

Specifying Windows and Doors Using Performance Standards

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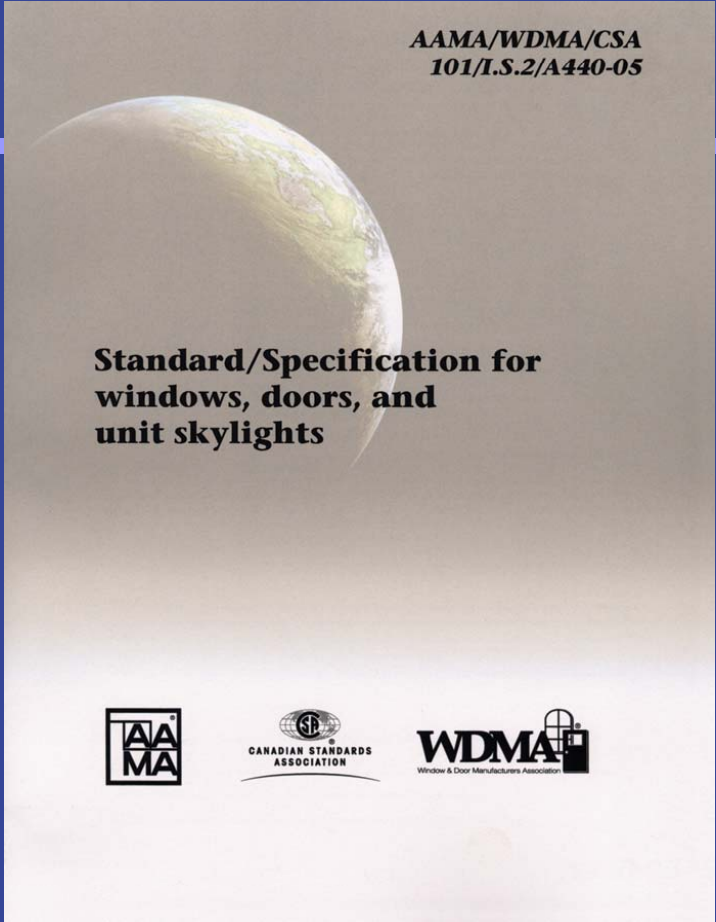
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Specifying Windows and Doors Using Performance Standards

Learning Objectives:

- ❖ Understand The Evolution Of Window and Door Standards and Code References
- ❖ Recognize How To Use The Standard To Specify Product Type, Performance Level And Key Performance Attributes
- ❖ Analyze Special Requirements for Different Window and Door Types
- ❖ Learn To Use the Short Form Specification





**The New Standard
AAMA/WDMA/CSA
101/I.S. 2/A440-05**

Getting to 101-05

1947

The first Guide Specification for Aluminum Windows was released.

1950

Performance levels for different applications were first defined.

1962

AAMA 302 aluminum window standard was released.

1985

AAMA "101" standard for aluminum windows and doors was released.

1988

AAMA "101" standard for aluminum windows and doors is updated from 1985 document and released.

1993

AAMA "101" standards for aluminum and vinyl windows and doors combined and released.

1986

AAMA "101" standard for vinyl windows and doors was released.

1994

AAMA and NWWDA begin work to consolidate the two major U.S. standards for windows and glass doors.

1997


ANSI/AAMA/NWWDA 101/I.S. 2-97 was released, encompassing products made of aluminum, vinyl, fiberglass or wood, as well as those with aluminum- or vinyl-clad wood framing members.

2002

ANSI/AAMA/WDMA 101/I.S. 2/NAFS - 02, was released, which incorporates skylights, sidelites and transoms for the first time.


2005

AAMA/WDMA/CSA 101/I.S. 2/A440-05 was issued, fully consolidating U.S. and Canadian standards and adding four more operator types, eight additional materials and requirements for side-hinged doors.




Key Features of AAMA/WDMA/CSA 101/I.S. 2/A440-05

❖ Performance Based




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- ❖ Performance Based
- ❖ Material Neutral



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- ❖ Performance Based
- ❖ Material Neutral
- ❖ Referenced by IBC and IRC



Key Features of AAMA/WDMA/CSA 101/I.S. 2/A440-05

- ❖ Performance Based
- ❖ Material Neutral
- ❖ Referenced by IBC and IRC
- ❖ **Multinational in Scope**



Using 101/I.S. 2/A440-05

- ❖ What type of product?
- ❖ What application?
- ❖ Performance level?

What Type of Product?





Product Types

30 Product Types are Identified in the 2005 Standard by a Specific Letter Code.

Application: What Kind of Building?



Performance Class



R

LC

C

HC

AW

Performance Grade

Product Performance Class	Minimum Performance Grade	Minimum Design Pressure (psf)	Wind Speed (mph)
Windows and Doors			
R	15	720 (15.0)	77
LC	25	1200 (25.0)	100
C	30	1440 (30.0)	109
HC	40	1920 (40.0)	126
AW	40	1920 (40.0)	126



Product Designation System

HS – R 15 – 63x44

A **B** **C** **D**

PRODUCT KEY

A = Product Type: Horizontal Siding Window (HS)

B = Performance Class: R

C = Performance Grade: Design Pressure = 15 psf

D = Maximum Size Tested: Width x Height (63x44)



AAMA Label



QUALITY CONTROL & TESTING
AAMA CERTIFICATION PROGRAM
 ACCREDITED BY: AMERICAN NATIONAL STANDARDS INSTITUTE
 VALIDATOR: ALI® Code: XXX-1

Series: XXX XX
 AAMA/WDMA/CSA 101/I.S.2/A440-05
HS-R15-1600 x 1100 (63 X 44)

RAM
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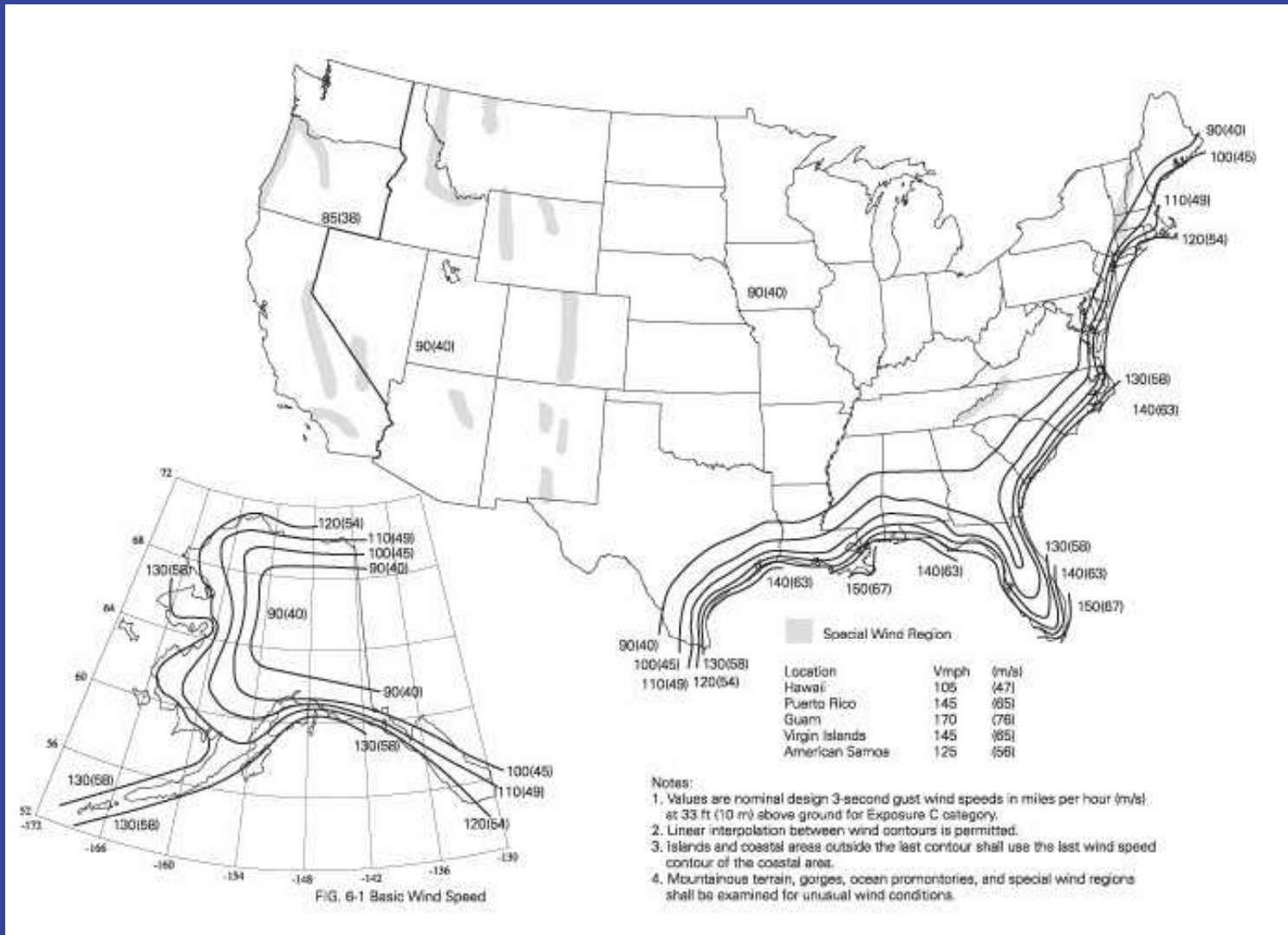


A photograph of a modern building with a glass facade and a courtyard area. The building has a light-colored exterior and a dark roof. The courtyard area is paved and has a glass railing. The building is illuminated at dusk, with warm lights visible through the windows and doors.

