



# **DESIGN VALUES FOR JOISTS AND RAFTERS**

**2012 EDITION**

**SUPPLEMENT TO  
SPAN TABLES FOR JOISTS AND RAFTERS**



**AMERICAN WOOD COUNCIL**

## **Updates and Errata**

While every precaution has been taken to ensure the accuracy of this document, errors may have occurred during development. Updates or Errata are posted to the American Wood Council website at [www.awc.org](http://www.awc.org). Technical inquiries may be addressed to [info@awc.org](mailto:info@awc.org).

**The American Wood Council (AWC)** is the voice of North American traditional and engineered wood products. From a renewable resource that absorbs and sequesters carbon, the wood products industry makes products that are essential to everyday life. AWC's engineers, technologists, scientists, and building code experts develop state-of-the-art engineering data, technology, and standards on structural wood products for use by design professionals, building officials, and wood products manufacturers to assure the safe and efficient design and use of wood structural components.

# **DESIGN VALUES FOR JOISTS AND RAFTERS**

**2012 EDITION**

**SUPPLEMENT TO  
SPAN TABLES FOR JOISTS AND RAFTERS**

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of-the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this publication. Those using this document assume all liability from its use.

Copyright © 2011  
American Wood Council  
[info@awc.org](mailto:info@awc.org)  
[www.awc.org](http://www.awc.org)



AMERICAN WOOD COUNCIL



March 2013

**ADDENDUM**  
**to the 2012 and previous versions of**  
**DESIGN VALUES FOR JOISTS AND RAFTERS**  
**(a supplement to *Span Tables for Joists and Rafters*)**

**Effective June 1, 2013, design values for all grades of visually-graded Southern Pine and Mixed Southern Pine lumber, 2"- 4" thick will change. The design values to use with the *Span Tables for Joists and Rafters* are shown below (values that will change on June 1, 2013 are shown as underlined). These values supersede values published in the AWC March 2012 Addendum.**

