIT DEAD LOAD TEST (Greenhouse Windows only)

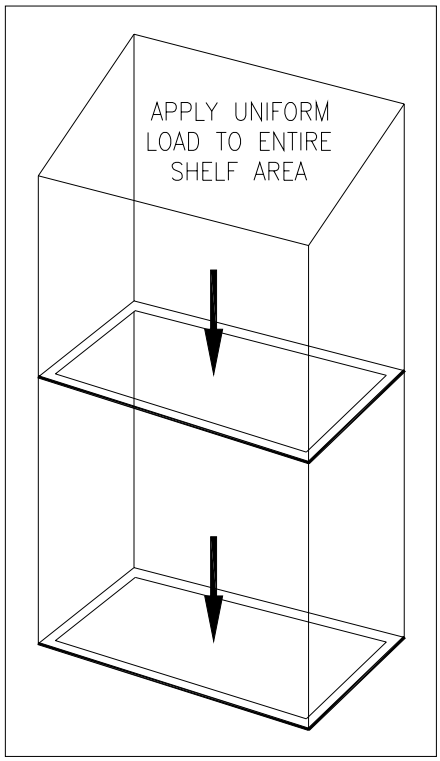

Figure 5.17

A uniform load of 40 kg/m^2 (8 lbf/ft^2) of shelf area (including the bottom pan area) shall be applied simultaneously to each shelf and to the bottom pan of a glazed vertically mounted unit for a period of 5 minutes. The maximum vertical displacement of the specimen in relation to its mounting shall not be greater than L/175, “L” being defined as the width of the unit.