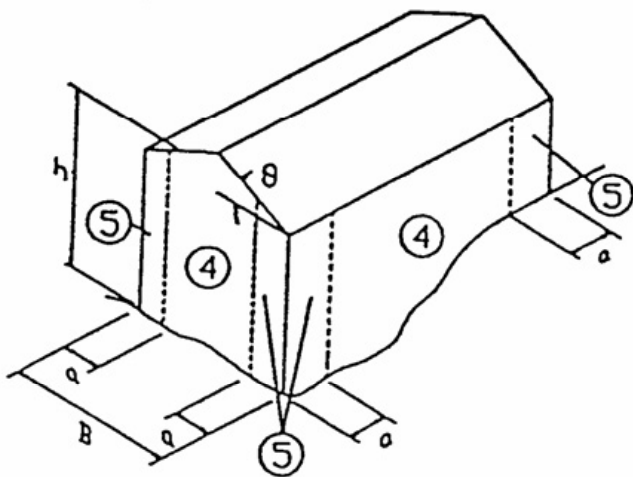
Basic Performance Requirements

- ❖ Structural adequacy to withstand design wind loads
- ❖ Resistance to water penetration
- ❖ Resistance to air infiltration
- ❖ Resistance to forced entry

ASCE Design Wind Load Map



Design Wind Load Table (psf)



Mean Roof Height (ft.)	Positive Pressure All Areas	Negative Pressure	
		Area 4	Area 5
BASIC WIND SPEED – 70 MPH			
15	16.6	-17.6	-22.6
20	18.0	-19.1	-24.6
25	19.2	-20.4	-26.2
30	20.3	-21.5	-27.7
40	21.9	-23.3	-29.9
50	23.4	-24.8	-31.9
60	24.6	-26.1	-33.6
70	25.7	-27.2	-35.0
80	26.7	-28.3	-36.4
90	27.7	-29.4	-37.8

Excerpt from ASCE-7 and AAMA TIR-A10

Structural Loading



Minimum Performance Requirements Listed by Class

Window/Door Classes	Design Pressure (psf)	Structural Test Pressure (psf)
R	15	22.5
LC	25	37.5
C	30	45.0
HC	40	60.0
AW	40	60.0



Uniform Load Deflection Test at the Design Pressure

A minimum uniform design pressure load is applied to the test specimen, first to the exterior surface (positive) and then to the interior surface (negative).

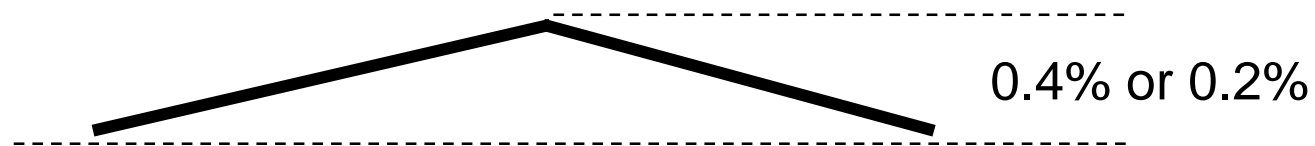
Deflection at design pressure is reported for all products. For HC and AW products, the deflection must not exceed $L/175$.



Structural Load Requirements

1997 Version Uniform Load Structural Test

There can be no permanent deformation of any mainframe, sash, panel or sash member in excess of 0.4% of its span for R, LC, C or HC class products or 0.2% of its span for AW class products