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>MIXED SOUTHERN PINE</b>							
Select Structural	2x4	2,360	2,710	2,945	565	1,600,000	SPIB
No.1		1,670	1,920	2,085	565	1,500,000	
No.2		<u>1,265</u>	<u>1,455</u>	<u>1,580</u>	565	1,400,000	
No.3 and Stud		<u>750</u>	<u>860</u>	<u>935</u>	565	1,200,000	
Construction		<u>980</u>	<u>1,125</u>	<u>1,220</u>	565	1,300,000	
Standard		<u>545</u>	<u>630</u>	<u>685</u>	565	1,200,000	
Utility		<u>260</u>	<u>300</u>	<u>325</u>	565	1,100,000	
Select Structural	2x6	2,130	2,445	2,660	565	1,600,000	
No.1		1,495	1,720	1,870	565	1,500,000	
No.2		<u>1,150</u>	<u>1,325</u>	<u>1,440</u>	565	1,400,000	
No.3 and Stud		<u>660</u>	<u>760</u>	<u>825</u>	565	1,200,000	
Select Structural	2x8	2,015	2,315	2,515	565	1,600,000	
No.1		1,380	1,585	1,725	565	1,500,000	
No.2		<u>1,065</u>	<u>1,225</u>	<u>1,330</u>	565	1,400,000	
No.3 and Stud		<u>605</u>	<u>695</u>	<u>755</u>	565	1,200,000	
Select Structural	2x10	1,725	1,985	2,155	565	1,600,000	
No.1		1,210	1,390	1,510	565	1,500,000	
No.2		<u>920</u>	<u>1,060</u>	<u>1,150</u>	565	1,400,000	
No.3 and Stud		<u>545</u>	<u>630</u>	<u>685</u>	565	1,200,000	
Select Structural	2x12	1,610	1,850	2,015	565	1,600,000	
No.1		1,120	1,290	1,400	565	1,500,000	
No.2		<u>865</u>	<u>990</u>	<u>1,080</u>	565	1,400,000	
No.3 and Stud		<u>520</u>	<u>595</u>	<u>645</u>	565	1,200,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER (Cont'd)<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>SOUTHERN PINE</b>							
Dense Select Structural	2x4	<u>3,105</u>	<u>3,570</u>	<u>3,880</u>	660	1,900,000	SPIB
Select Structural		<u>2,705</u>	<u>3,110</u>	<u>3,380</u>	565	1,800,000	
Non-Dense Select Structural		<u>2,360</u>	<u>2,710</u>	<u>2,945</u>	480	<u>1,600,000</u>	
No.1 Dense		<u>1,900</u>	<u>2,180</u>	<u>2,370</u>	660	1,800,000	
No.1		<u>1,725</u>	<u>1,985</u>	<u>2,155</u>	565	<u>1,600,000</u>	
No.1 Non-Dense		<u>1,495</u>	<u>1,720</u>	<u>1,870</u>	480	<u>1,400,000</u>	
No.2 Dense		<u>1,380</u>	<u>1,585</u>	<u>1,725</u>	660	<u>1,600,000</u>	
No.2		<u>1,265</u>	<u>1,455</u>	<u>1,580</u>	565	<u>1,400,000</u>	
No.2 Non-Dense		<u>1,210</u>	<u>1,390</u>	<u>1,510</u>	480	<u>1,300,000</u>	
No.3 and Stud		<u>750</u>	<u>860</u>	<u>935</u>	565	<u>1,300,000</u>	
Construction Standard		<u>1,005</u>	<u>1,155</u>	<u>1,260</u>	565	<u>1,400,000</u>	
Utility		<u>545</u>	<u>630</u>	<u>685</u>	565	<u>1,200,000</u>	
			<u>260</u>	<u>300</u>	<u>325</u>	565	
Dense Select Structural	2x6	<u>2,760</u>	<u>3,175</u>	<u>3,450</u>	660	1,900,000	
Select Structural		<u>2,415</u>	<u>2,775</u>	<u>3,020</u>	565	1,800,000	
Non-Dense Select Structural		<u>2,130</u>	<u>2,445</u>	<u>2,660</u>	480	<u>1,600,000</u>	
No.1 Dense		<u>1,725</u>	<u>1,985</u>	<u>2,155</u>	660	1,800,000	
No.1		<u>1,555</u>	<u>1,785</u>	<u>1,940</u>	565	<u>1,600,000</u>	
No.1 Non-Dense		<u>1,380</u>	<u>1,585</u>	<u>1,725</u>	480	<u>1,400,000</u>	
No.2 Dense		<u>1,210</u>	<u>1,390</u>	<u>1,510</u>	660	<u>1,600,000</u>	
No.2		<u>1,150</u>	<u>1,325</u>	<u>1,440</u>	565	<u>1,400,000</u>	
No.2 Non-Dense		<u>1,095</u>	<u>1,255</u>	<u>1,365</u>	480	<u>1,300,000</u>	
No.3 and Stud	<u>660</u>	<u>760</u>	<u>825</u>	565	<u>1,300,000</u>		
Dense Select Structural	2x8	<u>2,530</u>	<u>2,910</u>	<u>3,165</u>	660	1,900,000	
Select Structural		<u>2,245</u>	<u>2,580</u>	<u>2,805</u>	565	<u>1,800,000</u>	
Non-Dense Select Structural		<u>1,955</u>	<u>2,250</u>	<u>2,445</u>	480	1,600,000	
No.1 Dense		<u>1,555</u>	<u>1,785</u>	<u>1,940</u>	660	<u>1,800,000</u>	
No.1		<u>1,440</u>	<u>1,655</u>	<u>1,795</u>	565	<u>1,600,000</u>	
No.1 Non-Dense		<u>1,265</u>	<u>1,455</u>	<u>1,580</u>	480	<u>1,400,000</u>	
No.2 Dense		<u>1,120</u>	<u>1,290</u>	<u>1,400</u>	660	<u>1,600,000</u>	
No.2		<u>1,065</u>	<u>1,225</u>	<u>1,330</u>	565	<u>1,400,000</u>	
No.2 Non-Dense		<u>1,005</u>	<u>1,155</u>	<u>1,260</u>	480	<u>1,300,000</u>	
No.3 and Stud	<u>605</u>	<u>695</u>	<u>755</u>	565	<u>1,300,000</u>		

