However, construction adhesives are routinely used in floor diaphragm construction to increase the bending stiffness and strength of floors; in-plane (diaphragm) shear is probably affected by an amount similar to that reported above for shear walls.

For unit shear values of wood structural panels applied to cold-formed steel framing, the following references are suggested: *Uniform Building Code* (ICBO,1997); *Standard Building Code* (SBCCI, 1999); and *Shear Wall Values for Light Weight Steel Framing* (AISI, 1996). The unit shear values for cold-formed steel-framed walls in the previous references are consistent with the values used in Table 6.1, including the recommended safety factor or resistance factor. Table 6.2 presents some typical unit shear values for cold-formed steel-framed walls with wood structural panel sheathing fastened with #8 screws. Values for power-driven, knurled pins (similar to deformed shank nails) should be obtained from the manufacturer and the applicable code evaluation reports (NES, Inc., 1997).

TABLE 6.2 Unfactored (Ultimate) Unit Shear Resistance (plf) for Walls with Cold-Formed Steel Framing and Wood Structural Panels[1,2]

Panel Grade	Panel Type and Nominal Thickness (inches)	Minimum Screw Size[3]	Screw Spacing at Panel Edges (inches)[4]			
			6	4	3	2
Structural I	7/16 OSB	#8	700	915	1,275	1,625
	15/32 plywood	#8	780	990	1,465	1,700

Notes:
[1]Values are average ultimate unit shear capacity and should be multiplied by a safety factor (ASD) or resistance factor (LRFD) in accordance with Sections 6.5.2.2 and 6.5.2.3.
[2]Values apply to 18 gauge (43 mil) and 20 gage (33 mil) steel C-shaped studs with a 1-5/8-inch flange width and 3-1/2- to 5-1/2-inch depth. Studs spaced a maximum of 24 inches on center.
[3]The #8 screws should have a head diameter of no less than 0.29 inches and the screw threads should penetrate the framing so that the threads are fully engaged in the steel.
[4]The spacing of screws in framing members located in the interior of the panels should be no more than 12 inches on-center.

Portland Cement Stucco (PCS)

Ultimate unit shear values for conventional PCS wall construction range from 490 to 1,580 plf based on the ASTM E 72 test protocol and 12 tests conducted by various testing laboratories (Testing Engineers, Inc., 1971; Testing Engineers, Inc., 1970; ICBO, 1969). In general, nailing the metal lath or wire mesh resulted in ultimate unit shear values less than 750 plf, whereas stapling resulted in ultimate unit shear values greater than 750 plf. An ultimate design value of 500 plf is recommended unless specific details of PCS construction are known. A safety factor of 2 provides a conservative allowable design value of about 250 plf. It must be realized that the actual capacity can be as much as five times 250 plf depending on the method of construction, particularly the means of fastening the stucco lath material. Current code-approved allowable design values are typically about 180 plf (SBCCI, 1999; ICBO, 1997). One code requires the values to be further reduced by 50 percent in higher-hazard seismic design areas (ICBO, 1997), although the reduction factor may not necessarily improve performance with respect to the cracking of the stucco finish in seismic events

(HUD, 1999); refer to Chapter 1 and the discussion in Chapter 3 on displacement compatibility under seismic load. It may be more appropriate to use a lower seismic response modifier R than to increase the safety margin in a manner that is not explicit to the designer. In fact, an R factor for PCS wood-framed walls is not explicitly provided in building codes (perhaps an R of 4.5 for "other" wood-framed walls is used) and should probably be in the range of 3 to 4 (without additional increases in the safety factor) since some ductility is provided by the metal lath and its connection to wood framing.

The above values pertain to PCS that is 7/8-inch thick with nail or staple fasteners spaced 6 inches on-center for attaching the metal wire mesh or lath to all framing members. Nails are typically 11 gauge by 1-1/2 inches in length and staples typically have 3/4-inch leg and 7/8-inch crown dimensions. The above unit shear values also apply to stud spacings no greater than 24 inches on-center. Finally, the aspect ratio of stucco wall segments included in a design shear analysis should not be greater than 2 (height/width) according to current building code practice.

Gypsum Wall Board (GWB)

Ultimate capacities in testing 1/2-inch-thick gypsum wall board range from 140 to 300 plf depending on the fastening schedule (Wolfe, 1983; Patton-Mallory, Gutkowski, Soltis, 1984; NAHBRF, date unknown). Allowable or design unit shear values for gypsum wall board sheathing range from 75 to 150 plf in current building codes depending on the construction and fastener spacing. At least one building code requires the values to be reduced by 50 percent in high-hazard seismic design areas (ICBO, 1997). Gypsum wall board is certainly not recommended as the primary seismic bracing for walls, although it does contribute to the structural resistance of buildings in all seismic and wind conditions. It should also be recognized that fastening of interior gypsum board varies in practice and is generally not an 'inspected" system. Table 6.3 provides estimated ultimate unit shear values for gypsum wall board sheathing.

TABLE 6.3 ***Unfactored (Ultimate) Unit Shear Values (plf) for 1/2-Inch-Thick Gypsum Wall Board Sheathing***[1,2]

GWB Thickness	Blocking Condition[3]	Spacing of Framing (inches)	Fastener Spacing at Pane Edges (inches)				
			12	8	7	6	4
1/2 inch	Blocked	16	120	210	250	260	300
	Unblocked	16	80	170	200	220	250
		24	40	120	150	180	220

Notes:
[1]The values represent average ultimate unit shear capacity and should be multiplied by a safety factor (ASD) or resistance factor (LRFD) in accordance with Sections 6.5.2.2 and 6.5.2.3.
[2]Fasteners should be minimum 1 1/2-inch drywall nails (i.e., 4d cooler) or 1-1/4-inch drywall screws (i.e., #6 size with bugle head) or equivalent with spacing of fasteners and framing members as shown.
[3]"Blocked" refers to panels with all edges fastened to framing members; "unblocked" refers to the condition where the panels are placed horizontally with horizontal joints between panels not fastened to blocking or vertically with the top and bottom edges fastened only at stud locations.