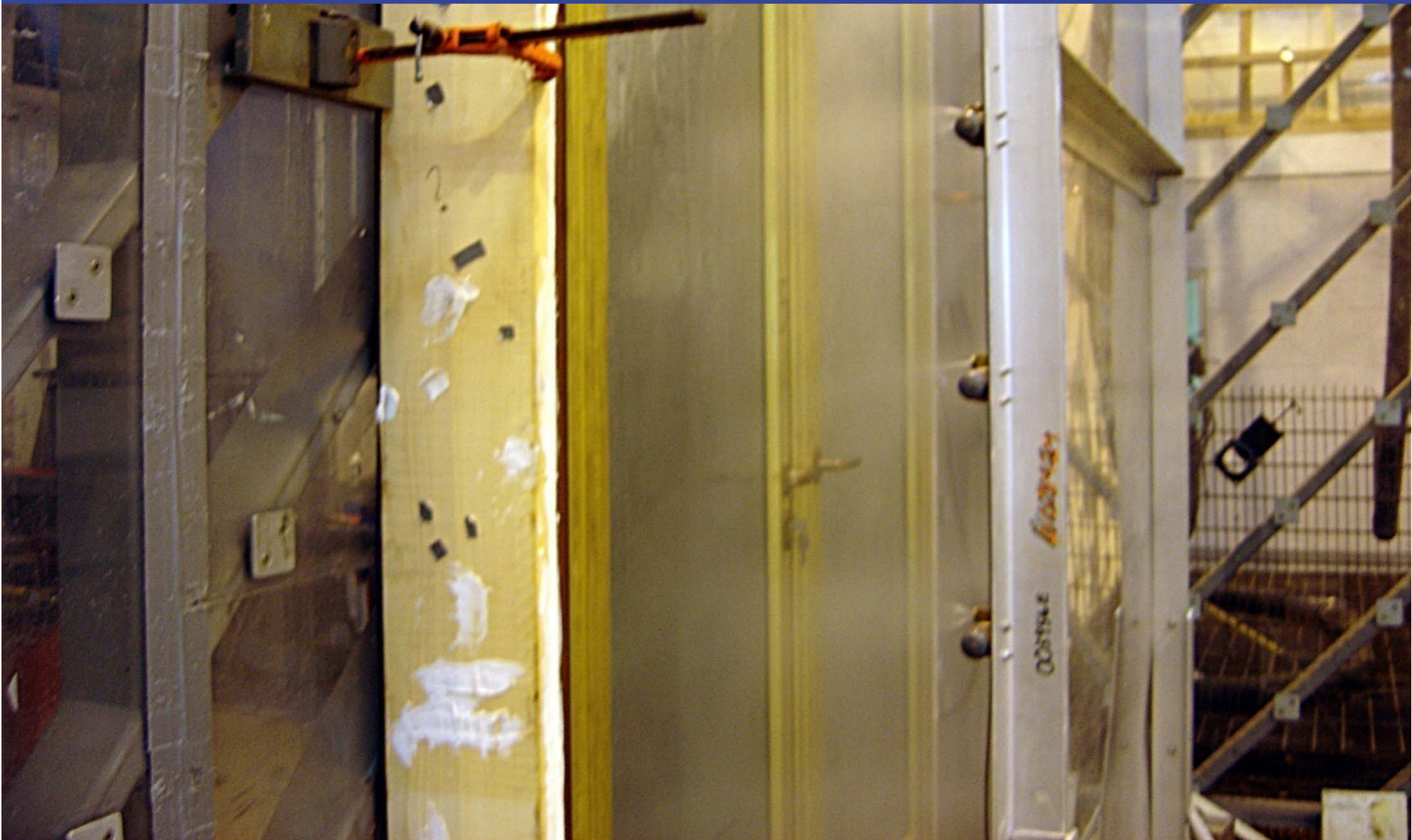
Structural Load Requirements

2002 and 2005 Versions Uniform Load Structural Test

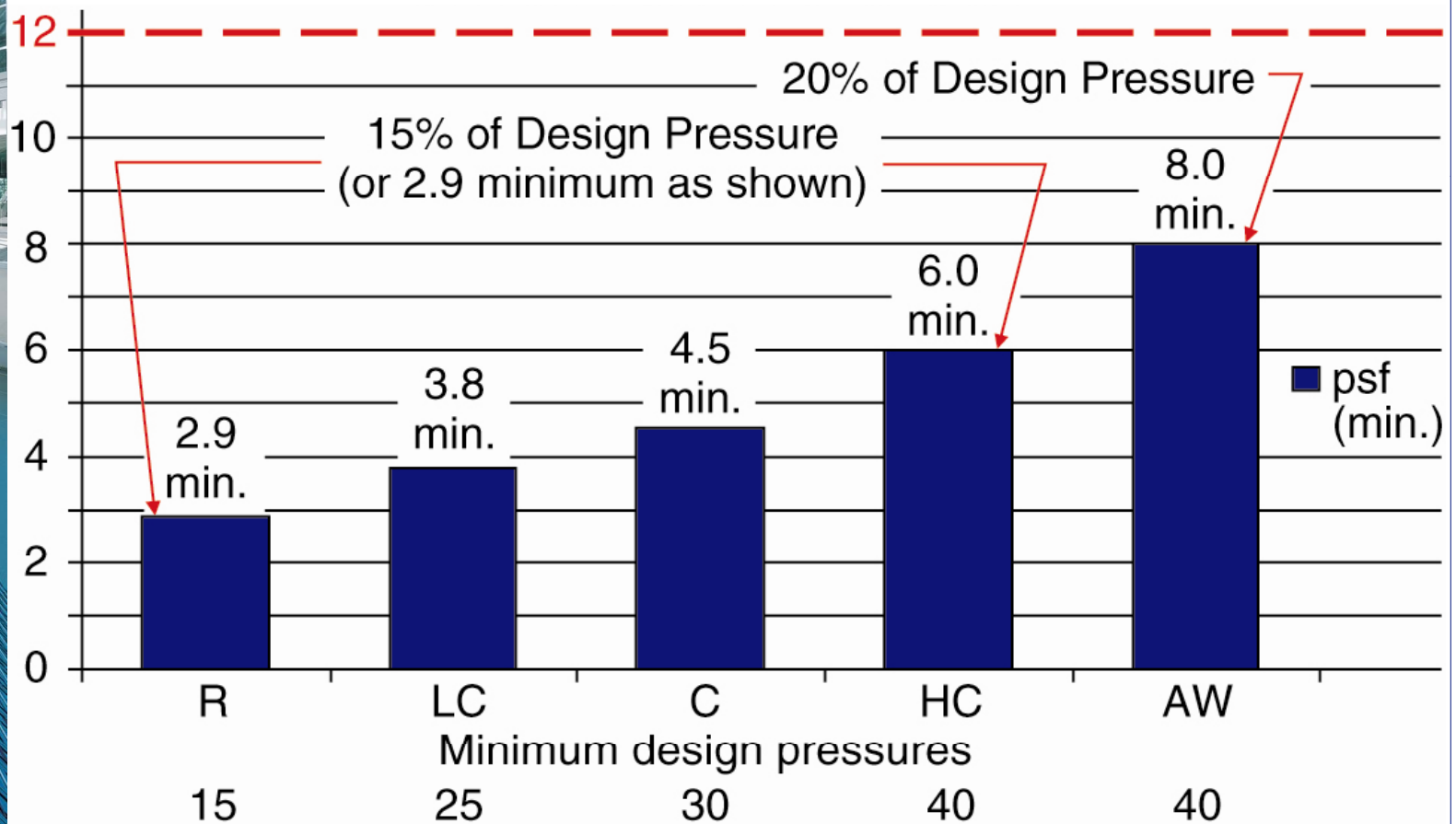
There can be no permanent deformation of any mainframe, sash, sash member, leaf or threshold/sill in excess of 0.4% of its span for R, LC class products, 0.3% of its span for C and HC class products, or 0.2% of its span for AW class products



