



City of Long Beach  
Department of Development Services  
Building and Safety Bureau  
**Design Limitation for Wood Shear  
Walls**

Information  
Bulletin  
**BU-004**  
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The purpose of this Informational Bulletin is to alert designers of the specific modifications that the City of Long Beach, in cooperation with major jurisdictions within the Los Angeles region, has made to the 2010 California Building Code relating to the design of light-framed walls with shear panels. The lessons learned from the 1994 Northridge Earthquake have been refined with studies and tests that continued since the last code adoption cycle. The results of these studies and tests necessitate the adoption of further amendments to the structural requirement of the building code. Therefore, Sections 18.40.410 through 18.40.420 of the Long Beach Municipal Code place certain design and construction limits on structural wood panel shear walls and shear walls sheathed with other materials. These design limitation are intended to improve the quality of construction and performance of structures to assure that new buildings and additions or alterations to existing buildings are designed and constructed to resist the hazards of future earthquakes.

Sections 18.40.410 through 18.40.420 of the Long Beach Municipal Code amended the allowable shear wall values as regulated in Section 2306.3 of the 2010 California Building Code. Pertinent sections of the Long Beach Municipal Code are repeated herein as follows:

**18.40.410 CBC section 2306.3 amended – Wood structural panel shear walls.**

Table 2306.3 (2) is added to Chapter 23 of the 2010 California Building Code and Section 2306.3 and Table 2306.3 of the 2010 Edition of the California Building Code are amended to read as follows:

**2306.4.1. Wood structural panel shear walls.** Wood structural panel shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Wood structural panel shear walls are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.3(1). For structures assigned to Seismic Design Category D, E or F, the allowable shear capacities shall be set forth in Table 2306.3(2). The allowable shear capacities in Table 2306.3(1) are permitted to be increased 40 percent for wind design.

Wood structural shear panel shear walls used to resist seismic forces in structures assigned to Seismic Design Category D, E or F shall not be less than 4 feet by 8 feet (1219 mm by 2438 mm), except at boundaries and at changes in framing. Wood structural panel thickness for shear walls shall not be less than 3/8 inch thick and studs shall not be spaced at more than 16 inches on center.

The maximum allowable shear value for three-ply plywood resisting seismic forces in structures assigned to Seismic Design Category D, E or F is 200 pounds per foot (2.92 kn/m). Nails shall be placed not less than 1/2 inch (12.7 mm) in from the panel edges and not less than 3/8 inch (9.5mm) from the edge of the connecting members for shear greater than 350 pounds per foot (5.11kN/m). Nails shall be placed not less than 3/8 inch (9.5 mm) from panel

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edges and not less than 1/4 inch (6.4 mm) from the edge of the connecting members for shears of 350 pounds per foot (5.11kN/m) or less.

Wood structural panel shear walls fastened with staples shall not be used to resist seismic forces in structures assigned to Seismic Design Category D, E, or F.

Exception: Staples may be used for wood structural panel shear walls when the allowable shear values are substantiated by cyclic testing and approved by the building official.

Wood structural panel shear walls used to resist seismic forces in structures assigned to Seismic Design Category D, E or F shall be applied directly to the framing members.

**18.40.420 CBC section 2306.7 amended – Shear walls sheathed with other materials.**

Section 2306.7 of the 2010 California Building Code is amended to read as follows:

**2306.6.7 Shear walls sheathed with other materials.** Shear walls sheathed with Portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall be designed and constructed in accordance with AF & PA SDPWS. Shear walls sheathed with these materials are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.7. Shear walls sheathed with Portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall not be used to resist seismic forces in structures assigned to Seismic Design Category E or F.

Shear walls sheathed with lath, plaster or gypsum board shall not be used below the top level in a multi-level building for structures assigned to Seismic Design Category D.

