

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **								
Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
Alaska Cedar								
Select Structural		1150	625	165	525	1000	1400000	510000
No. 1		975	525	165	525	900	1300000	470000
No. 2	2" & wider	800	425	165	525	750	1200000	440000
No. 3		450	250	165	525	425	1100000	400000
Stud		625	350	165	525	475	1100000	400000
Construction	2" & wider	900	500	165	525	950	1200000	440000
Standard		500	275	165	525	775	1100000	400000
Utility	2"- 4" wide	250	125	165	525	500	1000000	370000
Alaska Hemlock								
Select Structural		1300	825	185	440	1200	1700000	620000
No. 1		900	550	185	440	1100	1600000	580000
No. 2	2" & wider	825	475	185	440	1050	1500000	550000
No. 3		475	275	185	440	600	1400000	510000
Stud		650	375	185	440	650	1400000	510000
Construction	2" & wider	950	550	185	440	1250	1400000	510000
Standard		525	300	185	440	1050	1300000	470000
Utility	2"- 4" wide	250	150	185	440	700	1200000	440000
Alaska Spruce								
Select Structural		1400	900	160	330	1200	1600000	580000
No. 1		950	600	160	330	1100	1500000	550000
No. 2	2" & wider	875	500	160	330	1050	1400000	510000
No. 3		500	300	160	330	600	1300000	470000
Stud		675	400	160	330	675	1300000	470000
Construction	2" & wider	1000	575	160	330	1250	1300000	470000
Standard		550	325	160	330	1050	1200000	440000
Utility	2"- 4" wide	275	150	160	330	700	1100000	400000
Alaska Yellow Cedar								
Select Structural		1350	800	225	510	1200	1500000	550000
No. 1		900	525	225	510	1050	1400000	510000
No. 2	2" & wider	800	450	225	510	1000	1300000	470000
No. 3		475	250	225	510	575	1200000	440000
Stud		625	350	225	510	625	1200000	440000
Construction	2" & wider	925	500	225	510	1250	1300000	470000
Standard		500	275	225	510	1050	1100000	400000
Utility	2"- 4" wide	250	125	225	510	675	1100000	400000
Aspen								
Select Structural		875	500	120	265	725	1100000	400000
No. 1		625	375	120	265	600	1100000	400000
No. 2	2" & wider	600	350	120	265	450	1000000	370000
No. 3		350	200	120	265	275	900000	330000
Stud		475	275	120	265	300	900000	330000
Construction	2" & wider	700	400	120	265	625	900000	330000
Standard		375	225	120	265	475	900000	330000
Utility	2"- 4" wide	175	100	120	265	300	800000	290000
Baldcypress								
Select Structural		1200	650	160	615	1200	1400000	510000
No. 1		1000	550	160	615	1050	1400000	510000
No. 2	2" & wider	825	450	160	615	900	1300000	470000
No. 3		475	250	160	615	525	1200000	440000
Stud		650	350	160	615	575	1200000	440000
Construction	2" & wider	925	500	160	615	1100	1200000	440000
Standard		525	275	160	615	925	1100000	400000
Utility	2"- 4" wide	250	125	160	615	600	1000000	370000