Water Penetration



Water Test Pressure



Minimum Performance Requirements Listed by Class

Window/Door Classes	Design Pressure (psf)	Structural Test Pressure (psf)	Water Resistance Test Pressure (psf)	Required Percentage For Water Testing
R	15	22.5	2.9	*
LC	25	37.5	3.8	15%
C	30	45.0	4.5	15%
HC	40	60.0	6.0	15%
AW	40	60.0	8.0	20%

* R15 products are tested at 2.9 psf, which is higher than the 15% of design pressure, as required for other higher ratings within the R class.

Performance Considerations Related to Design Pressure

Performance Grade = Design Pressure

Structural Test Pressure = 1.5 Design Pressure

Water Resistance Test Pressure = 0.15 Design Pressure for R, LC, C
and HC
0.20 Design Pressure for AW

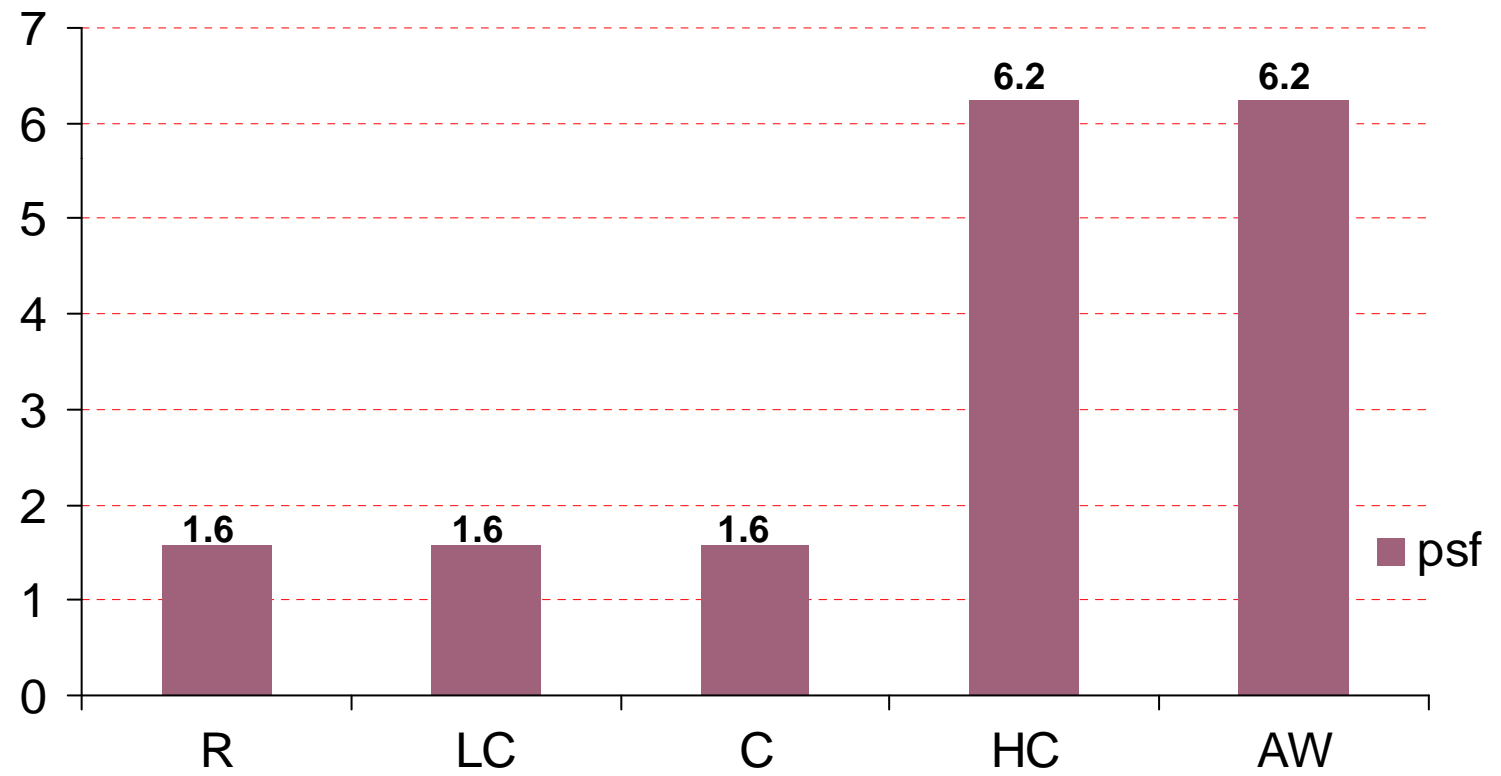
Air Infiltration



Air Infiltration Control Panel

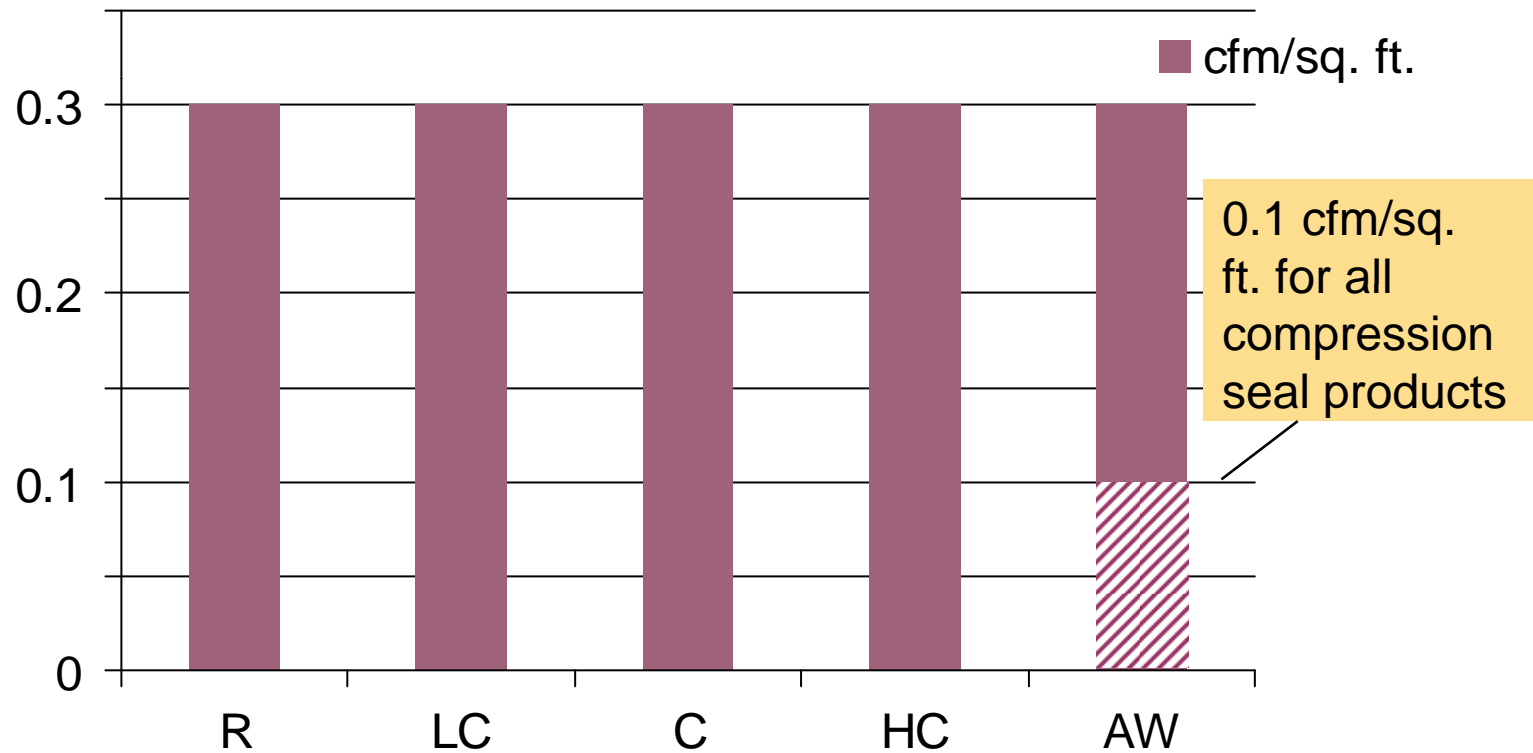
Air Infiltration Test Pressure

FOR VARIOUS PERFORMANCE CLASSES



Maximum Air Infiltration

FOR VARIOUS PERFORMANCE CLASSES AND GRADES
Field air infiltration is permitted to be 1.5 times values shown below.



