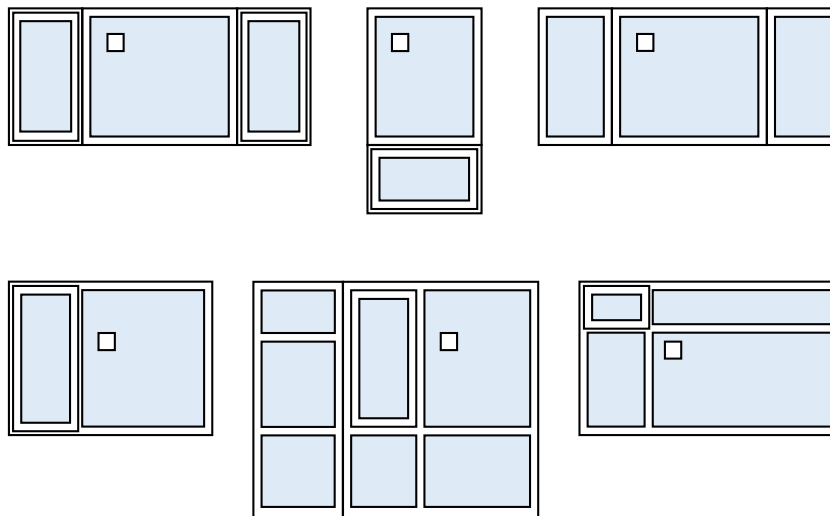


Voluntary

NAFS Labeling Guidelines

for Products with Mullions



Voluntary best practices for NAFS labeling of Composite Unit and Combination Assembly fenestration products having vertical and/or horizontal mullions for Canadian jurisdictions that have adopted the 2010 National Building Code of Canada (NBCC) or a provincial building code based on the 2010 NBCC.

September 2014

Disclaimer

Nothing in this document constitutes legal advice. Material is presented as general guidance and technical information from Fenestration Canada—a not-for-profit organization. Consult with a lawyer, accountant, or insurance professional before making any decisions.

NAFS Testing of Products with Mullions

The NAFS standard is clear that the air-water-structural performance ratings of products with mullions must be based on the tested performance of products with mullions. It is not permissible to test only single operator types, such as a fixed, sliding, awning, and casement window, and to apply these ratings to products containing more than one operator type separated by one or more mullions. *This practice is not supported under NAFS-08.*

Voluntary Guidelines for NAFS Labeling of Products with Mullions

This guideline document is offered to assist manufacturers, test labs, and certification entities to determine and label the air-water-structural performance of products that have integral, combination or reinforcing mullions in a uniform way, using primary and secondary NAFS designators as required by the Canadian Supplement CSA A440S1-09.

Use and Adoption of these Guidelines

The need to test and rate the performance of products with mullions has not been well understood in some parts of Canada. Consequently users of this document are urged to recognize that both industry and building officials will need time to understand and comply with the testing requirements and to implement appropriate labeling practices.

Labeling the tested NAFS performance of products with mullions is not well described in NAFS-08 or in the Canadian Supplement. These voluntary guidelines are intended to help all affected parties appreciate the need to label mullion product performance using Primary and Secondary Designators, and to illustrate practical ways of doing so.

When product labeling is unclear or in dispute, a test report from an independent testing laboratory or a report from a licensed professional engineer validating the overall performance rating of the assembly with mullions shall be an acceptable substitute.

Field mullion without manufacturer's involvement

Windows and doors combined into assemblies consisting of two or more individual units in the field without the manufacturer's involvement, testing, or evidence of compliance are not covered under NAFS.

Manufacturer's involvement includes published installation procedures and manufactured parts, such as mullion stiffeners, brackets, and fasteners.¹

This document provides guidance on the number and type of labels to be used with Composite Unit and Combination Assembly fenestration products. Refer to the Fenestration Canada document "NAFS Labeling Guidelines for Canada" for guidance on acceptable variations for reporting Primary and Secondary designator information within labels.

¹ NAFS-08 Clause 7.8.4, p. 98.