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **								
Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
Beech-Birch-Hickory								
Select Structural		1450	850	195	715	1200	1700000	620000
No. 1		1050	600	195	715	950	1600000	580000
No. 2		1000	600	195	715	750	1500000	550000
No. 3	2" & wider	575	350	195	715	425	1300000	470000
Stud		775	450	195	715	475	1300000	470000
Construction	2" & wider	1150	675	195	715	1000	1400000	510000
Standard		650	375	195	715	775	1300000	470000
Utility	2"- 4" wide	300	175	195	715	500	1200000	440000
Coast Sitka Spruce								
Select Structural		1300	950	125	455	1200	1700000	620000
No. 1/No. 2	2" & wider	925	550	125	455	1100	1500000	550000
No. 3		525	325	125	455	625	1400000	510000
Stud	2" & wider	725	450	125	455	675	1400000	510000
Construction		1050	650	125	455	1300	1400000	510000
Standard	2"- 4" wide	600	350	125	455	1100	1300000	470000
Utility		275	175	125	455	725	1200000	440000
Cottonwood								
Select Structural		875	525	125	320	775	1200000	440000
No. 1		625	375	125	320	625	1200000	440000
No. 2	2" & wider	625	350	125	320	475	1100000	400000
No. 3		350	200	125	320	275	1000000	370000
Stud	2" & wider	475	275	125	320	300	1000000	370000
Construction		700	400	125	320	650	1000000	370000
Standard	2"- 4" wide	400	225	125	320	500	900000	330000
Utility		175	100	125	320	325	900000	330000
Douglas Fir-Larch								
Select Structural		1500	1000	180	625	1700	1900000	690000
No.1 & Btr		1200	800	180	625	1550	1800000	660000
No. 1	2" & wider	1000	675	180	625	1500	1700000	620000
No. 2		900	575	180	625	1350	1600000	580000
No. 3		525	325	180	625	775	1400000	510000
Stud	2" & wider	700	450	180	625	850	1400000	510000
Construction		1000	650	180	625	1650	1500000	550000
Standard	2"- 4" wide	575	375	180	625	1400	1400000	510000
Utility		275	175	180	625	900	1300000	470000
Douglas Fir-Larch (North)								
Select Structural		1350	825	180	625	1900	1900000	690000
No. 1 & Btr		1150	750	180	625	1800	1800000	660000
No.1/No.2	2" & wider	850	500	180	625	1400	1600000	580000
No. 3		475	300	180	625	825	1400000	510000
Stud	2" & wider	650	400	180	625	900	1400000	510000
Construction		950	575	180	625	1800	1500000	550000
Standard	2"- 4" wide	525	325	180	625	1450	1400000	510000
Utility		250	150	180	625	950	1300000	470000
Douglas Fir-South								
Select Structural		1350	900	180	520	1600	1400000	510000
No. 1		925	600	180	520	1450	1300000	470000
No. 2	2" & wider	850	525	180	520	1350	1200000	440000
No. 3		500	300	180	520	775	1100000	400000
Stud	2" & wider	675	425	180	520	850	1100000	400000
Construction		975	600	180	520	1650	1200000	440000
Standard	2"- 4" wide	550	350	180	520	1400	1100000	400000
Utility		250	150	180	520	900	1000000	370000
Eastern Hemlock-Balsam Fir								

Select Structural		1250	575	140	335	1200	1200000	440000
No. 1		775	350	140	335	1000	1100000	400000
No. 2	2" & wider	575	275	140	335	825	1100000	400000
No. 3		350	150	140	335	475	900000	330000
Stud	2" & wider	450	200	140	335	525	900000	330000
Construction		675	300	140	335	1050	1000000	370000
Standard	2" - 4" wide	375	175	140	335	850	900000	330000
Utility		175	75	140	335	550	800000	290000