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER (Cont'd)<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>SOUTHERN PINE (Cont'd)</b>							
Dense Select Structural	2x10	<u>2,245</u>	<u>2,580</u>	<u>2,805</u>	660	1,900,000	SPIB
Select Structural		<u>1,955</u>	<u>2,250</u>	<u>2,445</u>	565	1,800,000	
Non-Dense Select Structural		<u>1,725</u>	<u>1,985</u>	<u>2,155</u>	480	<u>1,600,000</u>	
No.1 Dense		<u>1,380</u>	<u>1,585</u>	<u>1,725</u>	660	1,800,000	
No.1		<u>1,210</u>	<u>1,390</u>	<u>1,510</u>	565	<u>1,600,000</u>	
No.1 Non-Dense		<u>1,095</u>	<u>1,255</u>	<u>1,365</u>	480	<u>1,400,000</u>	
No.2 Dense		<u>980</u>	<u>1,125</u>	<u>1,220</u>	660	<u>1,600,000</u>	
No.2		<u>920</u>	<u>1,060</u>	<u>1,150</u>	565	<u>1,400,000</u>	
No.2 Non-Dense		<u>865</u>	<u>990</u>	<u>1,080</u>	480	<u>1,300,000</u>	
No.3 and Stud		<u>545</u>	<u>630</u>	<u>685</u>	565	<u>1,300,000</u>	
Dense Select Structural	2x12	<u>2,070</u>	<u>2,380</u>	<u>2,590</u>	660	1,900,000	
Select Structural		<u>1,840</u>	<u>2,115</u>	<u>2,300</u>	565	1,800,000	
Non-Dense Select Structural		<u>1,610</u>	<u>1,850</u>	<u>2,015</u>	480	<u>1,600,000</u>	
No.1 Dense		<u>1,265</u>	<u>1,455</u>	<u>1,580</u>	660	1,800,000	
No.1		<u>1,150</u>	<u>1,325</u>	<u>1,440</u>	565	<u>1,600,000</u>	
No.1 Non-Dense		<u>1,035</u>	<u>1,190</u>	<u>1,295</u>	480	<u>1,400,000</u>	
No.2 Dense		<u>920</u>	<u>1,060</u>	<u>1,150</u>	660	<u>1,600,000</u>	
No.2		<u>865</u>	<u>990</u>	<u>1,080</u>	565	<u>1,400,000</u>	
No.2 Non-Dense		<u>805</u>	<u>925</u>	<u>1,005</u>	480	<u>1,300,000</u>	
No.3 and Stud		<u>520</u>	<u>595</u>	<u>645</u>	565	<u>1,300,000</u>	

See *Span Tables for Joists and Rafters* for footnotes to Table W-1.

