2.1 List of Sawn Lumber Species Combinations

Species or Species Combination	Species That May Be Included in Combination	Grading Rules Agencies	Design Values Provided in Tables
Alaska Cedar		WCLIB	4A
Alaska Hemlock		WWPA	4A
Alaska Spruce	Alaska Sitka Spruce Alaska White Spruce	WWPA	4A
Alaska Yellow Cedar		WCLIB, WWPA	4A
Aspen	Big Tooth Aspen Quaking Aspen	NELMA WWPA	4A
Baldcypress		SPIB	4A, 4D
Balsam Fir		NELMA	4D, 4E
Beech-Birch-Hickory	American Beech Bitternut Hickory Mockernut Hickory Nutmeg Hickory Pecan Hickory Pignut Hickory Shagbark Hickory Shellbark Hickory Sweet Birch Water Hickory Yellow Birch	NELMA	4A, 4D
Coast Sitka Spruce		NLGA	4A, 4D, 4E
Coast Species	Amabilis Fir Coast Sitka Spruce Douglas Fir Western Hemlock Western Larch	NLGA	4E
Cottonwood		NELMA	4A
Douglas Fir-Larch	Douglas Fir Western Larch	WCLIB WWPA	4A, 4C, 4D, 4E
Douglas Fir-Larch (North)	Douglas Fir Western Larch	NLGA	4A, 4C, 4D, 4E
Douglas Fir-South		WWPA	4A, 4C, 4D, 4E
Eastern Hemlock		NELMA	4D
Eastern Hemlock-Balsam Fir	Balsam Fir Eastern Hemlock Tamarack	NELMA	4A
Eastern Hemlock-Tamarack	Eastern Hemlock Tamarack	NELMA	4A, 4D, 4E
Eastern Hemlock-Tamarack (North)	Eastern Hemlock Tamarack	NLGA	4D, 4E
Eastern Softwoods	Balsam Fir Black Spruce Eastern Hemlock Eastern White Pine Jack Pine Norway (Red) Pine Pitch Pine Red Spruce Tamarack White Spruce	NELMA	4A

2.1 List of Sawn Lumber Species Combinations (Cont.)

Species or Species Combination	Species That May Be Included in Combination	Grading Rules Agencies	Design Values Provided in Tables
Eastern Spruce	Black Spruce Red Spruce White Spruce	NELMA	4D, 4E
Eastern White Pine		NELMA	4A, 4D, 4E
Eastern White Pine (North)		NLGA	4E
Hem-Fir	California Red Fir Grand Fir Noble Fir Pacific Silver Fir Western Hemlock White Fir	WCLIB WWPA	4A, 4C, 4D, 4E
Hem-Fir (North)	Amabilis Fir Western Hemlock	NLGA	4A, 4C, 4D, 4E
Mixed Maple	Black Maple Red Maple Silver Maple Sugar Maple	NELMA	4A, 4D
Mixed Oak	All Oak Species graded under NELMA rules	NELMA	4A, 4D
Mixed Southern Pine	Any species in the Southern Pine species combination, plus either or both of the following: Pond Pine Virginia Pine	SPIB	4B, 4C, 4D
Mountain Hemlock		WWPA, WCLIB	4D
Northern Pine	Jack Pine Norway (Red) Pine Pitch Pine	NELMA	4D, 4E
Northern Red Oak	Black Oak Northern Red Oak Pin Oak Scarlet Oak	NELMA	4A, 4D
Northern Species	Any species graded under NLGA rules except Red Alder and White Birch	NLGA	4A, 4C, 4E
Northern White Cedar		NELMA	4A, 4D, 4E
Norway Spruce (North)		NLGA	4A, 4C
Ponderosa Pine		NLGA	4D, 4E
Red Maple		NELMA	4A, 4D
Red Oak	Black Oak Cherrybark Oak Laurel Oak Northern Red Oak Pin Oak Scarlet Oak Southern Red Oak Water Oak Willow Oak	NELMA	4A, 4D
Red Pine		NLGA	4D, 4E
Redwood		RIS	4A, 4D, 4E
Sitka Spruce		WWPA, WCLIB	4D, 4E

2.1 List of Sawn Lumber Species Combinations (Cont.)

Species or Species Combination	Species That May Be Included in Combination	Grading Rules Agencies	Design Values Provided in Tables
Southern Pine	Loblolly Pine Longleaf Pine Shortleaf Pine Slash Pine	SPIB	4B, 4C, 4D, 4E
Spruce-Pine-Fir	Alpine Fir Balsam Fir Black Spruce Engelmann Spruce Jack Pine Lodgepole Pine Red Spruce White Spruce	NLGA	4A, 4C, 4D, 4E
Spruce-Pine-Fir (South)	Balsam Fir Black Spruce Engelmann Spruce Jack Pine Lodgepole Pine Norway (Red) Pine Norway Spruce Red Spruce Sitka Spruce White Spruce	NELMA WCLIB WWPA	4A, 4C, 4D, 4E
Western Cedars	Alaska Cedar Incense Cedar Port Orford Cedar Western Red Cedar	WCLIB WWPA	4A, 4C, 4D, 4E
Western Cedars (North)	Pacific Coast Yellow Cedar Western Red Cedar	NLGA	4D, 4E
Western Hemlock		WWPA, WCLIB	4D, 4E
Western Hemlock (North)		NLGA	4D, 4E
Western Juniper		WCLIB	4A, 4D
Western White Pine		NLGA	4D, 4E
Western Woods	Any species in the Douglas Fir-Larch, Douglas Fir-South, Hem-Fir, and Spruce-Pine-Fir (South) species combinations, plus any or all of the following: Idaho White Pine Mountain Hemlock Ponderosa Pine Subalpine Fir Sugar Pine	WCLIB WWPA	4A, 4C, 4D, 4E
White Oak	Bur Oak	NELMA	4A, 4D

Table 4D Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
ALASKA CEDAR										
Select Structural	Beams and Stringers	1,400	675	155	525	925	1,200,000	440,000	0.47	WCLIB
No.1		1,150	475	155	525	775	1,200,000	440,000		
No.2		750	300	155	525	500	1,000,000	370,000		
Select Structural	Posts and Timbers	1,300	700	155	525	975	1,200,000	440,000		
No.1		1,050	575	155	525	850	1,200,000	440,000		
No.2		625	350	155	525	600	1,000,000	370,000		
BALDCYPRESS										
Select Structural	5"x5" and Larger	1,150	750	200	615	1,050	1,300,000	470,000	0.43	SPIB
No.1		1,000	675	200	615	925	1,300,000	470,000		
No.2		625	425	175	615	600	1,000,000	370,000		
BALSAM FIR										
Select Structural	Beams and Stringers	1,350	900	125	305	950	1,400,000	510,000	0.36	NELMA
No.1		1,100	750	125	305	800	1,400,000	510,000		
No.2		725	350	125	305	500	1,100,000	400,000		
Select Structural	Posts and Timbers	1,250	825	125	305	1,000	1,400,000	510,000		
No.1		1,000	675	125	305	875	1,400,000	510,000		
No.2		575	375	125	305	400	1,100,000	400,000		
BEECH-BIRCH-HICKORY										
Select Structural	Beams and Stringers	1,650	975	180	715	975	1,500,000	550,000	0.71	NELMA
No.1		1,400	700	180	715	825	1,500,000	550,000		
No.2		900	450	180	715	525	1,200,000	440,000		
Select Structural	Posts and Timbers	1,550	1,050	180	715	1,050	1,500,000	550,000		
No.1		1,250	850	180	715	900	1,500,000	550,000		
No.2		725	475	180	715	425	1,200,000	440,000		
COAST SITKA SPRUCE										
Select Structural	Beams and Stringers	1,150	675	115	455	775	1,500,000	550,000	0.43	NLGA
No.1		950	475	115	455	650	1,500,000	550,000		
No.2		625	325	115	455	425	1,200,000	440,000		
Select Structural	Posts and Timbers	1,100	725	115	455	825	1,500,000	550,000		
No.1		875	575	115	455	725	1,500,000	550,000		
No.2		525	350	115	455	500	1,200,000	440,000		
DOUGLAS FIR-LARCH										
Dense Select Structural	Beams and Stringers	1,900	1,100	170	730	1,300	1,700,000	620,000	0.50	WCLIB
Select Structural		1,600	950	170	625	1,100	1,600,000	580,000		
Dense No. 1		1,550	775	170	730	1,100	1,700,000	620,000		
No. 1		1,350	675	170	625	925	1,600,000	580,000		
No. 2		875	425	170	625	600	1,300,000	470,000		
Dense Select Structural	Posts and Timbers	1,750	1,150	170	730	1,350	1,700,000	620,000		
Select Structural		1,500	1,000	170	625	1,150	1,600,000	580,000		
Dense No. 1		1,400	950	170	730	1,200	1,700,000	620,000		
No. 1		1,200	825	170	625	1,000	1,600,000	580,000		
No. 2		750	475	170	625	700	1,300,000	470,000		
Dense Select Structural	Beams and Stringers	1,900	1,100	170	730	1,300	1,700,000	620,000	0.50	WWPA
Select Structural		1,600	950	170	625	1,100	1,600,000	580,000		
Dense No. 1		1,550	775	170	730	1,100	1,700,000	620,000		
No. 1		1,350	675	170	625	925	1,600,000	580,000		
No. 2 Dense		1,000	500	170	730	700	1,400,000	510,000		
No. 2		875	425	170	625	600	1,300,000	470,000		
Dense Select Structural	Posts and Timbers	1,750	1,150	170	730	1,350	1,700,000	620,000		
Select Structural		1,500	1,000	170	625	1,150	1,600,000	580,000		
Dense No. 1		1,400	950	170	730	1,200	1,700,000	620,000		
No. 1		1,200	825	170	625	1,000	1,600,000	580,000		
No. 2 Dense		850	550	170	730	825	1,400,000	510,000		
No. 2		750	475	170	625	700	1,300,000	470,000		

