

## Engineering Analysis of Fasteners

### 6901 A Everlast 7" with 6995 Everlast Starter Strip Composite Siding

Report L9034.04-122-34

Rendered to:

CHELSEA BUILDING PRODUCTS  
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	PROJECT: Fastener Analysis – 6901 A Everlast 7" with Starter Strip	BY: ARK    DATE: 03/26/2021
	PROJECT NO.: L9034.04-122-34	CKD: DCC    SHEET: 2 OF 8

## Scope

Architectural Testing, Inc., an Intertek company, was contracted by Chelsea Building Products to determine allowable fastener withdrawal loads for their 6901 A Everlast 7" with 6995 Everlast Starter Strip composite siding products tested in Intertek Report L9034.02-109-40 dated 03/17/2021. The tested pressures are used to calculate corresponding allowable wind loads.

The reference materials utilized in this project include the following:

*2020 Florida Building Code 7th Edition*, International Code Council, Inc., 2020.

ASTM D5206-19, *Standard Test Method for Windload Resistance of Rigid Plastic Siding*, ASTM International, 2019.

*National Design Specification for Wood Construction, NDS 2018 Edition*, American Forest & Paper Association / American Wood Council.

L9034.02-109-40 *Chelsea Building Products Windload Test Report – ASTM D5206 Windload Testing on 6901 A Everlast 7" with 6995 Everlast Starter Strip, Composite Siding*. Intertek, 03/17/2021.

The anchorage analyses presented herein do not address the water resistance, water penetration or air infiltration performance of the installation method of the installed product. In addition, the substrates are assumed to have the integrity to resist the anchor loads developed by the products.

### Analyses

#### **Allowable Wind Pressures**

The maximum sustained tested pressures are averaged for the utilized installation method, and then converted to the respective allowable design pressures as shown on page 5. The allowable design wind pressures for the assemblies are presented in the table below.

**Table 1** Allowable Design Pressures for Assemblies with Safety Factor of 1.50

<b>Assembly Description</b>	<b>Stud Spacing</b>	<b>Average Maximum Sustained Pressure</b>	<b>Allowable Design Pressure</b>
<p>1/8" Smooth Shank Diameter, 7/16" Head, 2" Long Galvanized Roofing Nails</p> <p>Spaced 16" On Center Through the Sheathing and Intermittently Into the Studs</p>	16" O.C.	-58.8 psf	-27.4 psf
<p>#10 x 2-1/2" Flat Head Screws</p> <p>Spaced 16" On Center Through the Sheathing and Intermittently Into the Studs</p>	16" O.C.	-101.7 psf	-67.8 psf

### As-Tested Installation Analysis

In order to test the product, the composite siding was secured to OSB sheathing and wood studs via two different installation methods. The as-tested withdrawal connection capacities are evaluated on page 6 through page 7 and summarized in Table 2.

**Table 2** As-Tested Anchorage Design Capacities

Test Specimens	Connection	Capacity	Comments
#1, #2, #3, #4	1/8" Smooth Shank Diameter, 7/16" Head, 2" Long Galvanized Roofing Nails through Siding into OSB Sheathing	21 lb	<ol style="list-style-type: none"> <li>1. <math>R_{max} = 30</math> lb</li> <li>2. 7/16" min penetration</li> <li>3. OSB Min G = 0.50</li> <li>4. Reduce DP to 27.4 psf</li> </ol>
#5, #6, #7	#10 x 2-1/2" Flat Head Screws through Siding into OSB Sheathing	95 lb	<ol style="list-style-type: none"> <li>1. <math>R_{max} = 52</math> lb</li> <li>2. 7/16" min penetration</li> <li>3. OSB Min G = 0.50</li> </ol>

**Note(s):**

- 1) The building substrate is assumed to have the integrity to resist the anchor loads developed by the products.
- 2) The fasteners for the purpose of analysis are conservatively assumed to not hit the stud and all withdrawal allowance is based on sheathing only.