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **

Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
Eastern Hemlock-Tamarack								
Select Structural		1250	575	170	555	1200	1200000	440000
No. 1		775	350	170	555	1000	1100000	400000
No. 2	2" & wider	575	275	170	555	825	1100000	400000
No. 3		350	150	170	555	475	900000	330000
Stud	2" & wider	450	200	170	555	525	900000	330000
Construction		675	300	170	555	1050	1000000	370000
Standard	2" - 4" wide	375	175	170	555	850	900000	330000
Utility		175	75	170	555	550	800000	290000
Eastern Softwoods								
Select Structural		1250	575	140	335	1200	1200000	440000
No. 1		775	350	140	335	1000	1100000	400000
No. 2	2" & wider	575	275	140	335	825	1100000	400000
No. 3		350	150	140	335	475	900000	330000
Stud	2" & wider	450	200	140	335	525	900000	330000
Construction		675	300	140	335	1050	1000000	370000
Standard	2" - 4" wide	375	175	140	335	850	900000	330000
Utility		175	75	140	335	550	800000	290000
Eastern White Pine								
Select Structural		1250	575	135	350	1200	1200000	440000
No. 1		775	350	135	350	1000	1100000	400000
No. 2	2" & wider	575	275	135	350	825	1100000	400000
No. 3		350	150	135	350	475	900000	330000
Stud	2" & wider	450	200	135	350	525	900000	330000
Construction		675	300	135	350	1050	1000000	370000
Standard	2" - 4" wide	375	175	135	350	850	900000	330000
Utility		175	75	135	350	550	800000	290000
Hem-Fir								
Select Structural		1400	925	150	405	1500	1600000	580000
No. 1 & Btr		1100	725	150	405	1350	1500000	550000
No.1	2" & wider	975	625	150	405	1350	1500000	550000
No.2		850	525	150	405	1300	1300000	470000
No.3		500	300	150	405	725	1200000	440000
Stud	2" & wider	675	400	150	405	800	1200000	440000
Construction		975	600	150	405	1550	1300000	470000
Standard	2" - 4" wide	550	325	150	405	1300	1200000	440000
Utility		250	150	150	405	850	1100000	400000
Hem-Fir (North)								
Select Structural		1300	775	145	405	1700	1700000	620000
No. 1 & Btr	2" & wider	1200	725	145	405	1550	1700000	620000
No.1/No.2		1000	575	145	405	1450	1600000	580000
No. 3		575	325	145	405	850	1400000	510000
Stud	2" & wider	775	450	145	405	925	1400000	510000
Construction		1150	650	145	405	1750	1500000	550000
Standard	2" - 4" wide	650	350	145	405	1500	1400000	510000
Utility		300	175	145	405	975	1300000	470000
Mixed Maple								
Select Structural		1000	600	195	620	875	1300000	470000

No. 1		725	425	195	620	700	1200000	440000
No. 2	2" & wider	700	425	195	620	550	1100000	400000
No. 3		400	250	195	620	325	1000000	370000
Stud	2" & wider	550	325	195	620	350	1000000	370000
Construction		800	475	195	620	725	1100000	400000
Standard	2"- 4" wide	450	275	195	620	575	1000000	370000
Utility		225	125	195	620	375	900000	330000

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **								
Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
Mixed Oak								
Select Structural		1150	675	170	800	1000	1100000	400000
No. 1		825	500	170	800	825	1000000	370000
No. 2	2" & wider	800	475	170	800	625	900000	330000
No. 3		475	275	170	800	375	800000	290000
Stud	2" & wider	625	375	170	800	400	800000	290000
Construction		925	550	170	800	850	900000	330000
Standard	2"- 4" wide	525	300	170	800	650	800000	290000
Utility		250	150	170	800	425	800000	290000
Northern Red Oak								
Select Structural		1400	800	220	885	1150	1400000	510000
No. 1		1000	575	220	885	925	1400000	510000
No. 2	2" & wider	975	575	220	885	725	1300000	470000
No. 3		550	325	220	885	425	1200000	440000
Stud	2" & wider	750	450	220	885	450	1200000	440000
Construction		1100	650	220	885	975	1200000	440000
Standard	2"- 4" wide	625	350	220	885	750	1100000	400000
Utility		300	175	220	885	500	1000000	370000
Northern Species								
Select Structural		975	425	110	350	1100	1100000	400000
No. 1/No. 2	2" & wider	625	275	110	350	850	1100000	400000
No. 3		350	150	110	350	500	1000000	370000
Stud	2" & wider	475	225	110	350	550	1000000	370000
Construction		700	325	110	350	1050	1000000	370000
Standard	2"- 4" wide	400	175	110	350	875	900000	330000
Utility		175	75	110	350	575	900000	330000
Northern White Cedar								
Select Structural		775	450	120	370	750	800000	290000
No.1		575	325	120	370	600	700000	260000
No.2	2" & wider	550	325	120	370	475	700000	260000
No.3		325	175	120	370	275	600000	220000
Stud	2" & wider	425	250	120	370	300	600000	220000
Construction		625	375	120	370	625	700000	260000
Standard	2"- 4" wide	350	200	120	370	475	600000	220000
Utility		175	100	120	370	325	600000	220000
Red Maple								
Select Structural		1300	750	210	615	1100	1700000	620000
No. 1		925	550	210	615	900	1600000	580000
No. 2	2" & wider	900	525	210	615	700	1500000	550000
No. 3		525	300	210	615	400	1300000	470000
Stud	2" & wider	700	425	210	615	450	1300000	470000
Construction		1050	600	210	615	925	1400000	510000
Standard	2"- 4" wide	575	325	210	615	725	1300000	470000
Utility		275	150	210	615	475	1200000	440000
Red Oak								
Select Structural		1150	675	170	820	1000	1400000	510000
No. 1		825	500	170	820	825	1300000	470000
No. 2	2" & wider	800	475	170	820	625	1200000	440000
No. 3		475	275	170	820	375	1100000	400000

