capacity at given amounts of drift may be determined by using the load-deformation equations in Section 6.5.2.6.

6.5.2.3 Shear Capacity Adjustment Factors

Safety and Resistance Factors (SF and ϕ)

Table 6.5 recommends values for safety and resistance factors for shear wall design in residential construction. A safety factor of 2.5 is widely recognized for shear wall design, although the range varies substantially in current code-approved unit shear design values for wood-framed walls (i.e., the range is 2 to more than 4). In addition, a safety factor of 2 is commonly used for wind design. The 1.5 safety factor for ancillary buildings is commensurate with lower risk but may not be a recognized practice in current building codes. A safety factor of 2 has been historically applied or recommended for residential dwelling design (HUD, 1967; MPS, 1958; HUD, 1999). It is also more conservative than safety factor adjustments typically used in the design of other properties with wood members and other materials.

TABLE 6.5 ***Minimum Recommended Safety and Resistance Factors for Residential Shear Wall Design***

Type of Construction		Safety Factor (ASD)	Resistance Factor (LRFD)
Detached garages and ancillary buildings not for human habitation		1.5	1.0
Single-family houses, townhouses, and multifamily low-rise buildings (apartments)	Seismic	2.5	0.55
	Wind	2.0	0.7

Species Adjustment Factor (C_{sp})

The ultimate unit shear values for wood structural panels in Table 6.1 apply to lumber species with a specific gravity (density), G, greater than or equal to 0.5. Table 6.6 presents specific gravity values for common species of lumber used for wall framing. For G < 0.5, the following value of C_{sp} should be used to adjust values in Table 6.1 only (APA, 1998):

$$C_{sp} = [1-(0.5-G)] \leq 1.0 \qquad \text{Eq. 6.5-3}$$

TABLE 6.6 ***Specific Gravity Values (Average) for Common Species of Framing Lumber***

Lumber Species	Specific Gravity, G
Southern Yellow Pine (SYP)	0.55
Douglas Fir-Larch (DF-L)	0.50
Hem-Fir (HF)	0.43
Spruce-Pine-Fir (SPF)	0.42

Nail Size Adjustment Factor (C_{ns})

The ultimate unit shear capacities in Table 6.1 are based on the use of common nails. For other nail types and corresponding nominal sizes, the C_{ns} adjustment factors in Table 6.7 should be used to adjust the values in Table 6.1. Nails should penetrate framing members a minimum of 10D, where D is the diameter of the nail.

TABLE 6.7 ***Values of C_{ns} for Various Nail Sizes and Types***[1]

Nominal Nail Size (penny weight)	Nail Length (inches)	Nail Type					
		Common[2]	Box[3]	Pneumatic (by diameter in inches)			
				0.092	0.113	0.131	0.148
6d	1-7/8 to 2	1.0	0.8	0.9	1.0	N/A[4]	N/A[4]
8d	2-3/8 to 2-1/2	1.0	0.8	0.5	0.75	1.0	N/A[4]
10d	3	1.0	0.8	N/A[4]	N/A[4]	0.8	1.0

Notes:
[1]The values of C_{ns} are based on ratios of the single shear nail values in NER-272 (NES, Inc., 1997) and the NDS (AF&PA, 1997) and are applicable only to wood structural panel sheathing on wood-framed walls in accordance with Table 6.1.
[2]Common nail diameters are as follows: 6d (0.113 inch), 8d (0.131 inch), and 10d (0.148 inch).
[3]Box nail diameters are as follows: 6d (0.099 inch), 8d (0.113 inch), and 10d (0.128 inch).
[4]Diameter not applicable to nominal nail size. Nail size, diameter, and length should be verified with the manufacturer.

Opening Adjustment Factor (C_{op})

The following equation for C_{op} applies only to the perforated shear wall method in accordance with Equation 6.5-1b of Section 6.5.2.2:

$$C_{op} = r/(3-2r) \qquad \text{Eq. 6.5-4}$$

where,

r = $1/(1 + \alpha/\beta)$ = sheathing area ratio (dimensionless)

α = ΣA_o / (H x L) = ratio of area of all openings ΣA_o to total wall area, H x L (dimensionless)

β = ΣL_i / L = ratio of length of wall with full-height sheathing ΣL_i to the total wall length L of the perforated shear wall (dimensionless)

Dead Load Adjustment Factor (C_{dl})

The C_{dl} factor applies to the perforated shear wall method only (Equation 6.5-1b). The presence of a dead load on a perforated shear has the effect of increasing shear capacity (Ni et al., 1998). The increase is 15 percent for a uniform dead load of 300 plf or more applied to the top of the wall framing. The dead load should be decreased by wind uplift and factored in accordance with the lateral design load combinations of Chapter 3. The C_{dl} adjustment factor is determined as follows and should not exceed 1.15: