

## CHAPTER 20 ALUMINUM

### SECTION 2001 GENERAL

#### 2001.1 Scope.

This chapter shall govern the quality, design, fabrication and erection of aluminum. The quality, design, fabrication and erection of aluminum used structurally in buildings or structures shall conform to good engineering practice, the provisions of this chapter and other applicable requirements of this code.

**Exception:** Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2002.7 and 2003.

### SECTION 2002 MATERIALS

#### 2002.1 General.

Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM 1. The *nominal loads* shall be the minimum design loads required by Chapter 16. The use of aluminum alloys not listed in the manual shall be permitted provided their standard of performance is not less than those required in the manual and the performance is substantiated to the satisfaction of the building official.

#### 2002.2 Definitions.

**PRIMARY MEMBER.** Structural framing members providing structural support to other members and/or surfaces of a structure including, but not limited to beams, posts, columns, joists, structural gutters, headers, eave rail, purlins, roof brace.

**SECONDARY MEMBERS.** Structural framing members which do not provide basic support for the entire structure, generally including, but not limited to, such members as kickplate rails, chair rails, roof or wall panels, wall brace.

**STRUCTURAL MEMBERS.** Members or sections that provide support to an assembly and/or resist applied loads.

#### 2002.3 Screen enclosures.

##### 2002.3.1

Actual wall thickness of extruded aluminum members shall be not less than 0.040 inch (1 mm).

**2002.3.2** Reserved.

**2002.3.3**

Vinyl and acrylic panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall essentially state “Removable panel SHALL be removed when wind speeds exceed 75 mph (34 m/s).” Decals shall be placed such that the decal is visible when the panel is installed.

**2002.4 Loads.**

Structural members supporting screened enclosures shall be designed for wind in both of two orthogonal directions using the pressures given in Table 2002.4. Each primary member shall also be designed for a 300 pound (1.33 kN) load applied vertically downward along any 1 foot (305 mm) of any member, not occurring simultaneously with wind load.

**Exception:** In addition to wind pressures, purlins shall also be designed for a 200 pound (0.89 kN) load applied vertically downward along any 1 foot (305 mm) of any member, not occurring simultaneously with wind load.

**TABLE 2002.4 DESIGN WIND PRESSURES SCREENED ENCLOSURES<sup>a, b, f, g,</sup>  
<sup>h</sup> (STRENGTH DESIGN OR LRFD ONLY)**

Surface	ULTIMATE DESIGN WIND SPEED $V_{ULT}$ (MPH)																				
	110			120			130			140			150			160			170		
	Design Pressures by Exposure Category (psf)																				
	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D
Horizontal Pressures on Windward Surfaces <sup>d</sup>	17	24	28	20	28	33	23	32	38	27	38	44	31	43	51	36	49	58	40	56	66
Horizontal Pressures on Leeward Surfaces <sup>d</sup>	13	18	21	15	22	26	20	26	31	21	29	34	22	34	40	25	39	46	29	44	52
Vertical Pressures on Screen Surfaces <sup>c</sup>	4	7	8	6	8	9	6	9	11	8	11	12	9	12	14	10	14	16	11	15	18
Vertical Pressures on Solid Surfaces <sup>e</sup>	14	19	23	17	23	27	20	27	32	23	32	37	25	36	42	29	41	48	33	46	54

For SI: 1 pound per square foot = 9.479 kN/m<sup>2</sup>.

**NOTES:**

- a. Pressures apply to enclosures with a mean enclosure roof height of 30 feet (10 m). For other heights, multiply the pressures in this table by the factors in Table 2002.4A.
- b. Apply horizontal pressures to the area of the enclosure projected on a vertical plane normal to the assumed wind direction, simultaneously inward on the windward side and outward on the leeward side.
- c. Apply vertical pressures upward or downward to the area of the enclosure projected on a horizontal plane.
- d. Apply horizontal pressures simultaneously with vertical pressures.

