

Wall Panel System's Z-Clip connection is comprised of extruded aluminum alloy rails, alloy clips and steel fasteners that collectively allow a simplified, patterned installation and a connection that binds in place the decorative wall panel assembly to the partition wall backing. The system is locked in place with edge rails that bind the assembly to the backing.

Various extruded aluminum alloy edge rails, midwall clip rails, and trim pieces fit together to the aluminum alloy Panel Clips with sloped, lapped, tightly fitting edges in a tongue and groove configuration. The flat rail and clip edges fit against the wall backing and the panel material. The sloped, lapped clips and rails form the connection with the flat parallel planes created by the walls and panels.

Aluminum alloy horizontal panel joint rails enhance the Z-Clip design by pairing fitted connection slots on either end of the horizontal joint rail that each receives a Panel Clip in a "tongue and groove" configuration. Aluminum alloy panel clips, edge rails and midwall clip rails have paired screw fasteners at each connection location that fasten the finished wall panels to each clip, edge rails, and clip rails.

This connection system is unique as it allows uniform support and connections of various heavy panel materials in a consistent manner by varying only the size and type of fasteners appropriate to the panel material.

Z-Clip Panel Connection Spacing:

Typical wall connection spacing is given to occur at 24 inch o.c. maximum horizontally. This is the typical maximum horizontal spacing for partition wall studs in commercial applications. Vertical connections are at a 34 inch o.c. maximum spacing. (This is H/3 for an 8 foot wall height & H/4 for a 12 foot wall height). Panel assembly edges connect to wall backing at the tops, bottoms and all vertical panel edges of partition walls and openings. Panel edge connection spacing may occur at shorter intervals listed above to fit partition dimensions.

Connection calculations are based upon a typical maximum area tributary to an individual panel to backing connection based upon dimensions of the supporting backing partitions.

5.67 sq. ft. = Typical maximum tributary area per panel connection = (24 in)(34 in)/ (12 in/ft)².

Panel System Unit Dead Loads (DL) per square foot (psf) are listed below. Each system is comprised of decorative panels, alloy components, and fasteners that collectively comprise each panel assembly. For system consistency we will analyze the Z Clip connection based upon the maximum values the connection will likely support utilizing similarly sized fasteners for the various panel materials:

USE 27.2 lbs Dead Load (DL) per connection for design of screw connections for the Z clip system.

Inverted Sloping Panel applications:

Panel connections have been analyzed for inverted sloping wall applications, including ceiling applications.

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Each panel assembly consists of: Modular Panels, Extruded aluminum alloy clips or rails fastened to each panel at its vertical edges, horizontally at top panel edges, bottom panel edges, and at mid-wall locations spaced vertically at 34 inches o.c. maximum. All horizontal rails are connected at each steel stud along the partition walls.

Aluminum alloy edge rails, trim rails, horizontal joint rails, and corner rails are connected to partition wall backing with fasteners of galvanized or zinc-coated steel self-drilling, self-tapping screws manufactured under ASTM A548, conforming to AISI Standards for cold formed steel framing. Aluminum alloy panel clips and midwall clips are connected to decorative phenolic wall panels with zinc-coated steel machine screws. , typically at 24 inches o.c., maximum.

Tributary Weights - Dead Loads per connection for various Panel Assemblies:

- 22.7 lbs = 1/2 in. Phenolic Panel Assembly Tributary DL =_(5.67 sq.ft)(4.0 psf)
- 14.7 lbs = 3/8 in. Acrylic Panel Assembly Tributary DL =_(5.67 sq.ft)(2.6 psf)
- 18.7 lbs = 3/4 in. MDF Panel Assembly Tributary DL =_(5.67 sq.ft)(3.3 psf)
- 27.2 lbs = 1-1/8 in. MDF Panel Assembly Tributary DL =_(5.67 sq.ft)(4.8 psf)**
- 20.5 lbs = 1/2 in. MDF with steel sheet facing panel = (5.67 sq.ft)(3.62 lb/ sq.ft)
- 17.0 lbs = 3/4 in. Bamboo LVL Panel Assembly Tributary DL =_(5.67 sq.ft)(3.0 psf)
- 24.4 lbs = 1-1/8 in. Bamboo LVL Panel Assembly Tributary DL =_(5.67 sq.ft)(4.3 psf)
- 19.8 lbs = 1/4 in. Tempered Glass Panel Assembly Tributary DL =_(5.67 sq.ft)(3.5 psf)

LOAD SUMMARY: IBC 2009/CBC 2010

Sloping Wall Panel Assemblies - MEDIUM DENSITY FIBERBOARD (MDF) 1-1/8" Thick
Dead Loads and Seismic for all sloping configurations. (Values in pounds).
Sloped panel assemblies vary from 90° (vertical – plumb walls)
to 0° (horizontal – ceilings & soffits)

MAXIMUM APPLIED LOADS PER FASTENER (GRAVITY AND SEISMIC – COMBINED)

		#8 Self Tapping Screw		# 8 Wood Screw		#8	
Machine screw							
	Load Type	Shear	Tension	Shear	Tension	Shear	Tension
Use for							
Design of	Normal	27.2	27.2	13.6	13.6	13.6	13.6
Connections	Seismic	69.1	69.1	34.6	34.6	34.6	34.6

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IBC 2009/CBC 2010 - Allowable Stress Design (ASD), out of plane seismic force for vertical wall panel assembly attached to steel framing, per ASCE 7-05, Sec 13.3.1:

Lateral loads for out of plane seismic forces are evaluated as normal to the wall panel face, and for the vertical seismic force component in addition to gravity. Lateral analysis will be done under allowable stress design for non-structural components per IBC 2009/CBC 2010.