# TABLE OF CONTENTS

## Table W-1 Design Values for Joists and Rafters - Visually Graded Lumber

Species or Species Combination	Species that may be Included in the Combination	Page
Alaska Cedar.....		1
Alaska Hemlock .....		1
Alaska Spruce .....	Alaska Sitka Spruce, Alaska White Spruce .....	2
Alaska Yellow Cedar .....		2
Aspen .....	Big Tooth Aspen, Quaking Aspen .....	3
Baldcypress .....		3
Beech-Birch-Hickory .....	American Beech, Bitternut Hickory, Mockernut Hickory, .....	4
	Nutmeg Hickory, Pecan Hickory, Pignut Hickory, Shagbark Hickory, Shellbark Hickory, Sweet Birch, Water Hickory, Yellow Birch	
Coast Sitka Spruce .....		4
Cottonwood .....		5
Douglas Fir-Larch.....	Douglas Fir, Western Larch .....	5
Douglas Fir-Larch (North) .....	Douglas Fir, Western Larch .....	6
Douglas Fir-South .....		6
Eastern Hemlock-Balsam Fir ....	Balsam Fir, Eastern Hemlock, Tamarack.....	7
Eastern Hemlock-Tamarack .....	Eastern Hemlock, Tamarack .....	7
Eastern Softwoods .....	Balsam Fir, Black Spruce, Eastern Hemlock, Eastern White Pine, .....	8
	Jack Pine, Norway (Red) Pine, Pitch Pine, Red Spruce, Tamarack, White Spruce	
Eastern White Pine .....		8
Hem-Fir.....	California Red Fir, Grand Fir, Noble Fir, Pacific Silver Fir, .....	9
	Western Hemlock, White Fir	
Hem-Fir (North).....	Amabilis Fir, Western Hemlock .....	9
Mixed Maple .....	Black Maple, Red Maple, Silver Maple, Sugar Maple.....	10
Mixed Oak .....	All Oak Species graded under NELMA rules .....	10
Mixed Southern Pine .....	Any species in the Southern Pine species combination, plus .....	11
	either or both of the following: Pond Pine, Virginia Pine	
Northern Red Oak.....	Black Oak, Northern Red Oak, Pin Oak, Scarlet Oak .....	11
Northern Species .....	All species graded under NLGA rules .....	12
	except Red Alder, White Birch, and Norway Spruce	
Northern White Cedar .....		12
Red Maple.....		13
Red Oak .....	Black Oak, Cherrybark Oak, Laurel Oak, Northern Red Oak, Pin.....	13
	Oak, Scarlet Oak, Southern Red Oak, Water Oak, Willow Oak	
Redwood .....		14
Southern Pine .....	Loblolly Pine, Longleaf Pine, Shortleaf Pine, Slash Pine.....	15
Spruce-Pine-Fir .....	Alpine Fir, Balsam Fir, Black Spruce, Engelmann Spruce, .....	16
	Jack Pine, Lodgepole Pine, Red Spruce, White Spruce	
Spruce-Pine-Fir (South) .....	Balsam Fir, Black Spruce, Engelmann Spruce, Jack Pine, .....	16
	Lodgepole Pine, Norway (Red) Pine, Red Spruce, Sitka Spruce, White Spruce	
Western Cedars .....	Alaska Cedar, Incense Cedar, Port Orford Cedar, .....	17
	Western Red Cedar	
Western Woods.....	Any species in the Douglas Fir-Larch, Douglas Fir-South, .....	17
	Hem-Fir, and Spruce-Pine-Fir (South) species combinations, plus any or all of the following: Alpine Fir, Idaho White Pine, Mountain Hemlock, Ponderosa Pine, and Sugar Pine	
White Oak .....	Bur Oak, Chestnut Oak, Live Oak, Overcup Oak, Post.....	18
	Oak, Swamp Chestnut Oak, Swamp White Oak, White Oak	
Yellow Cedar .....		18
Yellow Poplar.....		19
<b>Table W-2 Design Values for Joists and Rafters - Mechanically Graded Lumber .....</b>		<b>21</b>