- e. Table pressures are MWFRS Loads. The design of solid roof panels and their attachments shall be based on component and cladding loads for enclosed or partially enclosed structures as appropriate.
- f. Table pressures apply to 20 × 20 × 0.013” mesh screen. For 18 × 14 × 0.013” mesh screen, pressures on screen surfaces may be multiplied by 0.88. For screen densities greater than 20 × 20 × 0.013”, use pressures for enclosed buildings.
- g. Table pressures may be interpolated using ASCE 7 methodology.
- h. For allowable stress design (ASD) pressures shall be permitted to be multiplied by 0.6.

**TABLE 2002.4A HEIGHT ADJUSTMENT FACTORS**

MEAN ROOF HEIGHT	EXPOSURE		
	B	C	D
0-15	1	0.86	0.89
20	1	0.92	0.93
25	1	0.96	0.97
30	1	1	1
35	1.05	1.03	1.03
40	1.09	1.06	1.05
45	1.12	1.09	1.07
50	1.16	1.11	1.09
55	1.19	1.14	1.11
60	1.22	1.16	1.13

**2002.4.1 Design guide.**

The following design guides shall be accepted as conforming to accepted engineering practices:

*AAF Guide to Aluminum Construction in High Wind Areas.*

**2002.5 Wall panels.**

The minimum thickness for formed sheet aluminum structural wall panels shall be not less than 0.024 inch (0.6 mm), subject to approved tolerances.

**2002.6 Sunroom design.**

**2002.6.1**

Sunrooms shall comply with AAMA/NPEA/NSA 2100.

**2002.6.2**

For the purpose of applying the criteria of the AAMA/NPEA/NSA 2100, sunrooms shall be categorized in one of the following categories by the permit applicant, design professional or the property owner where the sunroom is being constructed.

**Category I:** A thermally isolated sunroom with walls that are either open or enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is defined as a nonhabitable, nonconditioned sunroom.

**Category II:** A thermally isolated sunroom with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The space is defined as a nonhabitable, nonconditioned sunroom.

**Category III:** A thermally isolated sunroom with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The sunroom fenestration complies with additional requirements for air infiltration resistance and water penetration resistance. The space is defined as a nonhabitable, nonconditioned sunroom.

**Category IV:** A thermally isolated sunroom with enclosed walls. The sunroom is designed to be heated and or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom fenestration complies with additional requirements for air infiltration resistance, water penetration resistance, and thermal performance. The space is defined as a nonhabitable and conditioned sunroom.

**Category V:** A sunroom with enclosed walls. The sunroom is designed to be heated and or cooled and is open to the main structure. The sunroom fenestration complies with additional requirements for air infiltration resistance, water penetration resistance, and thermal performance. The space is defined as a habitable and conditioned sunroom.

#### **2002.7 Alternative design method for screen enclosure.**

(1) The purpose of this section is to provide an alternate method for designing aluminum screen enclosures as defined by the *Florida Building Code*, permitting the loads of the structural frame to be based on portions of the screen in the screen walls removed, retracted, moved to the open position, or cut. The use of framing materials other than aluminum is allowed in accordance with Section 104.11 The method applies only to walls and roofs with 100-percent screen.

(a) Screen enclosure frames designed in accordance with the screen removal alternates of this section, shall be designed using signed and sealed site-specific engineering and shall be designed in accordance with the wind load provisions of Section 1609.1.1.

(b) Designs that consider these screen alternates shall comply with Section 2002.4 and Table 2002.4, using the 110 mph (49.17 m/s) column as modified by Table 2002.4A with all screen panels in place.

(c) Designs using strength design or load and resistance factor design in accordance with Section 1605.2 or allowable stress design methods of Section 1605.3.1 shall be permitted.

(d) The design shall be by rational analysis or by 3D finite element analysis. Either method will be acceptable.

(2) Where screen enclosures are designed in accordance with the screen removal alternates of this section, removable screen may consist of removable panels, retractable panels, or by designating specific screen panels in the design in which the screen is to be removed by cutting the screen. Removable panels shall be removed, retractable panels shall be placed in the retracted position without increasing the load on the affected area. Screen designated in the design to be cut shall be completely cut when wind speeds are forecast to exceed 75 mph (33.5 m/s).