Referenced Documents

This document uses the commonly used names/acronyms on the left to refer to the standards on the right:

NAFS, NAFS-08	AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS—North American Fenestration Standard/Specification for windows, doors and skylights
Canadian Supplement	A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS—North American Fenestration Standard/Specification for windows, doors and skylights (Update No. 1 released July, 2013)
AAMA 450	AAMA 450-06, Voluntary Performance Rating Method for Mullied Fenestration Assemblies

NAFS Labeling Guidelines for Canada, issued by Fenestration Canada²

Definitions

In this document the following terms are used with the meanings they have in the NAFS standard:

Composite unit — a fenestration product consisting of two or more sash, leaves, lites, or sliding door panels within a single frame utilizing an integral mullion.³

Combination assembly — an assembly formed by a combination of two or more separate fenestration products whose frames are mullied together utilizing a combination mullion or reinforcing mullion.⁴

Individual unit — a single fixed or operating product or a composite unit.⁵

Integral mullion — a horizontal or vertical member that is bounded at either end or both ends by crossing frame members.⁶

Combination mullion — a horizontal or vertical member formed by joining two or more individual units together without a mullion stiffener.⁷

Reinforcing mullion — a horizontal or vertical member with an added continuous mullion stiffener and joining two or more individual units along the sides of the mullion stiffener.⁸

Mullion stiffener — an additional reinforcing member used as part of a reinforcing mullion. Mullion stiffeners shall be designed to carry all the load or share the load with adjacent framing members.⁹

² This document is available on the Fenestration Canada website at <http://fenestrationcanada.ca>.

³ NAFS-08, p. 19.

⁴ NAFS-08, p. 19.

⁵ While this term is not explicitly defined in the standard, it is used multiple times in NAFS-08.

⁶ NAFS-08, p. 93.

⁷ NAFS-08, p. 93.

⁸ NAFS-08, p. 23.

⁹ NAFS-08, p. 93.

General Labeling Requirements

To distinguish the performance ratings of products with mullions from those of single operator type products without mullions, this guideline provides examples of labels for the following products.

NAFS Tested Product	Label Type
Composite Unit product	Composite Unit
Combination Assembly product	Combination Assembly
Combination or reinforcing mullion(s) tested or rated under AAMA 450	Mullion Assembly

1 Labeling of Composite Unit Products

Composite Unit products must be labeled with overall performance ratings that are based on testing of complete units with integral mullions. In no case can Overall Ratings for Composite Units be based on individual product tests only with the mullions rated separately, as may be done for Combination Assemblies.

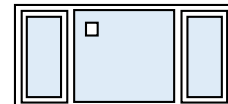
Testing Composite Units with integral mullions qualifies mullions in similar units or assemblies with equal or smaller spans, and equal or smaller tributary widths, and horizontal mullions with equal or smaller supported mass. Each unique intermediate framing member in a composite unit shall be tested in the longest dimension for which compliance is desired. Intermediate framing members which are longer or which are not tested shall not comply. Framing members shall be of identical cross-section to those tested to claim compliance.

Any use of engineering methods must be performed by a licensed professional engineer and documented in accordance with the applicable referenced standards.

Example: Composite Unit, Overall Product Performance Label

The example label is for a Casement-Fixed-Casement Composite Unit with two vertical integral mullions. The overall product performance rating is based on testing at a size greater than or equal to the labeled size.

<p>Competent Windows Builder Line 4000</p> <p>Class R – PG30 – Size tested 2750 x 1525 mm (108 x 60 in)</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2 Level</p> <p>Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09</p>
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2 Labeling of Combination Assembly Products

The performance of a Combination Assembly product is determined by testing it as a Combination Assembly or by testing the individual units and rating the mullions according to AAMA 450. (Annex A)

Combination Assembly products can be labeled with performance ratings in one of four ways. The choice of labeling method is at the discretion of the manufacturer or certification entity¹⁰.