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**TABLE 2306.3 (1)**  
**ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH**  
**FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b, h, i, j, l, m, n</sup>**

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING				PANELS APPLIED OVER 1/2" OR 5/8" GYPSUM SHEATHING <sup>m</sup>					
			NAIL (common or galvanized box) or staple size <sup>k</sup>	Fastener spacing at panel edges (inches)				NAIL (common or galvanized box) or staple size <sup>k</sup>	Fastener spacing at panel edges (inches)			
				6	4	3	2 <sup>e</sup>		6	4	3	2 <sup>e</sup>
Structural I Sheathing	3/8	1-3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	230 <sup>d</sup>	360 <sup>d</sup>	460 <sup>d</sup>	610 <sup>d</sup>	10d (3"x0.148" common, 3"x0.128" galvanized box)	280	430	550 <sup>f</sup>	730
		1	1 1/2 16 Gage	155	235	315	400	2 16 Gage	155	235	310	400
	7/16	1-3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	255 <sup>d</sup>	395 <sup>d</sup>	505 <sup>d</sup>	670 <sup>d</sup>	10d (3"x0.148" common, 3"x0.128" galvanized box)	280	430	550 <sup>f</sup>	730
		1	1 1/2 16 Gage	170	260	345	440	2 16 Gage	155	235	310	400
	15/32	1-3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	280	430	550	730	10d (3"x0.148" common, 3"x0.128" galvanized box)	280	430	550 <sup>f</sup>	730
		1	1 1/2 16 Gage	185	280	375	475	2 16 Gage	155	235	300	400
	1-1/2	10d (3"x0.148" common, 3"x0.128" galvanized box)	340	510	665 <sup>f</sup>	870	-	-	-	-	-	
Sheathing, plywood siding <sup>g</sup> except Group 5 Species	5/16 <sup>c</sup> or 1/4 <sup>c</sup>	1-1/4	6d (2"x0.113" common, 2"x0.099" galvanized box)	180	270	350	450	8d (2 1/2"x0.131" common, 2 1/2" x 0.113" galvanized box)	180	270	350	450
		1	1 1/1 16 Gage	145	220	295	375	2 16 Gage	110	165	220	285
	3/8	1-1/4	6d (2" x 0.113" common, 2" x 0.099" galvanized box)	200	300	390	510	8d (2 1/2"x0.131" common, 2 1/2" x 0.113" galvanized box)	200	300	390	510
		1 3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	220 <sup>d</sup>	320 <sup>d</sup>	410 <sup>d</sup>	530 <sup>d</sup>	10d (3"x0.148" common, 3"x0.128" galvanized box)	260	380	490 <sup>f</sup>	640
		1	1 1/2 16 Gage	140	210	280	360	2 16 Gage	140	210	280	360
	7/16	1-3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	240 <sup>d</sup>	350 <sup>d</sup>	450 <sup>d</sup>	585 <sup>d</sup>	10d (3"x0.148" common, 3"x0.128" galvanized box)	260	380	490 <sup>f</sup>	640
		1	1 1/2 16 Gage	155	230	310	395	2 16 Gage	140	210	280	360
	15/32	1-3/8	8d (2 1/2"x0.131" common, 2 1/2"x0.113" galvanized box)	260	380	490	640	10d (3"x0.148" common, 3"x0.128" galvanized box)	260	380	490 <sup>f</sup>	640
		1-1/2	10d (3"x0.148" common, 3"x0.128" galvanized box)	310	460	600 <sup>f</sup>	770	-	-	-	-	
		1	1 1/2 16 Gage	170	255	335	430	2 16 Gage	140	210	280	360
	19/32	1-1/2	10d (3"x0.148" common, 3"x0.128" galvanized box)	340	510	665 <sup>f</sup>	870	-	-	-	-	
		1	1 3/4 16 Gage	185	280	375	475	-	-	-	-	
	5/16 <sup>c</sup>	1-1/4	6d (2"x0.099")	140	210	275	360	8d (2 1/2"x0.113")	140	210	275	360
	3/8 <sup>c</sup>	1-3/8	8d (2 1/2"x0.113")	160	240	310	410	10d (3"x0.128")	160	240	310 <sup>f</sup>	410

For SI: 1 inch = 25.4 mm, 1 foot = 25.4 mm, 1 pound per foot = 14.5939 N/m.