Table 4D (Cont.) Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
DOUGLAS FIR-LARCH (NORTH)										
Select Structural	Beams and Stringers	1,600	950	170	625	1,100	1,600,000	580,000	0.49	NLGA
No.1		1,300	675	170	625	925	1,600,000	580,000		
No.2		875	425	170	625	600	1,300,000	470,000		
Select Structural	Posts and Timbers	1,500	1,000	170	625	1,150	1,600,000	580,000		
No.1		1,200	825	170	625	1,000	1,600,000	580,000		
No.2		725	475	170	625	700	1,300,000	470,000		
DOUGLAS FIR-SOUTH										
Select Structural	Beams and Stringers	1,550	900	165	520	1,000	1,200,000	440,000	0.46	WWPA
No.1		1,300	625	165	520	850	1,200,000	440,000		
No.2		825	425	165	520	550	1,000,000	370,000		
Select Structural	Posts and Timbers	1,450	950	165	520	1,050	1,200,000	440,000		
No.1		1,150	775	165	520	925	1,200,000	440,000		
No.2		675	450	165	520	650	1,000,000	370,000		
EASTERN HEMLOCK										
Select Structural	Beams and Stringers	1,350	925	155	550	950	1,200,000	440,000	0.41	NELMA
No.1		1,150	775	155	550	800	1,200,000	440,000		
No.2		750	375	155	550	550	900,000	330,000		
Select Structural	Posts and Timbers	1,250	850	155	550	1,000	1,200,000	440,000		
No.1		1,050	700	155	550	875	1,200,000	440,000		
No.2		600	400	155	550	400	900,000	330,000		
EASTERN HEMLOCK-TAMARACK										
Select Structural	Beams and Stringers	1,400	925	155	555	950	1,200,000	440,000	0.41	NELMA
No.1		1,150	775	155	555	800	1,200,000	440,000		
No.2		750	375	155	555	500	900,000	330,000		
Select Structural	Posts and Timbers	1,300	875	155	555	1,000	1,200,000	440,000		
No.1		1,050	700	155	555	875	1,200,000	440,000		
No.2		600	400	155	555	400	900,000	330,000		
EASTERN HEMLOCK-TAMARACK (N)										
Select Structural	Beams and Stringers	1,450	850	165	555	950	1,300,000	470,000	0.47	NLGA
No.1		1,200	600	165	555	800	1,300,000	470,000		
No.2		775	400	165	555	500	1,100,000	400,000		
Select Structural	Posts and Timbers	1,350	900	165	555	1,000	1,300,000	470,000		
No.1		1,100	725	165	555	875	1,300,000	470,000		
No.2		650	425	165	555	600	1,100,000	400,000		
EASTERN SPRUCE										
Select Structural	Beams and Stringers	1,050	725	135	390	750	1,400,000	510,000	0.41	NELMA
No.1		900	600	135	390	625	1,400,000	510,000		
No.2		575	275	135	390	375	1,000,000	370,000		
Select Structural	Posts and Timbers	1,000	675	135	390	775	1,400,000	510,000		
No.1		800	550	135	390	675	1,400,000	510,000		
No.2		450	300	135	390	300	1,000,000	370,000		
EASTERN WHITE PINE										
Select Structural	Beams and Stringers	1,050	700	125	350	675	1,100,000	400,000	0.36	NELMA
No.1		875	600	125	350	575	1,100,000	400,000		
No.2		575	275	125	350	400	900,000	330,000		
Select Structural	Posts and Timbers	975	650	125	350	725	1,100,000	400,000		
No.1		800	525	125	350	625	1,100,000	400,000		
No.2		450	300	125	350	325	900,000	330,000		
HEM-FIR										
Select Structural	Beams and Stringers	1,300	750	140	405	925	1,300,000	470,000	0.43	WCLIB WWPA
No.1		1,050	525	140	405	750	1,300,000	470,000		
No.2		675	350	140	405	500	1,100,000	400,000		
Select Structural	Posts and Timbers	1,200	800	140	405	975	1,300,000	470,000		
No.1		975	650	140	405	850	1,300,000	470,000		
No.2		575	375	140	405	575	1,100,000	400,000		