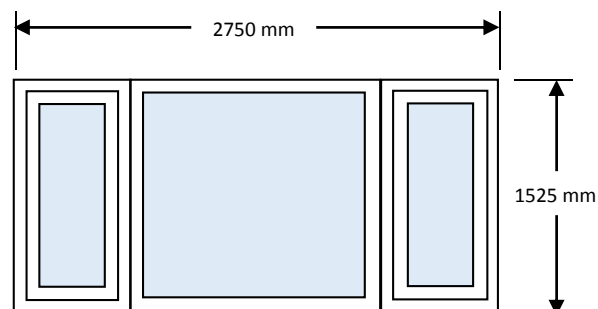
- **Label Option 1:** Using a single overall performance rating label, in the same manner as a Composite Unit.
- **Label Option 2:** Labeling each individual Unit and Mullion Assembly separately. In this case, the Combination Assembly would have multiple individual labels on it, one for each unique Unit and each unique Mullion Assembly.
- **Label Option 3:** Using a single label to display the performance rating for each unique Unit and each unique Mullion Assembly. This label may optionally show the Overall Rating of the Combination Assembly as the first rating on the label.
- **Label Option 4:** Labeling each individual Unit separately with two ratings: one for the Unit, and the other for the Overall Rating.

2.1 Overall Ratings for Combination Assembly Products

The Overall Rating for Building Code Compliance of a Combination Assembly is determined by the lowest Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level of the individual components within the Combination Assembly. When the performance of a Combination Assembly is reported with individual rating labels for each component, the lowest Performance Class, Performance Grade, Water Test Pressure and greatest Air Infiltration/Exfiltration Level of the individual components will be evaluated to determine compliance with the Building Code.

2.1.1 Combination Assembly Labeling Example Window

The example labels that follow are for a Casement-Fixed-Casement Combination Assembly with two vertical mullions, 2750 mm wide x 1525 mm high (108 x 60 in).



¹⁰ Four options for labeling the performance of Combination Assembly products are provided to accommodate the needs of large and small manufacturers and existing certification labeling practices.

The sizes and ratings of the individual units and mullion assemblies are shown in Table 1. The lowest rating in each category is underlined. The Overall Rating is therefore: Class R, PG30, 220 Pa Water Test Pressure, and A2 Air Infiltration/Exfiltration Level.

Table 1 - Performance ratings and sizes of individual units for Combination Assembly label examples

Component	Size Tested	Performance Class	Performance Grade	Positive Design Pressure	Negative Design Pressure	Water Test Pressure	Air Infiltration/Exfiltration Level	Rating Document
Casement window	610 mm wide x 1600 mm high	<u>R</u>	<u>PG30</u>	<u>1680 Pa (35 psf)</u>	<u>1440 Pa (30 psf)</u>	290 Pa	A3	NAFS test report
Fixed window	1830 mm wide x 1830 mm high	LC	PG45	2400 Pa (50 psf)	2160 Pa (45 psf)	360 Pa	Fixed	NAFS test report
Mullion Assembly	1830 mm span x 1220 mm tributary width	LC	PG30	2160 Pa (45 psf)	2160 Pa (45 psf)	<u>220 Pa</u>	<u>A2</u>	NAFS test report or AAMA 450 report

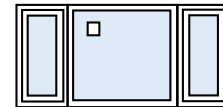
2.2 Combination Assembly Label Examples

The four labeling options are illustrated in the following examples.

Example: Label Option 1—Single Label Reporting Overall Rating Performance

A single label reports the Overall Rating performance of the Combination Assembly. The Overall Rating is the lowest Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level of the individual components within the Combination Assembly. Alternatively, the Overall Rating may be determined by testing the Combination Assembly.

<p>Competent Windows Builder Line 4000</p> <p>Class R – PG30 – Size Tested 2750 x 1525 mm (108 x 60 in)</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2</p> <p>Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09</p>
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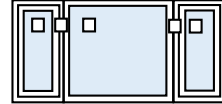


Example: Label Option 2—Separate Product Performance Labels for Individual Units and Mullion Assemblies

Each Individual Unit and Mullion Assembly is individually labeled. The building official would need to study the individual labels to determine the Overall Rating for code compliance by looking for the lowest Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level of the individual components within the Combination Assembly.