Stud	2" & wider	625	375	170	820	400	1100000	400000
Construction		925	550	170	820	850	1200000	440000
Standard	2"- 4" wide	525	300	170	820	650	1100000	400000
Utility		250	150	170	820	425	1000000	370000

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **								
Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
Redwood								
Clear Structural		1750	1000	160	650	1850	1400000	510000
Select Structural		1350	800	160	650	1500	1400000	510000
Select Structural, open grain		1100	625	160	425	1100	1100000	400000
No. 1		975	575	160	650	1200	1300000	470000
No.1, open grain		775	450	160	425	900	1100000	400000
No. 2	2" & wider	925	525	160	650	950	1200000	440000
No.2, open grain		725	425	160	425	700	1000000	370000
No. 3		525	300	160	650	550	1100000	400000
No.3, open grain		425	250	160	425	400	900000	330000
Stud		575	325	160	425	450	900000	330000
Construction	2" & wider	825	475	160	425	925	900000	330000
Standard		450	275	160	425	725	900000	330000
Utility	2"- 4" wide	225	125	160	425	475	800000	290000
Spruce-Pine-Fir								
Select Structural		1250	700	135	425	1400	1500000	550000
No. 1/No. 2	2" & wider	875	450	135	425	1150	1400000	510000
No. 3		500	250	135	425	650	1200000	440000
Stud	2" & wider	675	350	135	425	725	1200000	440000
Construction		1000	500	135	425	1400	1300000	470000
Standard	2"- 4" wide	550	275	135	425	1150	1200000	440000
Utility		275	125	135	425	750	1100000	400000
Spruce-Pine-Fir (South)								
Select Structural		1300	575	135	335	1200	1300000	470000
No. 1		875	400	135	335	1050	1200000	440000
No. 2	2" & wider	775	350	135	335	1000	1100000	400000
No. 3		450	200	135	335	575	1000000	370000
Stud	2" & wider	600	275	135	335	625	1000000	370000
Construction		875	400	135	335	1200	1000000	370000
Standard	2"- 4" wide	500	225	135	335	1000	900000	330000
Utility		225	100	135	335	675	900000	330000
Western Cedars								
Select Structural		1000	600	155	425	1000	1100000	400000
No.1		725	425	155	425	825	1000000	370000
No.2	2" & wider	700	425	155	425	650	1000000	370000
No.3		400	250	155	425	375	900000	330000
Stud	2" & wider	550	325	155	425	400	900000	330000
Construction		800	475	155	425	850	900000	330000
Standard	2"- 4" wide	450	275	155	425	650	800000	290000
Utility		225	125	155	425	425	800000	290000
Western Woods								
Select Structural		900	400	135	335	1050	1200000	440000
No. 1		675	300	135	335	950	1100000	400000
No. 2	2" & wider	675	300	135	335	900	1000000	370000
No. 3		375	175	135	335	525	900000	330000
Stud	2" & wider	525	225	135	335	575	900000	330000
Construction		775	350	135	335	1100	1000000	370000
Standard	2"- 4" wide	425	200	135	335	925	900000	330000
Utility		200	100	135	335	600	800000	290000