Table 4D (Cont.) Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
HEM-FIR (NORTH)										
Select Structural	Beams and Stringers	1,250	725	135	405	900	1,300,000	470,000	0.46	NLGA
No.1		1,000	500	135	405	750	1,300,000	470,000		
No.2		675	325	135	405	475	1,100,000	400,000		
Select Structural	Posts and Timbers	1,150	775	135	405	950	1,300,000	470,000		
No.1		925	625	135	405	850	1,300,000	470,000		
No.2		550	375	135	405	575	1,100,000	400,000		
MIXED MAPLE										
Select Structural	Beams and Stringers	1,150	700	180	620	725	1,100,000	400,000	0.55	NELMA
No.1		975	500	180	620	600	1,100,000	400,000		
No.2		625	325	180	620	375	900,000	330,000		
Select Structural	Posts and Timbers	1,100	725	180	620	750	1,100,000	400,000		
No.1		875	600	180	620	650	1,100,000	400,000		
No.2		500	350	180	620	300	900,000	330,000		
MIXED OAK										
Select Structural	Beams and Stringers	1,350	800	155	800	825	1,000,000	370,000	0.68	NELMA
No.1		1,150	550	155	800	700	1,000,000	370,000		
No.2		725	375	155	800	450	800,000	290,000		
Select Structural	Posts and Timbers	1,250	850	155	800	875	1,000,000	370,000		
No.1		1,000	675	155	800	775	1,000,000	370,000		
No.2		575	400	155	800	350	800,000	290,000		
MIXED SOUTHERN PINE[2]		(Wet Service Conditons)								
Select Structural	5"x5" and Larger	1,500	1,000	165	375	900	1,300,000	470,000	0.51	SPIB
No.1		1,350	900	165	375	800	1,300,000	470,000		
No.2		850	550	165	375	525	1,000,000	370,000		
MOUNTAIN HEMLOCK										
Select Structural	Beams and Stringers	1,350	775	170	570	875	1,100,000	400,000	0.47	WCLIB WWPA
No.1		1,100	550	170	570	725	1,100,000	400,000		
No.2		725	375	170	570	475	900,000	330,000		
Select Structural	Posts and Timbers	1,250	825	170	570	925	1,100,000	400,000		
No.1		1,000	675	170	570	800	1,100,000	400,000		
No.2		625	400	170	570	550	900,000	330,000		
NORTHERN PINE										
Select Structural	Beams and Stringers	1,250	850	135	435	850	1,300,000	470,000	0.42	NELMA
No.1		1,050	700	135	435	725	1,300,000	470,000		
No.2		675	350	135	435	450	1,000,000	370,000		
Select Structural	Posts and Timbers	1,150	800	135	435	900	1,300,000	470,000		
No.1		950	650	135	435	800	1,300,000	470,000		
No.2		550	375	135	435	375	1,000,000	370,000		
NORTHERN RED OAK										
Select Structural	Beams and Stringers	1,600	950	205	885	950	1,300,000	470,000	0.68	NELMA
No.1		1,350	675	205	885	800	1,300,000	470,000		
No.2		875	425	205	885	500	1,000,000	370,000		
Select Structural	Posts and Timbers	1,500	1,000	205	885	1,000	1,300,000	470,000		
No.1		1,200	800	205	885	875	1,300,000	470,000		
No.2		700	475	205	885	400	1,000,000	370,000		
NORTHERN WHITE CEDAR										
Select Structural	Beams and Stringers	900	600	115	370	600	700,000	260,000	0.31	NELMA
No.1		750	500	115	370	500	700,000	260,000		
No.2		500	250	115	370	325	600,000	220,000		
Select Structural	Posts and Timbers	850	575	115	370	650	700,000	260,000		
No.1		675	450	115	370	550	700,000	260,000		
No.2		400	250	115	370	250	600,000	220,000		
PONDEROSA PINE										
Select Structural	Beams and Stringers	1,100	725	130	535	750	1,100,000	400,000	0.43	NLGA
No.1		925	500	130	535	625	1,100,000	400,000		
No.2		600	300	130	535	400	900,000	330,000		
Select Structural	Posts and Timbers	1,000	675	130	535	800	1,100,000	400,000		
No.1		825	550	130	535	700	1,100,000	400,000		
No.2		475	325	130	535	325	900,000	330,000		

