...justment Factors for Reference Design

...8.4.4.1 General

Adjusted design values shall be obtained by adjusting ...rence design values by applicable adjustment factors in ...rdance with the following equations:

$$F = F_{bo}\, C_{KF}\, C_M\, (C_F \text{ or } C_V)\, C_{fu}\, C_i\, C_d\, C_\lambda \qquad (8.4.4.1\text{-}1)$$

$$F = F_{vo}\, C_{KF}\, C_M\, C_i\, C_\lambda \qquad (8.4.4.1\text{-}2)$$

$$F = F_{to}\, C_{KF}\, C_M\, C_F\, C_i\, C_\lambda \qquad (8.4.4.1\text{-}3)$$

$$F_c = F_{co}\, C_{KF}\, C_M\, C_F\, C_i\, C_\lambda \qquad (8.4.4.1\text{-}4)$$

$$F_{cp} = F_{cpo}\, C_{KF}\, C_M\, C_i\, C_\lambda \qquad (8.4.4.1\text{-}5)$$

$$E = E_o\, C_M\, C_i \qquad (8.4.4.1\text{-}6)$$

where:

F = applicable adjusted design values F_b, F_v, F_t, F_c, or F_{cp} (ksi)

F_o = reference design values F_{bo}, F_{vo}, F_{to}, F_{co}, or F_{cpo} specified in Article 8.4 (ksi)

E = adjusted modulus of elasticity (ksi)

E_o = reference modulus of elasticity specified in Article 8.4. (ksi)

C_{KF} = format conversion factor specified in Article 8.4.4.2

C_M = wet service factor specified in Article 8.4.4.3

C_F = size factor for visually-graded dimension lumber and sawn timbers specified in Article 8.4.4.4

C_V = volume factor for structural glued laminated timber specified in Article 8.4.4.5

C_{fu} = flat-use factor specified in Article 8.4.4.6

C_i = incising factor specified in Article 8.4.4.7

C_d = deck factor specified in Article 8.4.4.8

C_λ = time effect factor specified in Article 8.4.4.9

8.4.4.2 Format Conversion Factor, C_{KF}

The reference design values in Table 1 and 2 and reference design values specified in the *NDS*® shall be multiplied by a format conversion factor, C_{KF}, for use with load and resistance factor design (LRFD). $C_{KF} = 2.5/\phi$, except for compression perpendicular to grain which shall be obtained by multiplying the allowable stress by a format conversion factor of $C_{KF} = 2.1/\phi$.

C8.4.4.2

The conversion factors were derived so that LRFD design will result in same size member as the allowable stress design (ASD) specified in *NDS*®. For example, a rectangular component in flexure has to satisfy:

$$1.25\,M_{DL} + 1.75\,M_{LL} \le \phi\, S\, F_{bo}\, C_{KF}\, C_M\, (C_F \text{ or } C_v)\, C_{fu}\, C_i\, C_d\, C_\lambda\, C_L \quad \text{(C8.4.4.2-1)}$$

or:

$$(1.25\,M_{DL} + 1.75\,M_{LL}) / (\phi C_{KF}\, C_\lambda) \le S\, F_{bo}\, C_M\, (C_F \text{ or } C_v)\, C_{fu}\, C_i\, C_d\, C_L \quad \text{(C8.4.4.2-2)}$$

where:

M_{DL} = moment due to dead load

M_{LL} = moment due to live load

On the other hand, the allowable stress design (ASD) has to satisfy:

$$M_{DL} + M_{LL} \le S\, F_{bo}\, C_M\, (C_F \text{ or } C_v)\, C_{fu}\, C_i\, C_d\, C_D\, C_L \text{ or } (M_{DL} + M_{LL}) / (C_D) \le S\, F_{bo}\, C_M\, (C_F \text{ or } C_v)\, C_{fu}\, C_i\, C_d\, C_L \quad \text{(C8.4.4.2-3)}$$

Therefore:

$$(1.25\,M_{DL} + 1.75\,M_{LL}) / (\phi C_{KF}\, C_\lambda) = (M_{DL} + M_{LL}) / (C_D) \quad \text{(C8.4.4.2-4)}$$

$$C_{KF} = [(1.25\,M_{DL} + 1.75\,M_{LL})(C_D)] / [(M_{DL} + M_{LL})(\phi C_\lambda)] \quad \text{(C8.4.4.2-5)}$$

The format conversion factor is calculated assuming the ratio of M_{DL} and M_{LL} is 1:10, $\phi = 0.85$, $C_\lambda = 0.8$, and $C_D = 1.15$.

Table 8.4.4.4-1 Size Effect Factor, C_F, for Sawn Dimension Lumber.

Grade	Width (in.)	F_{bo} Thickness: 2.0 in. and 3.0 in.	F_{bo} Thickness: 4.0 in.	F_{to} Thickness: All	F_{co} Thickness: All	All Other Properties: All
	Structural Light Framing: 2.0 in × 2.0 in. through 4.0 in. × 4.0 in. Structural Joists and Planks: 2.0 in × 5.0 in. through 4.0 in. × 16.0 in.					
Sel. Str. No. 1 No. 2	≤4	1.5	1.54	1.5	1.15	1.00
	5	1.4	1.4	1.4	1.1	
	6	1.3	1.3	1.3	1.1	
	8	1.2	1.3	1.2	1.05	
	10	1.1	1.2	1.1	1.0	
	12	1.0	1.1	1.0	1.0	
	≥14	0.9	1.0	0.9	0.9	