Design Values for Visually Graded Dimension Lumber (2"-4" thick) Except Southern Pine* **								
Species and commercial grade	Size classification	Bending Fb	Tension parallel to grain Ft	Shear parallel to grain Fv	Compression perpendicular to grain Fc1	Compression parallel to grain Fc	Modulus of Elasticity E	Minimum Modulus of Elasticity Emin
White Oak								
Select Structural		1200	700	220	800	1100	1100000	400000
No.1		875	500	220	800	900	1000000	370000
No.2	2" & wider	850	500	220	800	700	900000	330000
No.3		475	275	220	800	400	800000	290000
Stud	2" & wider	650	375	220	800	450	800000	290000
Construction		950	550	220	800	925	900000	330000
Standard	2"- 4" wide	525	325	220	800	725	800000	290000
Utility		250	150	220	800	475	800000	290000
Yellow Cedar								
Select Structural		1200	725	175	540	1200	1600000	580000
No.1/No.2	2" & wider	800	475	175	540	1000	1400000	510000
No.3		475	275	175	540	575	1200000	440000
Stud	2" & wider	625	375	175	540	650	1200000	440000
Construction		925	550	175	540	1200	1300000	470000
Standard	2"- 4" wide	525	300	175	540	1050	1200000	440000
Utility		250	150	175	540	675	1100000	400000
Yellow Poplar								
Select Structural		1000	575	145	420	900	1500000	550000
No. 1		725	425	145	420	725	1400000	510000
No. 2	2" & wider	700	400	145	420	575	1300000	470000
No. 3		400	225	145	420	325	1200000	440000
Stud	2" & wider	550	325	145	420	350	1200000	440000
Construction		800	475	145	420	750	1300000	470000
Standard	2"- 4" wide	450	250	145	420	575	1100000	400000
Utility		200	125	145	420	375	1100000	400000

*Reference Design Values Notes	
1. Lumber Dimensions. Tabulated design values are applicable to lumber that will be used under dry conditions such as in most covered structures. For 2" to 4" thick lumber the DRY dressed sizes shall be used regardless of the moisture content at the time of manufacture or use. In calculating design values the natural gain in strength and stiffness that occurs as lumber dries has been taken into consideration as well as the reduction in size that occurs when unseasoned lumber shrinks. The gain in load carrying capacity due to increased strength and stiffness resulting from drying more than offsets the design effect of size reductions due to shrinkage.	
2. When individual species or species groups are combined, the design values to be used for the combination shall be the lowest design values for each individual species or species group for each design property.	

**Adjustment Factors
Repetitive Member Factor, Cr. Bending design values, Fb, for dimension lumber 2" to 4" thick shall be multiplied by the repetitive member factor, Cr = 1.15, when such members are used as joists, truss chords, rafters, studs, planks, decking, or similar members which are in contact or spaced not more than 24" on center, are not less than 3 in number and are joined by floor, roof, or other load distributing elements adequate to support the design load.