Table 4D (Cont.) Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
RED MAPLE										
Select Structural	Beams and Stringers	1,500	875	195	615	900	1,500,000	550,000	0.58	NELMA
No.1		1,250	625	195	615	750	1,500,000	550,000		
No.2		800	400	195	615	475	1,200,000	440,000		
Select Structural	Posts and Timbers	1,400	925	195	615	950	1,500,000	550,000		
No.1		1,150	750	195	615	825	1,500,000	550,000		
No.2		650	425	195	615	375	1,200,000	440,000		
RED OAK										
Select Structural	Beams and Stringers	1,350	800	155	820	825	1,200,000	440,000	0.67	NELMA
No.1		1,150	550	155	820	700	1,200,000	440,000		
No.2		725	375	155	820	450	1,000,000	370,000		
Select Structural	Posts and Timbers	1,250	850	155	820	875	1,200,000	440,000		
No.1		1,000	675	155	820	775	1,200,000	440,000		
No.2		575	400	155	820	350	1,000,000	370,000		
RED PINE										
Select Structural	Beams and Stringers	1,050	625	130	440	725	1,100,000	400,000	0.44	NLGA
No.1		875	450	130	440	600	1,100,000	400,000		
No.2		575	300	130	440	375	900,000	330,000		
Select Structural	Posts and Timbers	1,000	675	130	440	775	1,100,000	400,000		
No.1		800	550	130	440	675	1,100,000	400,000		
No.2		475	325	130	440	475	900,000	330,000		
REDWOOD										
Select Structural	5" x 5" and Larger	1,100	750	145	420	900	1,000,000	370,000	0.37	RIS
No. 1		950	650	145	420	800	1,000,000	370,000		
No. 2		750	400	145	420	650	900,000	330,000		
SITKA SPRUCE										
Select Structural	Beams and Stringers	1,200	675	140	435	825	1,300,000	470,000	0.43	WCLIB
No.1		1,000	500	140	435	675	1,300,000	470,000		
No.2		650	325	140	435	450	1,000,000	370,000		
Select Structural	Posts and Timbers	1,150	750	140	435	875	1,300,000	470,000		
No.1		925	600	140	435	750	1,300,000	470,000		
No.2		550	350	140	435	525	1,000,000	370,000		
Select Structural	Beams and Stringers	1,200	675	140	435	825	1,300,000	470,000	0.43	WWPA
No.1		1,000	500	140	435	675	1,300,000	470,000		
No.2		650	325	140	435	450	1,100,000	400,000		
Select Structural	Posts and Timbers	1,150	750	140	435	875	1,300,000	470,000		
No.1		925	600	140	435	750	1,300,000	470,000		
No.2		550	350	140	435	525	1,100,000	400,000		
SOUTHERN PINE		(Wet Service Conditons)								
Dense Select Structural	5" x 5" and Larger	1,750	1,200	165	440	1,100	1,600,000	580,000	0.55	SPIB
Select Structural		1,500	1,000	165	375	950	1,500,000	550,000		
No. 1 Dense		1,550	1,050	165	440	975	1,600,000	580,000		
No. 1		1,350	900	165	375	825	1,500,000	550,000		
No. 2 Dense		975	650	165	440	625	1,300,000	470,000		
No. 2		850	550	165	375	525	1,200,000	440,000		
Dense Select Structural 86		2,100	1,400	165	440	1,300	1,600,000	580,000		
Dense Select Structural 72		1,750	1,200	165	440	1,100	1,600,000	580,000		
Dense Select Structural 65		1,600	1,050	165	440	1,000	1,600,000	580,000		
SPRUCE-PINE-FIR										
Select Structural	Beams and Stringers	1,100	650	125	425	775	1,300,000	470,000	0.42	NLGA
No.1		900	450	125	425	625	1,300,000	470,000		
No.2		600	300	125	425	425	1,000,000	370,000		
Select Structural	Posts and Timbers	1,050	700	125	425	800	1,300,000	470,000		
No.1		850	550	125	425	700	1,300,000	470,000		
No.2		500	325	125	425	500	1,000,000	370,000		