(3) Where screen enclosures designed in accordance with the screen removal alternates of this section serve as the barrier required by Section 454.2.17 the required minimum height of the barrier shall be maintained when screen panels are retracted, removed, moved to the open position or cut.

(4) Where screen enclosures are designed in accordance with the screen removal alternates of this section, retractable screen panels, removable screen panels, and screen panels identified to be cut shall be clearly identified on adjacent structural members with highly visible permanent labels, at each panel, or by other means approved by the local building department.

(5) Where screen enclosures are designed in accordance with the screen removal alternates of this section, the retraction of screen panels, removal of screen panels, or cutting of screen panels shall not require the use of ladders or scaffolding.

(6) Engineering documents submitted with building permit applications shall identify the panels to be removed, retracted, opened or cut.

(7) Where screen enclosures are designed in accordance with the screen removal alternates of this section, based on removing screen panels by cutting the screen, the contractor shall provide replacement screen for a one-time replacement of all screen and spline designated by the design to be cut.

(8) Where screen enclosures are designed in accordance with the screen removal alternates of this section, the contractor shall provide written notice to the owner and the local building code enforcement department that the owner must retract, remove, or cut a panel or panels of the screen enclosure in accordance with the project engineering design

or the manufacturer's instructions when wind speeds are expected to exceed 75 mph (33.5 m/s).

## **SECTION 2003 HIGH-VELOCITY HURRICANE ZONES—ALUMINUM**

### **2003.1 Design.**

Aluminum members shall be designed by methods admitting of rational analysis according to established principles of mechanics.

### **2003.2 Standards.**

The design, fabrication, and erection of structural aluminum shall conform to the *Aluminum Design Manual*.

### **2003.3 Workmanship.**

Aluminum construction shall be in conformance with the tolerances, quality and methods of construction as set forth in Section 2003.2 and the *American Welding Society's Structural Welding Code-Aluminum* (D1.2).

### **2003.4 Definitions.**

Reserved.

### **2003.5 Identification.**

Reserved.

### **2003.6 Allowable unit stresses.**

#### **2003.6.1**

The design, fabrication and assembly of aluminum members for building and other structures shall conform to the standard set forth in Section 2003.2 and as otherwise set forth herein.

#### **2003.6.2 Reserved.**

#### **2003.6.3**

Aluminum members shall be limited by the deflections set forth in Section 1616.3.

### **2003.7**

The building official may require that any structure using aluminum primary or secondary members be designed by a Florida-registered professional engineer.

#### **2003.7.1 Reserved.**

### **2003.7.2**

In addition to flexural and shearing stresses, the critical factors of buckling, fatigue, stress raisers such as notches or holes or shape reentrant corners, deflection and connections shall be considered and provided for by proper design.

### **2003.7.3**

All solid roof systems shall be designed for a minimum 30 psf (1436 Pa) live load.

### **2003.7.4**

All buildings and structures shall be designed to resist uplift. In the case of placement on existing slabs and foundations, sufficient information and calculations shall be provided by the professional engineer and/or architect to verify the ability of the slab or foundation to resist uplift loads.

### **2003.7.5**

All connection devices shall be rated by load testing by an approved testing laboratory.

#### **2003.7.5.1**

All expansion anchors shall not be installed less than 3 inches (76 mm) from the edge of concrete slab and/or footings. All expansion anchors shall develop an ultimate withdrawal resisting force equal to four times the imposed load, with no stress increase for duration of load.

## **2003.8 Fabrication and construction details.**

### **2003.8.1 Connections.**

Aluminum members shall be designed as set forth in the standards in Section 2003.2.

#### **2003.8.1.1 Fasteners.**

Bolts and other fasteners shall be aluminum, stainless steel, hot-dip or electro-galvanized steel. Double cadmium plated steel bolts may also be used.

#### **2003.8.1.2 Painting.**

Reserved.

#### **2003.8.1.3 Welding.**

Aluminum parts shall be welded with an inert-gas-shielded arc or resistance welding process. No welding process that requires a welding flux shall be used. Filler alloys complying with the requirements of the standard in this chapter shall be used.

#### **2003.8.1.4 Welder qualifications.**

All welding of structural aluminum member shall be performed by certified welders.