Mullion Assembly Label¹¹

Competent Windows Builder Line 4000
Class LC – PG30 – MA Span 1830 x 1220 mm (72 x 48 in.) Trib Wd
Positive Design Pressure (DP) = 2160 Pa (45 psf)
Negative Design Pressure (DP) = 2160 Pa (45 psf)
Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)
Canadian Air Infiltration/Exfiltration = A2
Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09



Individual Unit Label: Casement Window

Competent Windows Builder Line 4000
Class R – PG30 – 610 x 1600 mm (24 x 63 in) – Type C
Positive Design Pressure (DP) = 1680 Pa (35 psf)
Negative Design Pressure (DP) = 1440 Pa (30 psf)
Water Penetration Resistance Test Pressure = 290 Pa (6.00 psf)
Canadian Air Infiltration/Exfiltration = A3
Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09

Individual Unit Label: Fixed Window

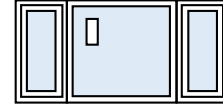
Competent Windows Builder Line 4000
Class LC – PG45 – 1830 x 1830 mm (72 x 72 in) – Type FW
Positive Design Pressure (DP) = 2400 Pa (50 psf)
Negative Design Pressure (DP) = 2160 Pa (45 psf)
Water Penetration Resistance Test Pressure = 360 Pa (7.50 psf)
Canadian Air Infiltration/Exfiltration = Fixed
Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09

¹¹ For information about reporting Mullion Assembly performance, see Annex A of this document.

Example: Label Option 3—Single Label Reporting Individual Component Ratings

A single label reports the performance of each unique Individual Unit and each unique Mullion Assembly. The Overall Rating is the lowest Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level of the individual components within the Combination Assembly. Use of the Overall Rating is optional.

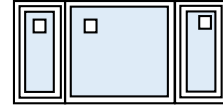
<p>Competent Windows Builder Line 4000</p> <p>Casement Picture Casement</p> <p>Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09</p>
<p>OVERALL RATING</p> <p>Class R – PG30 – Size Tested 2750 x 1525 mm (108 x 60 in)</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2</p>
<p>Class R – PG30 – 610 x 1600 mm (24 x 63 in) – Type C</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 290 Pa (6.00 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A3</p>
<p>Class LC – PG45 – 1830 x 1830 mm (72 x 72 in) – Type FW</p> <p>Positive Design Pressure (DP) = 2400 Pa (50 psf)</p> <p>Negative Design Pressure (DP) = 2160 Pa (45 psf)</p> <p>Water Penetration Resistance Test Pressure = 360 Pa (7.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = Fixed</p>
<p>Class LC – PG30 – MA Span 1830 x 1220 mm (72 x 48 in.) Trib Wd</p> <p>Positive Design Pressure (DP) = 2160 Pa (45 psf)</p> <p>Negative Design Pressure (DP) = 2160 Pa (45 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2</p>



Example: Label Option 4—Separate Product Performance Labels that Include Overall Product Performance

Each Unit has an individual label that reports both its individual product rating as well as the Overall Rating. The Overall Rating is the lowest Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level of the Individual Unit or Mullion Assembly within the Combination Assembly.

<p>Competent Windows Builder Line 4000</p> <p>Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09</p>
<p>Class R – PG30 – 610 x 1600 mm (24 x 63 in) – Type C</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 290 Pa (6.00 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A3</p>
<p>OVERALL RATING</p> <p>Class R – PG30 – Size Tested 2750 x 1525 mm (108 x 60 in)</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2</p>



<p>Competent Windows Builder Line 4000</p> <p>Conforms to AAMA/WDMA/CSA 101/I.S.2/A440-08 and A440S1-09</p>
<p>Class LC – PG45 – 1830 x 1830 mm (72 x 72 in) – Type FW</p> <p>Positive Design Pressure (DP) = 2400 Pa (50 psf)</p> <p>Negative Design Pressure (DP) = 2160 Pa (45 psf)</p> <p>Water Penetration Resistance Test Pressure = 360 Pa (7.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = Fixed</p>
<p>OVERALL RATING</p> <p>Class R – PG30 – Size Tested 2750 x 1525 mm (108 x 60 in)</p> <p>Positive Design Pressure (DP) = 1680 Pa (35 psf)</p> <p>Negative Design Pressure (DP) = 1440 Pa (30 psf)</p> <p>Water Penetration Resistance Test Pressure = 220 Pa (4.50 psf)</p> <p>Canadian Air Infiltration/Exfiltration = A2</p>