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- a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor =  $[1 - (0.5 \cdot SG)]$ , where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.
- b. Panel edges backed with 2-inch nominal or thicker framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for 3/8-inch and 7/16-inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.
- c. 3/8-inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied direct to framing as exterior siding. For grooved panel siding, the nominal panel thickness is the thickness of the panel measured at the point of nailing.
- d. Allowable shear values are permitted to be increased to values shown for 15/32-inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.
- e. Framing at adjoining panel edges shall be 3 inches nominal or thicker, and nails shall be staggered where nails are spaced 2 inches on center.
- f. Framing at adjoining panel edges shall be 3 inches nominal or thicker, and nails shall be staggered where both of the following conditions are met: (1) 10d (3"x0.148") nails having penetration into framing of more than 1-1/2 inches and (2) nails are spaced 3 inches on center.
- g. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.
- h. Where panels applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3-inch nominal or thicker at adjoining panel edges and nails on each side shall be staggered.
- i. In Seismic Design Category D, E or F, where shear design values exceed 350 pounds per linear foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch nominal member, or two 2-inch nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered at all panel edges. See Section 4.3.6.4.3 of AF&PA SDPWS for sill plate size and anchorage requirements.
- j. Galvanized nails shall be hot dipped or tumbled.
- k. Staples shall have a minimum crown width of 7/16 inch and shall be installed with their crowns parallel to the long dimension of the framing members.
- l. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.
- m. **[DSA-SS, DSA/SS-CC and OSHPD 1, 2 & 4]** Refer to Section 2305.1.3, which requires any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic-force-resisting system to be applied directly to framing members.

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**TABLE 2306.3(2)**  
**ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH**  
**FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE <sup>a</sup> FOR SEISMIC LOADING <sup>b, h, j, k, l</sup>**  
**FOR STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY D, E, OR F**

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	ALLOWABLE SHEAR VALUE FOR SEISMIC FORCES PANELS APPLIED DIRECTLY TO FRAMING				
			NAIL (common) size	Fastener spacing at panel edges (inches)			
				6	4	3	2 <sup>e</sup>
Structural I Sheathing	3/8	1-3/8	8d (2½"x0.131" common)	200 <sup>d</sup>	200 <sup>d</sup>	200 <sup>d</sup>	200 <sup>d</sup>
	7/16	1-3/8	8d (2½"x0.131" common)	255 <sup>d</sup>	395 <sup>d</sup>	505 <sup>d</sup>	670 <sup>d</sup>
	15/32	1-3/8	8d (2½"x0.131" common)	280	430	550	730
1-1/2		10d (3"x0.148" common)	340	510	665 <sup>f</sup>	870	
Sheathing, plywood siding <sup>g</sup> except Group 5 Species	3/8	1-1/4	6d (2" x 0.113" common)	200	200	200	200
		1-3/8	8d (2½"x0.131" common)	200	200	200	200
	7/16	1-3/8	8d (2½"x0.131" common)	240 <sup>d</sup>	350 <sup>d</sup>	450 <sup>d</sup>	585 <sup>d</sup>
	15/32	1-3/8	8d (2½"x0.131" common)	260	380	490	640
		1-1/2	10d (3"x0.148" common)	310	460	600 <sup>f</sup>	770
19/32	1-1/2	10d (3"x0.148" common)	340	510	665 <sup>f</sup>	870	

For SI: 1 inch = 25.4 mm, 1 foot = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1-(0.5-SG)], where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.
- b. Panel edges backed with 2-inch nominal or thicker framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for 3/8-inch and 7/16-inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.
- c. 3/8-inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied direct to framing as exterior siding.
- d. Allowable shear values are permitted to be increased to values shown for 15/32-inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.
- e. Framing at adjoining panel edges shall be 3 inches nominal or thicker, and nails shall be staggered where nails are spaced 2 inches on center.
- f. Framing at adjoining panel edges shall be 3 inches nominal or thicker, and nails shall be staggered where both of the following conditions are met: (1) 10d (3"x0.148") nails having penetration into framing of more than 1-1/2 inches and (2) nails are spaced 3 inches on center or less.
- g. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.
- h. Where panels applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3-inch nominal or thicker at adjoining panel edges and nails on each side shall be staggered.
- i. Where shear design values exceed 350 pounds per linear foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch nominal member, or two 2-inch nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered at all panel edges. See Section 4.3.6.1 and 4.3.6.4.3 of AF&PA SDPWS for sill plate size and anchorage requirements.

