

ASCE 7 Design Wind Speed Analysis

Classic Edge and Staggered Edge Cellular PVC Siding Products

Report L5309.01-122-34

Rendered to:

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Scope


Architectural Testing, Inc., an Intertek company, was contracted by AZEK Building Products to perform ASCE 7 analyses of their siding products tested in Intertek Report L5309.01-109-40 dated 05/05/2020. The tested allowable design pressures are used to calculate corresponding wind speeds for ASCE 7-10 and ASCE 7-16.

The reference materials utilized in this project include the following:

ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2010.

ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures. American Society of Civil Engineers, 2017.

K0907.01-109-40 AZEK Building Products Windload Test Report – ASTM D5206 Windload Testing on Classic Edge, Cellular PVC Siding. Intertek, 05/05/2020.

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Assumptions

Certain assumptions have been made in determining the wind speeds reported herein.

ASCE 7-10 Ultimate Wind Speed Assumptions

- Tested Pressures are Ultimate, Wind Load Factor equal to 1.0.
- Wind Directionality Factor (K_d) equal to 0.85.
- The Building is Considered Enclosed, Internal pressure coefficient (GC_{pi}) equal to +/-0.18.
- External pressure coefficient (GC_p) equal to -1.4.
- The effects of topographic features have not been considered, Topographic Factor (K_{zt}) equal to 1.0.
- Ultimate Test Pressures listed in Intertek Reports are divided by a Safety Factor of 1.5.
- The wind speed has been limited to 210 mph.
- ASD wind load factor of 0.6 applied per ASCE 7-10.

ASCE 7-16 Ultimate Wind Speed Assumptions

- Tested Pressures are Ultimate, Wind Load Factor equal to 1.0.
- Wind Directionality Factor (K_d) equal to 0.85.
- The Building is Considered Enclosed, Internal pressure coefficient (GC_{pi}) equal to +/-0.18.
- External pressure coefficient (GC_p) equal to -1.4.
- The effects of topographic features have not been considered, Topographic Factor (K_{zt}) equal to 1.0.
- Ultimate Test Pressures listed in Intertek Reports are divided by a Safety Factor of 1.5.
- Ground Elevation Factor (K_e) equal to 1.0
- The wind speed has been limited to 210 mph.
- ASD wind load factor of 0.6 applied per ASCE 7-16.

Analyses

Assemblies Ultimate Wind Speeds per ASCE 7-10/7-16

The Ultimate Wind Speeds are converted to the respective ASD Design Pressures per ASCE 7-10 and ASCE 7-16 as shown on page 6. The ASD Allowable Design Wind Pressures for the new assemblies are presented in the table below.

Table 1 ASD Design Pressures for Assemblies with Safety Factor

Assembly Description	Minimum Penetration	Stud Spacing	Ultimate Test Pressure (psf)	ASD ASCE 7-10 or ASCE 7-16 Design Pressure (psf)
One (1) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nail into 2x4 SPF Wood	1-1/4"	16"	-166.7	-66.7
Two (2) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nails into 2x4 SPF Wood	1-1/4"	16"	-222.5	-89.0

Calculations for the Ultimate Wind Speeds per ASCE 7-10 and ASCE 7-16 for the new assemblies are presented on page 7 through page 8. The resulting wind speeds are included in Table 2 which can be found on page 5.

Table 2 ASCE 7 Wind Speeds for Cellular PVC Siding – Nails with 1-1/4" Penetration

Assembly Description	Building Height (ft)	ASCE 7-10 or ASCE 7-16 Ultimate Wind Speed (mph)		
		Exp B	Exp C	Exp D
One (1) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nail to 2x4 SPF Wood Stud spaced at 16" on Center	15	210	195	177
	20	210	189	173
	25	210	185	169
	30	210	181	167
	40	206	176	163
	50	200	172	160
	60	195	169	157
Two (2) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nails to 2x4 SPF Wood Stud spaced at 16" on Center	15	210	210	205
	20	210	210	200
	25	210	210	196
	30	210	210	193
	40	210	203	188
	50	210	199	184
	60	210	195	181



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ASCE 7-10 or ASCE -16 Design Wind Pressures for Siding Adjusted with Safety Factor

Safety Factor: 1.5
ASD Wind Load Factor: 0.6

Ultimate Pressure	ASD Design Pressure
-166.7 psf	-66.7 psf
-222.5 psf	-89.0 psf

One (1) Nail to Stud Spaced at 16" O.C. – 1-1/4" Penetration – ASCE 7-10/7-16 Ultimate Wind Speeds