Annex A: Combination Assembly Product Ratings

The NAFS-08 standard allows mullion ratings for Combination Assembly products to be determined by either testing the products as Combination Assemblies, or by testing as individual units, with mullion performance tested separately or calculated using AAMA 450.

The purpose of AAMA 450 is to determine air, water and structural performance ratings for Mullion Assemblies to facilitate the determination of NAFS Performance Grades for multiple-lite and multiple-operator products assembled from individual fenestration products. It requires the preparation of a detailed engineering report that identifies the various fenestration assemblies that can be qualified with mullion performance ratings for one or more mullion types used by a manufacturer. It also allows grouping of operator types and mullion types to reduce the amount of physical testing. The report documents the performance of mullions at various spans and tributary widths, and serves as the basis for labeling mullion performance. According to AAMA 450, the report must be prepared by a licensed professional engineer.

While AAMA 450 requires the air and water tightness of the Mullion Assembly joints to be determined by physical testing of these properties, it allows the structural performance of mullions to be determined in one of three different ways:

Option 1 – by physical testing of the total mullion assembly

Option 2 – by testing a mullion element as an individual component

Option 3 – by rating the mullion element by structural calculation

AAMA Technical Interpretation TI-08-01 clarifies that AAMA 450-06 can be used to rate mullions used to assemble bay, bow, and other 3-dimensional projecting units.

A1 Application of AAMA 450 to Fenestration Products Sold in Canada

The application of AAMA 450 in Canada must take account of the need to both test and report mullion performance attributes in a way that allows them to be rated with Canadian air infiltration/exfiltration levels¹², positive and negative design pressures, and water penetration resistance test pressure, using Canadian optional performance grades.

Mullions intended for use with R, LC, CW and AW products must also meet the appropriate Class-specific attributes in NAFS-08 (See Table 2 – Class-specific mullion attributes, below). These attributes must be part of the test record and must be documented in the AAMA 450 report in a way that ensures Class-specific properties are not overlooked when a manufacturer wishes to qualify a mullion type for use with products of more than one Performance Class.

In manufacturing environments where mullions are labeled individually before products are mullioned, the NAFS performance rating labels must contain information related to both the Primary Designator

¹² In Canada, NAFS air leakage is not a simple pass/fail test as in the US. There are two air/infiltration/exfiltration levels for operable products (A2 and A3), and a single level for all classes of fixed glazing (Fixed). The tested mullion air infiltration/exfiltration therefore needs to be recorded and labeled

attributes (Performance Class, Performance Grade, “size tested” — span and tributary area width), as well as secondary designator attributes.

Table 2 – Class-specific mullion attributes

Attribute	NAFS-08 Reference	Performance Class			
		R	LC	CW	AW
Test pressure for air infiltration/exfiltration testing	Clause 5.3.2.2	75 Pa (1.6 psf)			300 Pa (6.2 psf)
Minimum water penetration resistance test pressure	Clause 5.3.3.2	15% DP			20% DP
Water penetration resistance test method	Clause 5.3.3.2	ASTM E 547			ASTM E 547 and E 331
Tested uniform load deflection at design pressure ¹³	Clause 5.3.4.2	Report Only		L/175	
Tested permanent deformation at structural test pressure ¹⁴	Clause 5.3.4.3	0.4%		0.3%	0.2%

A2 Reporting Mullion Assembly Performance in Canada

With respect to the performance of individual mullion assemblies, AAMA 450 reports must identify:

- The Performance Classes and Grades for the rated mullions at the spans and tributary widths to which they apply
- The tested or calculated Positive and Negative Design Pressures for the mullions at the spans and tributary widths to which they apply
- The Water Penetration Resistance Test Pressure in Pascals at the spans for which the mullions are qualified
- The Canadian Air Infiltration/Exfiltration Level at the spans for which the mullions are qualified