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>ALASKA CEDAR</b>							
Select Structural	2x4	1,985	2,280	2,480	525	1,400,000	WCLIB
No. 1		1,680	1,935	2,100	525	1,300,000	
No. 2		1,380	1,585	1,725	525	1,200,000	
No. 3		775	895	970	525	1,100,000	
Stud		790	910	990	525	1,100,000	
Construction		1,035	1,190	1,295	525	1,200,000	
Standard		575	660	720	525	1,100,000	
Utility		290	330	360	525	1,000,000	
Select Structural	2x6	1,720	1,975	2,150	525	1,400,000	
No. 1		1,460	1,675	1,820	525	1,300,000	
No. 2		1,195	1,375	1,495	525	1,200,000	
No. 3		675	775	840	525	1,100,000	
Stud		720	825	900	525	1,100,000	
Select Structural	2x8	1,585	1,825	1,985	525	1,400,000	
No. 1		1,345	1,545	1,680	525	1,300,000	
No. 2		1,105	1,270	1,380	525	1,200,000	
No. 3		620	715	775	525	1,100,000	
Select Structural	2x10	1,455	1,675	1,820	525	1,400,000	
No. 1		1,235	1,420	1,540	525	1,300,000	
No. 2		1,010	1,165	1,265	525	1,200,000	
No. 3		570	655	710	525	1,100,000	
Select Structural	2x12	1,325	1,520	1,655	525	1,400,000	
No. 1		1,120	1,290	1,400	525	1,300,000	
No. 2		920	1,060	1,150	525	1,200,000	
No. 3		520	595	645	525	1,100,000	
<b>ALASKA HEMLOCK</b>							
Select Structural	2x4	2,245	2,580	2,805	440	1,700,000	WWPA
No. 1		1,555	1,785	1,940	440	1,600,000	
No. 2		1,425	1,635	1,780	440	1,500,000	
No. 3		820	940	1,025	440	1,400,000	
Stud		820	945	1,030	440	1,400,000	
Construction		1,095	1,255	1,365	440	1,400,000	
Standard		605	695	755	440	1,300,000	
Utility		290	330	360	440	1,200,000	
Select Structural	2x6	1,945	2,235	2,430	440	1,700,000	
No. 1		1,345	1,545	1,680	440	1,600,000	
No. 2		1,235	1,420	1,540	440	1,500,000	
No. 3		710	815	890	440	1,400,000	
Stud		750	860	935	440	1,400,000	
Select Structural	2x8	1,795	2,065	2,245	440	1,700,000	
No. 1		1,240	1,430	1,555	440	1,600,000	
No. 2		1,140	1,310	1,425	440	1,500,000	
No. 3		655	755	820	440	1,400,000	
Select Structural	2x10	1,645	1,890	2,055	440	1,700,000	
No. 1		1,140	1,310	1,425	440	1,600,000	
No. 2		1,045	1,200	1,305	440	1,500,000	
No. 3		600	690	750	440	1,400,000	
Select Structural	2x12	1,495	1,720	1,870	440	1,700,000	
No. 1		1,035	1,190	1,295	440	1,600,000	
No. 2		950	1,090	1,185	440	1,500,000	
No. 3		545	630	685	440	1,400,000	