Resistance to Forced Entry



ASTM F 588
ASTM F 842
AAMA 1304



AAMA Label



MEMBER

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Code: XXX-1

Series: XXX XX

AAMA/WDMA/CSA 101/I.S.2/A440-05
HS-R15-1600 x 1100 (63 X 44)

RAM
INSTITUTE
Code: XXX-1

Series: XXX XX

AAMA/WDMA/CSA 101/I.S.2/A440-05

HS-R15-1600 x 1100 (63 X 44)



Window Testing



Minimum Test Size Requirements

Test Sample Requirements

(Example: Casement Windows)

Window Designation

2005 Minimum Frame Size

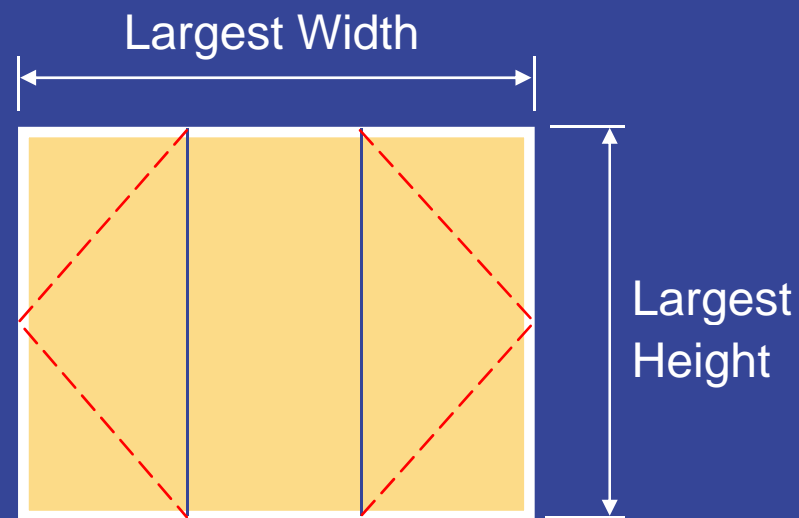
C-R15	24" (600 mm) x 60" (1500 mm)
C-LC25	32" (800 mm) x 60" (1500 mm)
C-C30	32" (800 mm) x 60" (1500 mm)
C-HC40	36" (900 mm) x 60" (1500 mm)
C-AW40	36" (900 mm) x 60" (1500 mm)





Minimum Test Sizes

Must include all intermediate members to be qualified.



Maximum Size Tested



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Higher Performance Grades?

Optional Performance Grades

Optional Performance Grade	Applicable Product Designation	Design Pressure		Structural Test Pressure		Water Resistance Test Pressure			
		psf	(Pa)	psf	(Pa)	R, LC, C and HC		AW	
						psf	(Pa)	psf	(Pa)
20	R	20.0	(960)	30.0	(1440)	3.00	(150)	-	-
25	R	25.0	(1200)	37.5	(1800)	3.75	(180)	-	-
30	R,LC	30.0	(1440)	45.0	(2160)	4.50	(220)	-	-
35	R,LC,C	35.0	(1680)	52.5	(2520)	5.25	(260)	-	-
40	R,LC,C	40.0	(1920)	60.0	(2880)	6.00	(290)		
45	R,LC,C, HC,AW	45.0	(2160)	67.5	(3240)	6.75	(330)	9.00	(440)
50	R,LC,C, HC,AW	50.0	(2400)	75.0	(3600)	7.50	(360)	10.00	(480)
55	R,LC,C, HC,AW	55.0	(2640)	82.5	(3960)	8.25	(400)	11.00	(530)
60	R,LC,C, HC,AW	60.0	(2880)	90.0	(4320)	9.00	(440)	12.00	(580)

Optional Performance Grades higher than those shown on the table may be used in increments of 5 psf.

Water resistance test pressures are capped at 15 psf in the 2002 version of the standard.

Ratings are capped at the entry level plus 60 psf in the 2002 & 2005 version of the standard, except for the AW class.

Optional Performance Grades (cont'd)

Optional Performance Grade	Applicable Product Designation	Design Pressure		Structural Test Pressure		Water Resistance Test Pressure			
		psf	Pa	psf	Pa	R, LC, C and HC		AW	
						psf	Pa	psf	Pa
65	R,LC,C, HC,AW	65.0	3120	97.5	4680	9.75	470	12.00	580
70	R,LC,C, HC,AW	70.0	3360	105.0	5040	10.50	510	12.00	580
75	R,LC,C, HC,AW	75.0	3600	112.5	5400	11.25	540	12.00	580
80	LC,C, HC,AW	80.0	3840	120.0	5760	12.00	580	12.00	580
85	LC,C, HC,AW	85.0	4080	127.5	6120	12.00	580	12.00	580
90	C, HC,AW	90.0	4320	135.0	6480	12.00	580	12.00	580
95	HC,AW	95.0	4560	142.5	6840	12.00	580	12.00	580
100	HC,AW	100.0	4800	150.0	7200	12.00	580	12.00	580

Optional Performance Grades higher than those shown on the table may be used in increments of 5 psf.

Water resistance test pressures are capped at 15 psf in the 2002 version of the standard.

Ratings are capped at the entry level plus 60 psf in the 2002 & 2005 version of the standard, except for the AW class.



Optional Performance Grades

Must meet ALL minimum gateway performance requirements before testing at optional higher grades.

Optional Performance Grades Examples

1. Tested Design Pressure @ 80 psf
Tested Water Resistance @ 8.00 psf

AW40 / HC50

97/02/05

2. Tested Design Pressure @ 50 psf
Tested Water Resistance @ 12.00 psf

AW50 / HC50

97/02/05

3. Tested Design Pressure @ 75 psf
Tested Water Resistance @ 12.00 psf

AW75 / HC75

97 & 05 only

AW60 / HC75

02 only

The performance grade assigned must be consistent with the lowest test level achieved.



Special Requirements Per Window Type?

Deglazing



Life Cycle Testing



Concerns Addressed by AAMA 910 Life Cycle Testing

- ❖ Carelessness by the occupants or maintenance personnel.
- ❖ Unawareness of proper operating or maintenance procedures.
- ❖ Operating force beyond the limits of normal physical ability.
- ❖ Attempted operation without proper keys or devices.





AAMA 910 Life Cycle Testing Excludes:

- ❖ Vandalism
- ❖ Improper installation/handling practices
- ❖ Intentional abuse
- ❖ Detention or psychiatric applications

Requirements for Mullions



Mullions or Other Structural Members

- ❖ Products assembled at the factory are tested as a single complete unit per the 2005 standard or its predecessors.
- ❖ Products stacked or combined in the field must be tested for mullion integrity per AAMA 450.



Mullions and Other Structural Members

- ❖ Must withstand the full design load for the project site.
- ❖ Deflection for all AW and HC products cannot exceed $1/175$ of the span length in the 2005 version.
- ❖ Evidence of compliance may be by structural analysis or AAMA 450.



Glass and Glazing Materials

- ❖ ASTM E 1300 “Standard Practice For Determining The Minimum Thickness And Type Of Glass Required To Resist A Specified Load”
- ❖ Glass furnished by the manufacturer must meet the values given in ASTM E 1300 for the design pressure rating of the product



Performance Requirements For Side-Hinged Entry Doors



Laboratory and Field Testing



Short Form Specification

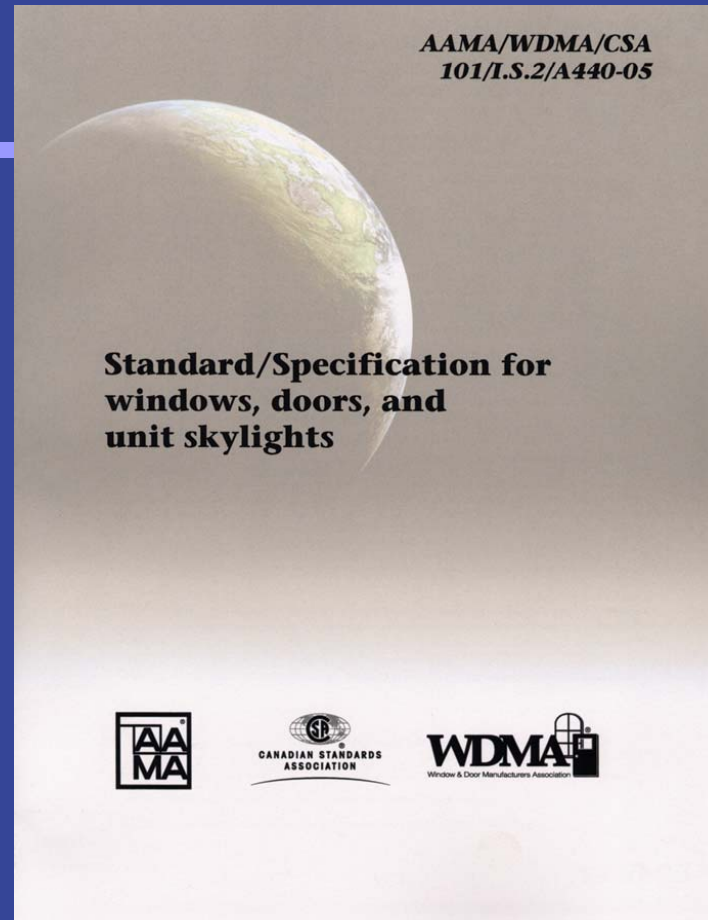
All (windows) (doors) (unit skylights) shall conform to the _____ voluntary specification(s) in AAMA/WDMA/CSA 101/I.S. 2/A440-05, be labeled with the AAMA, CSA or WDMA label, have the sash arrangement(s), leaf arrangement(s), or sliding door panel arrangement(s) and be of the size(s) shown on the drawings and be as manufactured by _____ or approved equal.



Short Form Specification

All (windows) (doors) (unit skylights) shall conform to the HS-LC25 voluntary specification(s) in AAMA/WDMA/CSA 101/I.S. 2/A440-05, be labeled with the AAMA, CSA or WDMA label, have the sash arrangement(s), leaf arrangement(s), or sliding door panel arrangement(s) and be of the size(s) shown on the drawings and be as manufactured by XYZ Windows or approved equal.





**The New Standard
AAMA/WDMA/CSA
101/I.S. 2/A440-05**

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Seminar Evaluation

Please take a moment to complete the evaluation form. Thank You.