On the basis of these properties individual Mullion Assembly ratings must be reported using both primary and secondary designators:

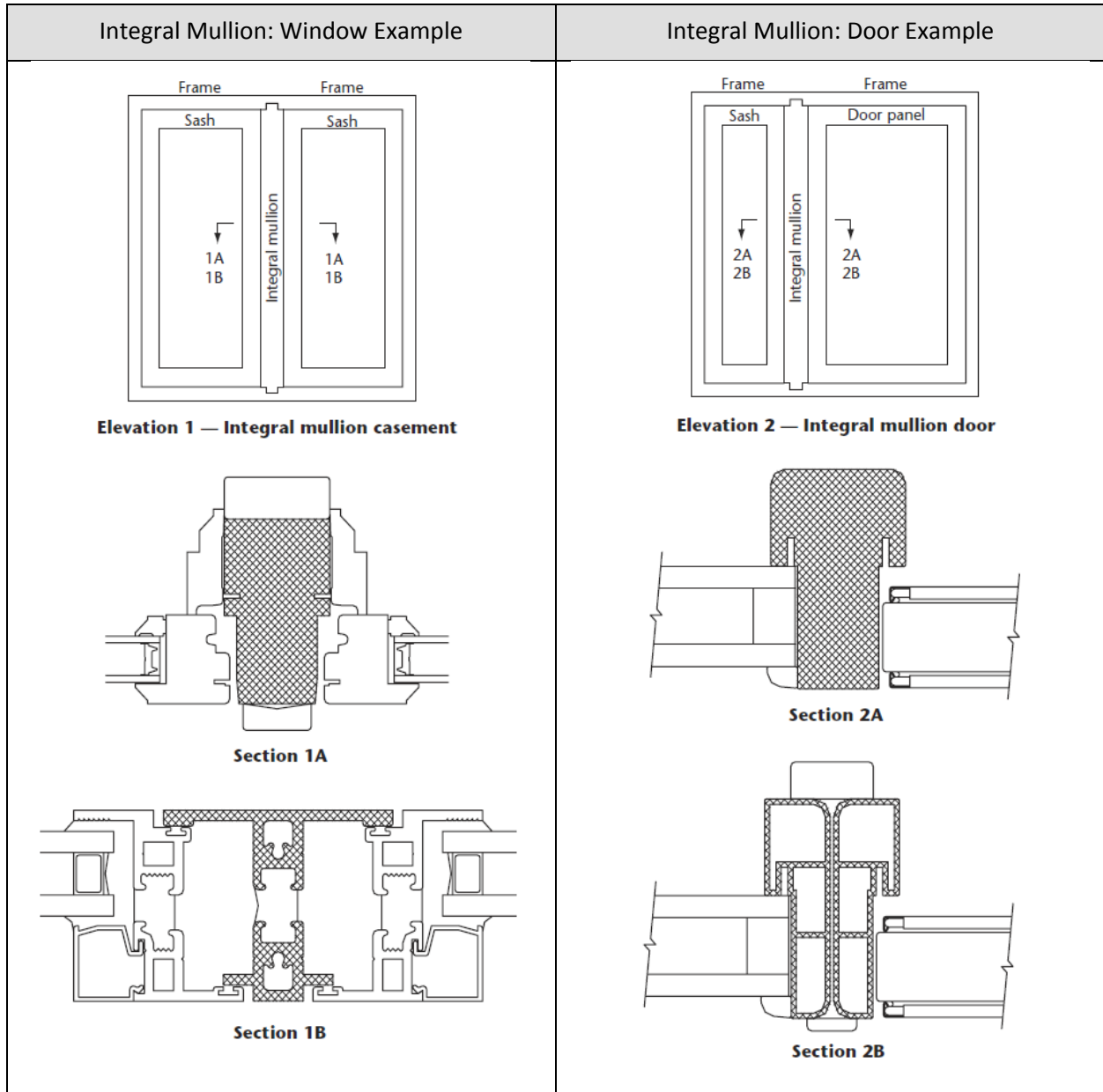
Primary Designator	Performance Class — Performance Grade — MA span x tributary width
Secondary Designator	Positive/Negative Design Pressure in Pascals Water Penetration Resistance Test Pressure in Pascals Canadian Air Infiltration/Exfiltration Level

¹³ If mullion is rated using AAMA 450 Option 1.