The capacities presented in Table 2 are used to prove acceptable anchorage for the 6901 A Everlast 7" with 6995 Everlast Starter Strip product. The capacities of the connections are greater than or equal to the allowable tested wind loads, thereby validating the anchorage. Studs and anchorage should be provided at the same spacing and layout as on the tested products.

**Allowable Design Wind Pressures Adjusted with Safety Factor**

**Safety Factor:** Use a 1.5 Safety Factor on the Maximum Sustained

Specimen	Maximum Sustained Pressure	Average Maximum Sustained Pressure	Allowable Design Pressure
#1	-60.0 psf	-58.8 psf	-39.2 psf
#2	-75.0 psf		
#3	-40.0 psf		
#4	-60.0 psf		
#5	-100.0 psf	-101.7 psf	-67.8 psf
#6	-105.0 psf		
#7	-100.0 psf		

Check capacities against code allowed withdrawal capacities of fasteners

**Fastener Withdrawal Capacity – Installation #1**

$$R_{\max} = (39.2 \text{ psf})(1 \text{ ft}^2 / 144 \text{ in}^2)(6.875 \text{ in})(16 \text{ in}) = 30 \text{ lb per anchor}$$

**Smooth Shank Nail into OSB Sheathing**

1/8" Smooth Shank Diameter, 7/16" Head, 2" Long Galvanized Roofing Nails

7/16" Minimum Penetration

7/16" thick OSB Sheathing, G = 0.50

**Withdrawal of 1/8" Shank Diameter Nail**

$$W' = 1,380(G^{5/2})(D)(C_d)(C_m)(C_t)(C_{eg})(C_{tn})(L)$$

$$W' = 1,380 (0.50^{5/2})(0.125")(1.6)(1.0)(1.0)(1.00)(1.0)(0.44")$$

$$W' = 21 \text{ lb}$$

**Adjustment Factors**

Load Duration Factor - Ten Minutes,  $C_d = 1.6$

Moisture Factor - Fabrication  $\leq 19\%$  and In-Service  $\leq 19\%$ ,  $C_m = 1.0$


Temperature Factor -  $T \leq 100^\circ\text{F}$ ,  $C_t = 1.0$

End Grain Factor - No,  $C_{eg} = 1.00$

Toe Nail Factor - No,  $C_{tn} = 1.0$

**Capacity of Connection is 21 lb < 30 lb**

**Reduce Design Pressure (39.2 psf)(21 lb/30 lb) = 27.4 psf**

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**Fastener Withdrawal Capacity – Installation #2**

$$R_{max} = (67.8 \text{ psf})(1 \text{ ft}^2 / 144 \text{ in}^2)(6.875 \text{ in})(16 \text{ in}) = 52 \text{ lb per anchor}$$

**Flat Head Screw into OSB Sheathing**

#10 x 2-1/2" Flat Head Screw

7/16" Minimum Penetration

7/16" thick OSB Sheathing, G = 0.50

Withdrawal of #10 Flat Head Screw

$$W' = 2,850(G^2)(D)(Cd)(Cm)(Ct)(Ceg)(Ctn)(L)$$

$$W' = 2,850 (0.50^2)(0.190'')(1.6)(1.0)(1.0)(1.00)(1.0)(0.44'')$$

$$W' = 95 \text{ lb}$$

Adjustment Factors

- Load Duration Factor - Ten Minutes, Cd = 1.6
- Moisture Factor - Fabrication ≤ 19% and In-Service ≤ 19%, Cm = 1.0
- Temperature Factor - T ≤ 100°F, Ct = 1.0
- End Grain Factor - No, Ceg = 1.00
- Toe Nail Factor - No, Ctn = 1.0

**Capacity of Connection is 95 lb > 52 lb**

**Revision Log**

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	03/26/21	N/A	Original report issue
1	04/08/21	3, 4, 5, 6, & 7	Updated per comments