Wet Service Factor, Cm. When dimension lumber is used where moisture content will exceed 19% for an extended time period, design values shall be multiplied by the appropriate wet service factors below:					
Fb	Ft	Fv	Fc1	Fc	E and Emin
0.85*	1.0	0.97	0.67	0.8**	0.9
*when (Fb)(Cf) <= 1150 psi, Cm = 1.0, **when (Fc)(Cf) <= 750 psi, Cm = 1.0					
Size Factor, Cf. Tabulated bending, tension, and compression parallel to grain design values for dimension lumber 2" to 4" thick shall be multiplied by the following size factors:					
		Fb		Ft	Fc
Grades	Width (depth)	Thickness (breadth)			
		2" & 3"	4"		
Select Structural No.1 & Btr, No.1, No.2, No.3	2", 3" & 4"	1.5	1.5	1.5	1.15
	5"	1.4	1.4	1.4	1.1
	6"	1.3	1.3	1.3	1.1
	8"	1.2	1.2	1.2	1.05
	10"	1.1	1.2	1.1	1.0
	12"	1.0	1.1	1.0	1.0
	14" & wider	0.9	1.0	0.9	0.9
Stud	2", 3", & 4"	1.1	1.1	1.1	1.05
	5" & 6"	1.0	1.0	1.0	1.0
	8" & wider	Use No.3 Grade tabulated design values and size factors			
Construction, Standard	2", 3", & 4"	1.0	1.0	1.0	1.0
Utility	4"	1.0	1.0	1.0	1.0
	2" & 3"	0.4	----	0.4	0.6
Flat Use Factor, Cfu. Bending design values adjusted by size factors are based on edgewise use (load applied to narrow face). When dimension lumber is used flatwise (load applied to wide face), the bending design value, Fb, shall also be multiplied by the following flat use factors:					
Width (depth)		Thickness (breadth)			
		2" & 3"		4"	
2" & 3"		1.0		----	
4"		1.1		1.0	
5"		1.1		1.05	
6"		1.15		1.05	
8"		1.15		1.05	
10" & wider		1.2		1.1	
Temperature Factor, Ct. When structural members will experience sustained exposure to elevated temperatures up to 150 deg. F, Reference design values shall be multiplied by the following:					
Reference Design Values	In-Service Moisture Conditions	Ct			
		T <= 100 degF	100 degF<T<=125 degF	125 degF<T<=150 degF	
Ft, E, Emin	Wet or Dry	1.0	0.9	0.9	
Fb, Fv, Fc, and Fc1	Dry	1.0	0.8	0.7	
	Wet	1.0	0.7	0.5	
Load Duration Factor, Cd. When structural members will sustain loads for a design period which does not exceed the normal duration for the design load, typically a cumulative duration of approximately 10 years, all reference design values except modulus of elasticity, E, modulus of elasticity for beam and column stability, Emin, and compression perpendicular to grain, Fc1, based on deformation limit shall be multiplied by the appropriate load duration factor from the table below. The duration factor, Cd for the shortest duration load in a combination of loads shall apply for that load combination.					
Load Duration		Cd		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*	2.0	Impact Load

*Load duration factors greater than 1.6 shall not apply to structural members pressure-treated with water-borne preservatives, or fire retardant chemicals. The impact load duration factor shall not apply to connections.

Beam Stability Factor, CL. When the depth of a bending member does not exceed its breadth, $d \leq b$, no lateral support is required and $CL = 1.0$. When the compression edge of a bending member is supported throughout its length to prevent lateral displacement, and the ends at points of bearing have lateral support to prevent rotation, $CL = 1.0$. When rectangular sawn lumber bending members are laterally supported as shown below, $CL = 1.0$.

- (a) $d/b \leq 2$; no lateral support shall be required.
- (b) $2 < d/b \leq 4$; the ends shall be held in position, as by full depth solid blocking, bridging, hangers, nailing, or bolting to other framing members, or other acceptable means.
- (c) $4 < d/b \leq 5$; the compression edge of the member shall be held in line for its entire length to prevent lateral displacement, as by adequate sheathing or subflooring, and ends at point of bearing shall be held in position to prevent rotation and/or lateral displacement.
- (d) $5 < d/b \leq 6$; bridging, full depth solid blocking or diagonal cross bracing shall be installed at intervals not exceeding 8 feet, the compression edge of the member shall be held in line as by adequate sheathing or subflooring, and the ends at points of bearing shall be held in position to prevent rotation and/or lateral displacement.
- (e) $6 < d/b \leq 7$; both edges of the member shall be held in line for their entire length and ends at points of bearing shall be held in position to prevent rotation and/or lateral displacement.
- (f) If bending member is subjected to flexure and axial compression then $d/b \leq 5$, and one edge must be firmly held in line.
- (g) If under all combinations of load, the un-braced edge of the member is in tension then $d/b \leq 6$.