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- j. Galvanized nails shall be hot dipped or tumbled.
- k. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.
- n. *The maximum allowable shear value for three-ply plywood resisting seismic forces is 200 pounds per foot (2.92 kn/m).*

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**TABLE 2306.7  
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES FOR SHEAR WALLS OF LATH  
AND PLASTER OR GYPSUM BOARD WOOD FRAMED WALL ASSEMBLIES**

TYPE OF MATERIAL	THICKNESS OF MATERIAL	WALL CONSTRUCTION	FASTENER SPACING <sup>b</sup> MAXIMUM (inches)	SHEAR VALUE <sup>a, e</sup> (plf)	MINIMUM FASTENER SIZE <sup>c, d, j, k</sup>	
1. Expanded metal, or woven wire lath and Portland cement plaster	7/8"	Unblocked	6	180	No. 11 gage 1 1/2" long, 1/16" head No. 16 gage galv. Staple, 7/8" legs	
2. Gypsum lath, plain or perforated with vertical joints staggered	3/8" lath and 1/2" plaster	Unblocked	5	180	No. 13 gage galv. 1 1/8" long, 19/64" head, plasterboard nail	
3. Gypsum lath, plain or perforated	3/8" lath and 1/2" plaster	Unblocked	5	100	No. 16 gage galv. staple, 1 1/8" long, 0.120" nail, min. 3/8" head, 1 1/4" long	
4. Gypsum board, gypsum veneer base or water-re	1/2"	Unblocked <sup>f</sup>	7	75	5d cooler ( 1 5/8" x 0.086") or Wallboard 0.120" nail, min. 3/8" Head, 1 1/2" long No. 16 gage galv. staple, 1 1/2" long	
		Unblocked <sup>f</sup>	4	110		
		Unblocked	7	100		
		Unblocked	4	125		
		Blocked <sup>g</sup>	7	125		
		Blocked <sup>g</sup>	4	150		
		Unblocked	8/12 <sup>h</sup>	60		No. 6- 1 1/4" screws <sup>i</sup>
		Blocked <sup>g</sup>	4/16 <sup>h</sup>	160		
	Blocked <sup>f, g</sup>	4/12 <sup>h</sup>	155			
	Blocked <sup>g</sup>	8/12 <sup>h</sup>	70			
	5/8"	Unblocked <sup>f</sup>		7	115	6d cooler ( 1 7/8" x 0.092") or Wallboard 0.120" nail, min. 3/8" head, 1 3/4" long No. 16 gage galv. staple, 1 1/2" legs, 1 5/8" long
				4	145	
			Blocked <sup>g</sup>	7	145	
				4	175	
		Blocked <sup>g</sup> Two-ply		Base ply: 9 Face ply : 7	250	Base ply – 6d cooler ( 1 7/8" x 0.092") wallboard 1 3/4" x 0.120" nail, min. 3/8" head 1 5/8" 16 gage galv. staple 1 5/8" 16 gage galv. staple Face ply-8d cooler (2 3/8" x 0.113") Or wallboard 0.120" nail, min. 3/8" head, 2 3/8" long No. 15 gage galv. staple, 2 1/4" long
			Unblocked	8/12 <sup>h</sup>	70	No. 6 – 1 1/4" screws <sup>i</sup>
Blocked <sup>g</sup>			8/12 <sup>h</sup>	90		

See page 8 of this Information Bulletin for Footnote to Table 2306.7.

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Table 2306.7 Footnote:

For SI: 1 inch = 25.4 mm, 1 foot = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. These shear walls shall not be used to resist loads imposed by masonry or concrete construction (see Section 4.1.5 of AF & PA SDPWS). Values shown are for short-term loading due to wind or seismic loading. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7. Values shown shall be reduced 25 percent for normal loading.
- b. Applies to fastening at studs, top and bottom plates and blocking.
- c. Alternate fasteners are permitted to be used if their dimensions are not less than the specified dimensions. Drywall screws are permitted to substitute for the 5d (1-5/8" x 0.086"), and 6d (1-7/8" x 0.092")(cooler) nails listed above, and No. 6 1-1/4 inch Type S or W screws for 6d (1-7/8" x 0.092")(cooler) nails.
- d. For properties of cooler nails, see ASTM C 514.
- e. Except as noted, shear values are based on maximum framing spacing of 16 inches on center.
- f. Maximum framing spacing of 24 inches on center.
- g. All edges are blocked, and edge fastening is provided at all supports and all panel edges.
- h. First number denotes fastener spacing at the edges; second number denotes fastener spacing at intermediate framing members.
- i. Screws are Type W or S.
- j. *Staples shall have a minimum crown width of 7/16 inch, measured outside the legs, and shall be installed with their crowns parallel to the long dimension of the framing members.*
- k. Staples for the attachment of gypsum lath and woven-wire lath shall have a minimum crown width of 3/4 inch, measured outside the legs.