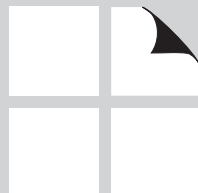


DESIGN VALUES FOR STRUCTURAL MEMBERS

2.1	General	10
2.2	Reference Design Values	10
2.3	Adjustment of Reference Design Values	10
	Table 2.3.2 Frequently Used Load Duration Factors, C_D	11
	Table 2.3.3 Temperature Factor, C_t	11
	Table 2.3.5 Format Conversion Factor, K_F (LRFD Only).....	12
	Table 2.3.6 Resistance Factor, ϕ (LRFD Only).....	12



2.1 General

2.1.1 General Requirement

Each wood structural member or connection shall be of sufficient size and capacity to carry the applied loads without exceeding the adjusted design values specified herein.

2.1.1.1 For ASD, calculation of adjusted design values shall be determined using applicable ASD adjustment factors specified herein.

2.1.1.2 For LRFD, calculation of adjusted design values shall be determined using applicable LRFD adjustment factors specified herein.

2.1.2 Responsibility of Designer to Adjust for Conditions of Use

Adjusted design values for wood members and connections in particular end uses, shall be appropriate for the conditions under which the wood products are used, taking into account conditions such as the differences in wood strength properties with different moisture contents, load durations, and types of treatment. Common end use conditions are addressed in this Specification. It shall be the final responsibility of the designer to relate design assumptions with design values, and to make design value adjustments appropriate to the end use conditions.

2.2 Reference Design Values

Reference design values and design value adjustments for wood products in 1.1.1.1 are based on methods specified in each of the wood product chapters. Chapters 4 through 10 contain design provisions for sawn lumber, glued laminated timber, poles and piles, prefabricated wood I-joists, structural composite lum-

ber, wood structural panels, and cross-laminated timber, respectively. Chapters 11 through 14 contain design provisions for connections. Reference design values are for normal load duration under the moisture service conditions specified.

2.3 Adjustment of Reference Design Values

2.3.1 Applicability of Adjustment Factors

Reference design values shall be multiplied by all applicable adjustment factors to determine adjusted design values. The applicability of adjustment factors to sawn lumber, structural glued laminated timber, poles and piles, prefabricated wood I-joists, structural composite lumber, wood structural panels, cross-laminated timber, and connection design values is defined in 4.3, 5.3, 6.3, 7.3, 8.3, 9.3, 10.3, and 11.3, respectively.

2.3.2 Load Duration Factor, C_D (ASD Only)

2.3.2.1 Wood has the property of carrying substantially greater maximum loads for short durations than for long durations of loading. Reference design values apply to normal load duration. Normal load duration represents a load that fully stresses a member to its allowable design value by the application of the full design load for a cumulative duration of approximately ten years. When the cumulative duration of the full maximum load does not exceed the specified time period, all

reference design values except modulus of elasticity, E , modulus of elasticity for beam and column stability, E_{min} , and compression perpendicular to grain, $F_{c\perp}$, based on a deformation limit (see 4.2.6) shall be multiplied by the appropriate load duration factor, C_D , from Table 2.3.2 or Figure B1 (see Appendix B) to take into account the change in strength of wood with changes in load duration.

2.3.2.2 The load duration factor, C_D , for the shortest duration load in a combination of loads shall apply for that load combination. All applicable load combinations shall be evaluated to determine the critical load combination. Design of structural members and connections shall be based on the critical load combination (see Appendix B.2).

2.3.2.3 The load duration factors, C_D , in Table 2.3.2 and Appendix B are independent of load combination factors, and both shall be permitted to be used in design calculations (see 1.4.4 and Appendix B.4).

Table 2.3.2 Frequently Used Load Duration Factors, C_D ¹

Load Duration	C_D	Typical Design Loads
Permanent	0.9	Dead Load
Ten years	1.0	Occupancy Live Load
Two months	1.15	Snow Load
Seven days	1.25	Construction Load
Ten minutes	1.6	Wind/Earthquake Load
Impact ²	2.0	Impact Load

1. Load duration factors shall not apply to reference modulus of elasticity, E , reference modulus of elasticity for beam and column stability, E_{min} , nor to reference compression perpendicular to grain design values, $F_{c\perp}$, based on a deformation limit.
2. Load duration factors greater than 1.6 shall not be used in the design of structural members pressure-treated with water-borne preservatives (see Reference 30), or fire retardant chemicals. Load duration factors greater than 1.6 shall not be used in the design of connections or wood structural panels.

2.3.3 Temperature Factor, C_t

Reference design values shall be multiplied by the temperature factors, C_t , in Table 2.3.3 for structural members that will experience sustained exposure to elevated temperatures up to 150°F (see Appendix C).

2.3.4 Fire Retardant Treatment

The effects of fire retardant chemical treatment on strength shall be accounted for in the design. Adjusted design values, including adjusted connection design values, for lumber and structural glued laminated timber pressure-treated with fire retardant chemicals shall be obtained from the company providing the treatment and redrying service. Load duration factors greater than 1.6 shall not apply to structural members pressure-treated with fire retardant chemicals (see Table 2.3.2).

2.3.5 Format Conversion Factor, K_F (LRFD Only)

For LRFD, reference design values shall be multiplied by the format conversion factor, K_F , specified in Table 2.3.5. The format conversion factor, K_F , shall not apply for designs in accordance with ASD methods specified herein.

2.3.6 Resistance Factor, ϕ (LRFD Only)

For LRFD, reference design values shall be multiplied by the resistance factor, ϕ , specified in Table 2.3.6. The resistance factor, ϕ , shall not apply for designs in accordance with ASD methods specified herein.

2.3.7 Time Effect Factor, λ (LRFD Only)

For LRFD, reference design values shall be multiplied by the time effect factor, λ , specified in Appendix N.3.3. The time effect factor, λ , shall not apply for designs in accordance with ASD methods specified herein.

Table 2.3.3 Temperature Factor, C_t

Reference Design Values	In-Service Moisture Conditions ¹	C_t		
		$T \leq 100^\circ\text{F}$	$100^\circ\text{F} < T \leq 125^\circ\text{F}$	$125^\circ\text{F} < T \leq 150^\circ\text{F}$
F_t, E, E_{min}	Wet or Dry	1.0	0.9	0.9
F_b, F_v, F_c , and $F_{c\perp}$	Dry	1.0	0.8	0.7
	Wet	1.0	0.7	0.5

1. Wet and dry service conditions for sawn lumber, structural glued laminated timber, prefabricated wood I-joists, structural composite lumber, wood structural panels and cross-laminated timber are specified in 4.1.4, 5.1.4, 7.1.4, 8.1.4, 9.3.3, and 10.1.5 respectively.

Table 2.3.5 Format Conversion Factor, K_F (LRFD Only)

Application	Property	K_F
Member	F_b	2.54
	F_t	2.70
	F_v, F_{rt}, F_s	2.88
	F_c	2.40
	$F_{c\perp}$	1.67
	E_{min}	1.76
All Connections	(all design values)	3.32

Table 2.3.6 Resistance Factor, ϕ (LRFD Only)

Application	Property	Symbol	Value
Member	F_b	ϕ_b	0.85
	F_t	ϕ_t	0.80
	F_v, F_{rt}, F_s	ϕ_v	0.75
	$F_c, F_{c\perp}$	ϕ_c	0.90
	E_{min}	ϕ_s	0.85
	(all design values)	ϕ_z	0.65