Bearing Area Factor, Cb. Compression design values perpendicular to grain, F_{c1} , apply to bearings of any length at the ends of a member, and to all bearings 6" or more in length at any other location. For bearing less than 6" in length and not nearer than 3" to the end shall be multiplied by the following bearing area factor, $C_b = (l_b + 0.375)/l_b$; where l_b = the bearing length measured parallel to the grain in inches. For round bearing areas such as washer, the bearing length, l_b , shall be equal to the diameter. The equation gives the following bearing area factors for the indicated bearing length on such small areas as plates and washers:

l_b	0.5"	1"	1.5"	2"	3"	4"	6" or more
C_b	1.75	1.38	1.25	1.19	1.13	1.10	1.00

Buckling Length Coefficient K_e

End no. 1 (bottom)	End no. 2 (top)	Design K_e
Built-in: rotation fixed, translation fixed	Built-in: rotation fixed, translation fixed	0.65
Built-in: rotation fixed, translation fixed	Pinned: rotation free, translation fixed	0.80
Built-in: rotation fixed, translation fixed	Rotation fixed, translation free	1.20
Built-in: rotation fixed, translation fixed	Free: rotation free, translation free	2.10
Pinned: rotation free, translation fixed	Pinned: rotation free, translation fixed	1.0
Pinned: rotation free, translation fixed	Rotation fixed, translation free	2.4

Buckling Stiffness Factor, CT. Increased chord stiffness relative to axial loads when a 2"x4" or smaller sawn lumber truss compression chord is subjected to combined flexure and axial compression under dry service condition and has 3/8" or thicker plywood sheathing nailed to the narrow face of the chord in accordance with code required roof sheathing fastener schedules, shall be permitted to be accounted for by multiplying the reference modulus of elasticity design value for beam and column

stability, E_{min} , by the buckling stiffness factor, CT , as calculated below: When $l_e < 96"$, $CT = 1 + (KMl_e)/(KTE)$; Where l_e = effective column length of truss compression chord $KM = 2300$ for wood seasoned to 19% moisture content or less at the time of plywood attachment. $KM = 1200$ for unseasoned or partially seasoned wood at the time of plywood attachment. $KT = 1.1645$ (COVE) $KT = 0.59$ for visually graded lumber $KT = 0.75$ for machine evaluated lumber (MEL) $KT = 0.82$ for products with $COVE \leq 0.11$ When $l_e > 96"$, CT shall be calculated based on $l_e = 96"$.	
Column Stability Factor, C_p. When a compression member is supported throughout its length to prevent lateral displacement in all directions, $C_p = 1.0$. For all other conditions C_p shall be calculated as follows: $C_p = (1 + (F_{ce}/F_c^*)) / 2c - (((1 + (F_{ce}/F_c^*)) / 2c)^2 - (F_{ce}/F_c^*) / c)^{0.5}$; where: F_c^* = reference compression design value parallel to grain multiplied by all applicable adjustment factors except C_p $F_{ce} = (0.822 E_{min}) / (l_e / d)^2$ $c = 0.8$ for sawn lumber $c = 0.85$ for round timber poles and piles $c = 0.9$ for structural glued laminated timber or structural composite lumber	
Incising Factor, C_i. Reference design values shall be multiplied by the following incising factor, C_i , when dimension lumber is incised parallel to grain a maximum depth of 0.4", a maximum length of 3/8", and density of incisions up to 1100/ft ² . Incising factors shall be determined by test or by calculation using reduced section properties for incising patterns exceeding these limits.	
Design Value	C_i
E, E_{min}	0.95
F_b, F_t, F_c, F_v	0.80
F_{c1}	1.00