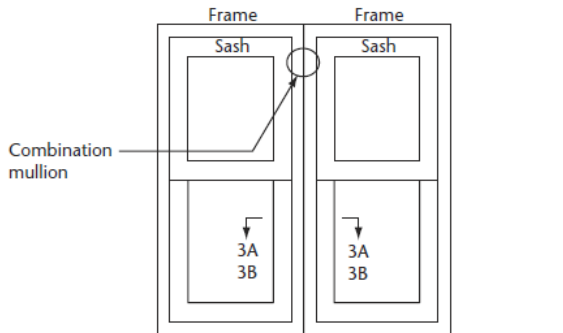
¹⁴ If mullion is rated using AAMA 450 Option 1.

Annex B: NAFS Mullion Types Illustrated

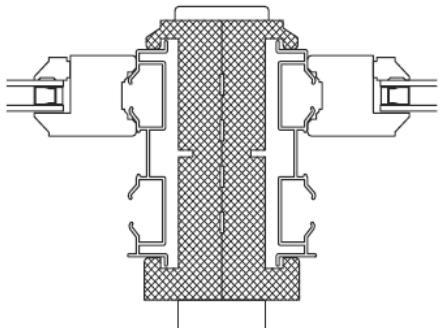
The NAFS-08 standard illustrates typical integral, combination, and reinforcing mullions in Figure 25. These illustrations are reproduced here to assist users of this document who may not have access to the NAFS-08 standard.



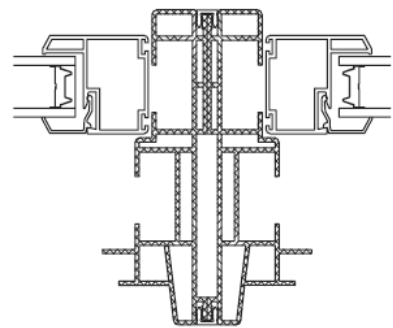
Combination Mullion Example



Elevation 3 — Combination mullion hung window

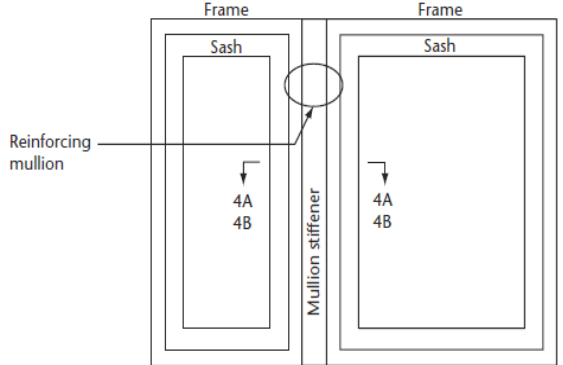


Section 3A

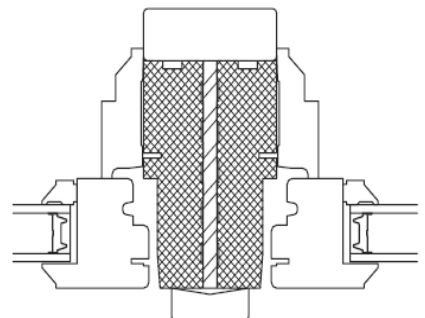


Section 3B

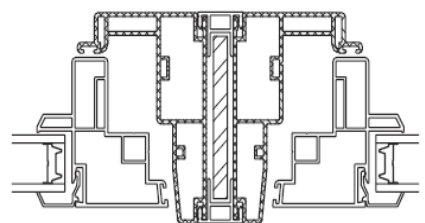
Reinforcing Mullion Example



Elevation 4 — Reinforcing mullion casement & fixed



Section 4A



Section 4B