Table 4D (Cont.) Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
SPRUCE-PINE-FIR (SOUTH)										
Select Structural	Beams and Stringers	1,050	625	125	335	675	1,200,000	440,000	0.36	NELMA WWPA WCLIB
No.1		900	450	125	335	550	1,200,000	440,000		
No.2		575	300	125	335	375	1,000,000	370,000		
Select Structural	Posts and Timbers	1,000	675	125	335	700	1,200,000	440,000		
No.1		800	550	125	335	625	1,200,000	440,000		
No.2		475	325	125	335	425	1,000,000	370,000		
WESTERN CEDARS										
Select Structural	Beams and Stringers	1,150	675	140	425	875	1,000,000	370,000	0.36	WCLIB WWPA
No.1		975	475	140	425	725	1,000,000	370,000		
No.2		625	325	140	425	475	800,000	290,000		
Select Structural	Posts and Timbers	1,100	725	140	425	925	1,000,000	370,000		
No.1		875	600	140	425	800	1,000,000	370,000		
No.2		550	350	140	425	550	800,000	290,000		
WESTERN CEDARS (NORTH)										
Select Structural	Beams and Stringers	1,150	675	130	425	850	1,000,000	370,000	0.35	NLGA
No.1		925	475	130	425	700	1,000,000	370,000		
No.2		625	300	130	425	450	800,000	290,000		
Select Structural	Posts and Timbers	1,050	700	130	425	900	1,000,000	370,000		
No.1		875	575	130	425	800	1,000,000	370,000		
No.2		500	350	130	425	550	800,000	290,000		
WESTERN HEMLOCK										
Select Structural	Beams and Stringers	1,400	825	170	410	1,000	1,400,000	510,000	0.47	WCLIB WWPA
No.1		1,150	575	170	410	850	1,400,000	510,000		
No.2		750	375	170	410	550	1,100,000	400,000		
Select Structural	Posts and Timbers	1,300	875	170	410	1,100	1,400,000	510,000		
No.1		1,050	700	170	410	950	1,400,000	510,000		
No.2		650	425	170	410	650	1,100,000	400,000		
WESTERN HEMLOCK (NORTH)										
Select Structural	Beams and Stringers	1,400	825	135	410	1,000	1,400,000	510,000	0.46	NLGA
No.1		1,150	575	135	410	850	1,400,000	510,000		
No.2		750	375	135	410	550	1,100,000	400,000		
Select Structural	Posts and Timbers	1,300	875	135	410	1,100	1,400,000	510,000		
No.1		1,050	700	135	410	950	1,400,000	510,000		
No.2		650	425	135	410	650	1,100,000	400,000		
WESTERN JUNIPER										
Select Structural	Beams and Stringers	1,300	650	115	770	325	500,000	180,000	0.42	WCLIB
No.1		1,100	450	115	770	275	500,000	180,000		
No.2		650	350	115	770	175	400,000	150,000		
Select Structural	Posts and Timbers	1,300	675	115	770	350	500,000	180,000		
No.1		1,000	550	115	770	300	500,000	180,000		
No.2		600	325	115	770	225	400,000	150,000		
WESTERN WHITE PINE										
Select Structural	Beams and Stringers	1,050	600	120	375	775	1,300,000	470,000	0.40	NLGA
No.1		850	425	120	375	625	1,300,000	470,000		
No.2		550	275	120	375	400	1,000,000	370,000		
Select Structural	Posts and Timbers	975	650	120	375	800	1,300,000	470,000		
No.1		775	525	120	375	700	1,300,000	470,000		
No.2		450	300	120	375	500	1,000,000	370,000		
WESTERN WOODS										
Select Structural	Beams and Stringers	1,050	625	125	345	750	1,100,000	400,000	0.36	WCLIB WWPA
No.1		900	450	125	345	625	1,100,000	400,000		
No.2		575	300	125	345	425	900,000	330,000		
Select Structural	Posts and Timbers	1,000	675	125	345	800	1,100,000	400,000		
No.1		800	525	125	345	700	1,100,000	400,000		
No.2		475	325	125	345	475	900,000	330,000		