$a_p = 1.0$ per Table 13.5-1 $S_{DS} = 1.373$ most severe locale $W_p = 22.7$ lb Tributary DL (1/2 in. Phenolic)
 $W_w = 27.2$ Tributary DL (1-1/8 in. MDF)

$I_p = 1.0$ per Sec.13.1.3, ASCE $R_p = 2.5$ per 13.5-1 ASCE $Z_{max} = 12$ ft $h_{max} = 12$ ft

For PHENOLIC PANELS:

$$\text{Eq. 13.3-1} \quad F_p = 15.0 \text{ lbs} = \frac{(0.4)(a_p)(S_{DS})(W_p)}{(R_p / I_p)} [1 + (2)(Z/h)] = \frac{(12.5)}{(2.5)} [3]$$

$$\text{Eq. 13.3-2} \quad \text{max. } F_p = 49.9 \text{ lbs} = (1.6)(S_{DS})(W_p)(I_p)$$

$$\text{Eq. 13.3-2} \quad \text{min. } F_p = 9.4 \text{ lbs} = (0.3)(S_{DS})(W_p)(I_p)$$

Therefore, $F_p = 49.9$ lbs = PHENOLIC Maximum Horizontal Out of Plane Seismic force / connection,
perpendicular to panel face, from any direction.

$$\text{Vertical Concurrent force} = (DL) +/- [(0.2)(S_{DS})(W_p)] = (22.7 \text{ lb}) +/- [6.2 \text{ lb per connection}]$$

PHENOLIC - Vertical Concurrent (gravity + seismic) forces = 28.9 lb max, or 16.5 lb min.

For MDF PANELS:

$$\text{Eq. 13.3-1} \quad F_w = 18.0 \text{ lbs} = \frac{(0.4)(a_p)(S_{DS})(W_w)}{(R_p / I_p)} [1 + (2)(Z/h)] = \frac{(12.5)}{(2.5)} [3]$$

$$\text{Eq. 13.3-2} \quad \text{max. } F_w = 59.8 \text{ lbs} = (1.6)(S_{DS})(W_w)(I_p)$$

$$\text{Eq. 13.3-2} \quad \text{min. } F_w = 11.3 \text{ lbs} = (0.3)(S_{DS})(W_w)(I_p)$$

Therefore, $F_w = 59.8$ lbs = MDF Maximum Horizontal Out of Plane Seismic force / connection,
perpendicular to panel face, from any direction.

$$\text{Vertical Concurrent force} = (DL) +/- [(0.2)(S_{DS})(W_w)] = (27.2 \text{ lb}) +/- [7.4 \text{ lb per connection}]$$

MDF - Vertical Concurrent (gravity + seismic) forces = 34.6 lb maximum, or 19.8 lb minimum.

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CONNECTION SUMMARY

Calculated Load Capacity Between Elements

ELEMENT	PULLOUT (lbs)	SHEAR (lbs)	CLIP SHEAR (lbs)
Panel Clip (Gen 002)			320 Normal 425 Seismic
Horizontal Joint Rails (Various)			82 Normal #8 109 Seismic #8 95 Normal #10 126 Seismic #10
Midwall Clip (GEN-013)			82 Normal 109 Seismic 95 Normal #10 126 Seismic #10
Edge Trim Rails (Various) Corner Rails (Various)			164 Normal 218 Seismic

Horizontal Joint Rails
Edge Trim Rails
Midwall Clip

Normal	85	194
Seismic	113	258

Backing – 20 ga (39 mil) Cold Formed Steel Stud Wall
Wall fasteners - #8 x 1-1/2 inch self-drilling, self-tapping screw

Horizontal Joint Rails
Edge Trim Rails
Midwall Clip

Normal	99	209
Seismic	132	278

Backing – 20 ga (39 mil) Cold Formed Steel Stud Wall
Wall fasteners - # 10 x 2 inch self-drilling, self-tapping screw

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CONNECTION SUMMARY		Calculated Load Capacity Between Elements		
Typical Panel Assembly		PULLOUT	SHEAR	CLIP SHEAR
ELEMENT		(lbs)	(lbs)	(lbs)
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1-1/8 in thick MDF Panel				
	Normal	199	141	
	Seismic	265	187	
Panel fasteners – (2) #8 x 1 in wood screws				
	Normal	425	232	
	Seismic	565	308	
Panel Clip (Gen 002)				
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1/2 in thick Phenolic Composite Panel				
	Normal	225	165	
	Seismic	299	219	
Panel fastener – (2) #8 x 5/8 in machine screws				
	Normal	425	170	
	Seismic	565	226	
Panel Clip (Gen 002)				
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