#### **2003.8.1.5 Erection.**

During erection, structural aluminum shall be adequately braced and fastened to resist dead, wind and erection loads.

### **2003.8.2 Structural aluminum decking and siding.**

#### **2003.8.2.1**

Aluminum sections spanning between supports shall be limited in span to satisfactorily support the positive and negative loads set forth in Chapter 16 (High-Velocity Hurricane Zones). The deflection of decking shall not exceed that set forth in Section 1616.

#### **2003.8.2.2**

Aluminum sheet used for roof decking or siding shall be not less than 0.032 inch (0.8 mm) in thickness.

#### **2003.8.2.3**

Aluminum sheets shall be secured to the supports to adequately resist positive and negative loads. Attachments shall be at intervals not exceeding 8-inches (203 mm) o.c. and shall be secured to each other at side laps at intervals as required by rational analysis and/or tests, but shall not exceed 12-inches (305 mm) o.c.

#### **2003.8.2.4**

Fasteners shall have a head, and/or be provided with washers not less than  $\frac{1}{2}$  inch (13 mm) in diameter.

#### **2003.8.2.5**

Fasteners located at end laps shall be placed not more than 2 inches (51 mm) nor less than 1 inch (25 mm) from the end of overlapping sheets.

#### **2003.8.2.6**

Where roof or wall cladding is of aluminum, an approved membrane to protect against water intrusion to the interior shall be provided or the aluminum cladding shall be designed and constructed with an approved continuous edge-interlock, overlap or seam to prevent water intrusion.

### **2003.8.3 Nonstructural aluminum decking and siding.**

#### **2003.8.3.1**



Nonstructural aluminum sheets shall be backed with cladding as set forth in Chapter 23 and Chapter 24 (High-Velocity Hurricane Zones).

#### **2003.8.3.2**

Nonstructural aluminum sheets shall have a minimum thickness of 0.032 inches (0.8 mm).

#### **2003.8.3.3 Reserved.**

#### **2003.8.3.4**

Nonstructural decking and siding shall be attached as set forth in Section 2003.8.2 except that the attachment of aluminum residential siding shall be by rational analysis and/or tests using a minimum 0.120-inch (3 mm) diameter aluminum nails of sufficient length to penetrate studs a minimum of 2 inches (51 mm). Nails at wood studs shall be as required by rational analysis and/or tests, but spaced not greater than 24 inches (610 mm) o.c. horizontally and no greater than 8 inches (203 mm) o.c. vertically.

#### **2003.8.4 Dissimilar materials.**

Reserved.

#### **2003.8.5 Expansion and contraction.**

Reserved.

#### **2003.9 Sunrooms.**

##### **2003.9.1 Wind loads.**

Basic wind speed in miles per hour (mph) shall be determined in accordance with Section 1620. Sunrooms including exposed structures, components, cladding, and roof covering shall be designed to resist the wind loads as established in Section 1620.1.

##### **2003.9.2 Sunroom categories.**

Sunrooms shall be categorized in one of the following categories by the permit applicant, design professional, or the property owner where the sunroom is being constructed:

**Category I:** A roof or a covering of an outdoor space. The openings shall be permitted to be enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is defined as nonhabitable and unconditioned.

**Category II:** A roof or a covering of an outdoor space with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The space is defined as nonhabitable and unconditioned.

**Category III:** A roof or a covering of an outdoor space with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The sunroom complies with additional requirements for forced-entry resistance, air-leakage resistance and water-penetration resistance. The space is defined as nonhabitable and unconditioned.

**Category IV:** A roof or a covering of an outdoor space with enclosed walls. The sunroom is designed to be heated and/or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom complies with additional requirements for forced-entry resistance, water-penetration resistance, air-leakage resistance, and thermal performance. The space is defined as habitable and conditioned.

**Category V:** A roof or a covering of an outdoor space with enclosed walls. The sunroom is designed to be heated and/or cooled and is open to the main structure. The sunroom complies with additional requirements for forced-entry resistance, water-penetration resistance, air-leakage resistance, and thermal performance. The space is defined as habitable and conditioned.