Table 4D (Cont.) Reference Design Values for Visually Graded Timbers (5" x 5" and larger)[1,3]

(Tabulated design values are for normal load duration and dry service conditions, unless specified otherwise. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4D ADJUSTMENT FACTORS

Species and commercial Grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending	Tension parallel to grain	Shear parallel to grain	Compression perpendicular to grain	Compression parallel to grain	Modulus of Elasticity			
		F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}	G	
WHITE OAK										
Select Structural	Beams and Stringers	1,400	825	205	800	900	1,000,000	370,000	0.73	NELMA
No.1		1,200	575	205	800	775	1,000,000	370,000		
No.2		750	375	205	800	475	800,000	290,000		
Select Structural	Posts and Timbers	1,300	875	205	800	950	1,000,000	370,000		
No.1		1,050	700	205	800	825	1,000,000	370,000		
No.2		600	400	205	800	400	800,000	290,000		

Footnotes to Table 4D

1. **LUMBER DIMENSIONS.** Tabulated design values are applicable to lumber that will be used under dry conditions such as in most covered structures. For 5" and thicker lumber, the GREEN dressed sizes shall be permitted to be used (see Table 1A) because design values have been adjusted to compensate for any loss in size by shrinkage which may occur.
2. **SPRUCE PINE.** To obtain recommended design values for Spruce Pine graded to Southern Pine Inspection Bureau (SPIB) rules, multiply the appropriate design values for Mixed Southern Pine by the corresponding conversion factor shown below and round to the nearest 100,000 psi for E; to the nearest 10,000 psi for E; to the next lower multiple of 5 psi for F_v and $F_{c\perp}$; to the next lower multiple of 50 psi for F_b, F_t, and F_c if 1,000 psi or greater, 25 psi otherwise.

CONVERSION FACTORS FOR DETERMINING DESIGN VALUES FOR SPRUCE PINE

	Bending F_b	Tension parallel to grain F_t	Shear parallel to grain F_v	Compression perpendicular to grain $F_{c\perp}$	Compression parallel to grain F_c	Modulus of Elasticity E and E_{min}
Conversion Factor	0.78	0.78	0.98	0.73	0.78	0.82

3. 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.
4. Specific gravity, G, based on weight and volume when oven-dry.

Table 4E Adjustment Factors

Wet Service Factor, C_M

When decking is used where moisture content will exceed 19% for an extended time period, design values shall be multiplied by the appropriate wet service factors from the following table (for surfaced dry Southern Pine decking use tabulated surfaced green design values for wet service conditions without further adjustment):

Wet Service Factors, C_M

F_b	$F_{c\perp}$	E and E_{min}
0.85*	0.67	0.9

* when $(F_b)(C_F) \leq 1{,}150$ psi, $C_M = 1.0$

Flat Use Factor, C_{fu}

Tabulated bending design values, F_b, for decking have already been adjusted for flatwise usage (load applied to wide face).

Size Factor, C_F

Bending design values for all species of decking except Redwood are based on 4" thick decking. When 2" thick or 3" thick decking is used, the bending design values, F_b, for all species except Redwood shall be multiplied by the following size factors:

Size Factors, C_F

Thickness	C_F
2"	1.10
3"	1.04

Repetitive Member Factor, C_r

Tabulated bending design values for repetitive member uses, $(F_b)(C_r)$, for decking have already been multiplied by the repetitive member factor, C_r.