(Assume $K_e = 1.0$ for ASCE 7-16)

Design Wind Pressures for Components and Cladding

ASCE 7-10 and ASCE 7-16 for Ground Elevation Factor, $K_e = 1.0$

For Buildings ≤ 60 ft tall

Manufacturer AZEK Building Products

Assembly One (1) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nail to 2x4 SPF Wood Stud spaced at 16" on Center with 1-1/4" Penetration

Date: 10/27/20

Design Pressure	-66.7 psf
Component Area	1.0 ft ²
Tested Pressure Type:	ASD
Wind Load Factor:	0.6
Building Roof Slope (θ):	45.0 degrees
External Pressure Coefficient (GC_p):	-1.40 Based on Zone 5 Corner Pressures
Topographic Factor (K_{zt}):	1.00
Wind Directionality Factor (K_d):	0.85
Enclosure Classification:	Enclosed
Internal Pressure Coefficient (GC_{pi}):	0.18

Assembly	Design Pressure	Building Roof Height (z):	Exposure B		Exposure C		Exposure D	
			Exposure Coeff (K_r):	Wind Speed	Exposure Coeff (K_r):	Wind Speed	Exposure Coeff (K_r):	Wind Speed
One (1) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nail to 2x4 SPF Wood Stud spaced at 16" on Center with 1-1/4" Penetration	-66.7 psf	15'	0.70	210 mph	0.85	195 mph	1.03	177 mph
	-66.7 psf	20'	0.70	210 mph	0.90	189 mph	1.08	173 mph
	-66.7 psf	25'	0.70	210 mph	0.95	185 mph	1.13	169 mph
	-66.7 psf	30'	0.70	210 mph	0.98	181 mph	1.16	167 mph
	-66.7 psf	40'	0.76	206 mph	1.04	176 mph	1.22	163 mph
	-66.7 psf	50'	0.81	200 mph	1.09	172 mph	1.27	160 mph
	-66.7 psf	60'	0.85	195 mph	1.14	169 mph	1.31	157 mph

Two (2) Nails to Stud Spaced at 16" O.C. – 1-1/4" Penetration – ASCE 7-10/7-16 Ultimate Wind Speeds

(Assume $K_e = 1.0$ for ASCE 7-16)

Design Wind Pressures for Components and Cladding

ASCE 7-10 and ASCE 7-16 for Ground Elevation Factor, $K_e = 1.0$

For Buildings ≤ 60 ft tall

Manufacturer AZEK Building Products

Assembly Two (2) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nails to 2x4 SPF Wood Stud spaced at 16" on Center with 1-1/4" Penetration

Date: 10/27/20

Design Pressure	-89.0 psf
Component Area	1.0 ft ²
Tested Pressure Type:	ASD
Wind Load Factor:	0.6
Building Roof Slope (θ):	45.0 degrees
External Pressure Coefficient (GC_p):	-1.40 Based on Zone 5 Corner Pressures
Topographic Factor (K_{zt}):	1.00
Wind Directionality Factor (K_d):	0.85
Enclosure Classification:	Enclosed
Internal Pressure Coefficient (GC_{pi}):	0.18

Assembly	Design Pressure	Building Roof Height (z):	Exposure B		Exposure C		Exposure D	
			Exposure Coeff (K_r):	Wind Speed	Exposure Coeff (K_r):	Wind Speed	Exposure Coeff (K_r):	Wind Speed
Two (2) 0.080" Shank Diameter, 0.210" Head, 1-1/2" Long Ring Shank Nails to 2x4 SPF Wood Stud spaced at 16" on Center with 1-1/4" Penetration	-89.0 psf	15'	0.70	210 mph	0.85	210 mph	1.03	205 mph
	-89.0 psf	20'	0.70	210 mph	0.90	210 mph	1.08	200 mph
	-89.0 psf	25'	0.70	210 mph	0.95	210 mph	1.13	196 mph
	-89.0 psf	30'	0.70	210 mph	0.98	210 mph	1.16	193 mph
	-89.0 psf	40'	0.76	210 mph	1.04	203 mph	1.22	188 mph
	-89.0 psf	50'	0.81	210 mph	1.09	199 mph	1.27	184 mph
	-89.0 psf	60'	0.85	210 mph	1.14	195 mph	1.31	181 mph



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Revision Log

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0	10/29/20	N/A	Original report issue