**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>ALASKA SPRUCE</b>							
Select Structural	2x4	2,415	2,775	3,020	330	1,600,000	WWPA
No. 1		1,640	1,885	2,050	330	1,500,000	
No. 2		1,510	1,735	1,885	330	1,400,000	
No. 3		865	990	1,080	330	1,300,000	
Stud		855	980	1,065	330	1,300,000	
Construction Standard		1,150	1,325	1,440	330	1,300,000	
Standard		635	725	790	330	1,200,000	
Utility		315	365	395	330	1,100,000	
Select Structural	2x6	2,095	2,405	2,615	330	1,600,000	
No. 1		1,420	1,635	1,775	330	1,500,000	
No. 2		1,310	1,505	1,635	330	1,400,000	
No. 3		750	860	935	330	1,300,000	
Stud		775	895	970	330	1,300,000	
Select Structural	2x8	1,930	2,220	2,415	330	1,600,000	
No. 1		1,310	1,510	1,640	330	1,500,000	
No. 2		1,210	1,390	1,510	330	1,400,000	
No. 3		690	795	865	330	1,300,000	
Select Structural	2x10	1,770	2,035	2,215	330	1,600,000	
No. 1		1,200	1,380	1,500	330	1,500,000	
No. 2		1,105	1,275	1,385	330	1,400,000	
No. 3		635	725	790	330	1,300,000	
Select Structural	2x12	1,610	1,850	2,015	330	1,600,000	
No. 1		1,095	1,255	1,365	330	1,500,000	
No. 2		1,005	1,155	1,260	330	1,400,000	
No. 3		575	660	720	330	1,300,000	
<b>ALASKA YELLOW CEDAR</b>							
Select Structural	2x4	2,330	2,680	2,910	510	1,500,000	WCLIB WWPA
No. 1		1,555	1,785	1,940	510	1,400,000	
No. 2		1,380	1,585	1,725	510	1,300,000	
No. 3		820	940	1,025	510	1,200,000	
Stud		790	910	990	510	1,200,000	
Construction Standard		1,065	1,225	1,330	510	1,300,000	
Standard		575	660	720	510	1,100,000	
Utility		290	330	360	510	1,100,000	
Select Structural	2x6	2,020	2,320	2,525	510	1,500,000	
No. 1		1,345	1,545	1,680	510	1,400,000	
No. 2		1,195	1,375	1,495	510	1,300,000	
No. 3		710	815	890	510	1,200,000	
Stud		720	825	900	510	1,200,000	
Select Structural	2x8	1,865	2,140	2,330	510	1,500,000	
No. 1		1,240	1,430	1,555	510	1,400,000	
No. 2		1,105	1,270	1,380	510	1,300,000	
No. 3		655	755	820	510	1,200,000	
Select Structural	2x10	1,710	1,965	2,135	510	1,500,000	
No. 1		1,140	1,310	1,425	510	1,400,000	
No. 2		1,010	1,165	1,265	510	1,300,000	
No. 3		600	690	750	510	1,200,000	
Select Structural	2x12	1,555	1,785	1,940	510	1,500,000	
No. 1		1,035	1,190	1,295	510	1,400,000	
No. 2		920	1,060	1,150	510	1,300,000	
No. 3		545	630	685	510	1,200,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{cL}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>ASPEN</b>							
Select Structural	2x4	1,510	1,735	1,885	265	1,100,000	NELMA NSLB WWPA
No. 1		1,080	1,240	1,350	265	1,100,000	
No. 2		1,035	1,190	1,295	265	1,000,000	
No. 3		605	695	755	265	900,000	
Stud		600	690	750	265	900,000	
Construction Standard		805	925	1,005	265	900,000	
Standard		430	495	540	265	900,000	
Utility		200	230	250	265	800,000	
Select Structural	2x6	1,310	1,505	1,635	265	1,100,000	
No. 1		935	1,075	1,170	265	1,100,000	
No. 2		895	1,030	1,120	265	1,000,000	
No. 3		525	600	655	265	900,000	
Stud	545	630	685	265	900,000		
Select Structural	2x8	1,210	1,390	1,510	265	1,100,000	
No. 1		865	990	1,080	265	1,100,000	
No. 2		830	950	1,035	265	1,000,000	
No. 3		485	555	605	265	900,000	
Select Structural	2x10	1,105	1,275	1,385	265	1,100,000	
No. 1		790	910	990	265	1,100,000	
No. 2		760	875	950	265	1,000,000	
No. 3		445	510	555	265	900,000	
Select Structural	2x12	1,005	1,155	1,260	265	1,100,000	
No. 1		720	825	900	265	1,100,000	
No. 2		690	795	865	265	1,000,000	
No. 3		405	465	505	265	900,000	
<b>BALDCYPRESS</b>							
Select Structural	2x4	2,070	2,380	2,590	615	1,400,000	SPIB
No. 1		1,725	1,985	2,155	615	1,400,000	
No. 2		1,425	1,635	1,780	615	1,300,000	
No. 3		820	940	1,025	615	1,200,000	
Stud		820	945	1,030	615	1,200,000	
Construction Standard		1,065	1,225	1,330	615	1,200,000	
Standard		605	695	755	615	1,100,000	
Utility		290	330	360	615	1,000,000	
Select Structural	2x6	1,795	2,065	2,245	615	1,400,000	
No. 1		1,495	1,720	1,870	615	1,400,000	
No. 2		1,235	1,420	1,540	615	1,300,000	
No. 3		710	815	890	615	1,200,000	
Stud	750	860	935	615	1,200,000		
Select Structural	2x8	1,655	1,905	2,070	615	1,400,000	
No. 1		1,380	1,585	1,725	615	1,400,000	
No. 2		1,140	1,310	1,425	615	1,300,000	
No. 3		655	755	820	615	1,200,000	
Select Structural	2x10	1,520	1,745	1,900	615	1,400,000	
No. 1		1,265	1,455	1,580	615	1,400,000	
No. 2		1,045	1,200	1,305	615	1,300,000	
No. 3		600	690	750	615	1,200,000	
Select Structural	2x12	1,380	1,585	1,725	615	1,400,000	
No. 1		1,150	1,325	1,440	615	1,400,000	
No. 2		950	1,090	1,185	615	1,300,000	
No. 3		545	630	685	615	1,200,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>BEECH-BIRCH-HICKORY</b>							
Select Structural	2x4	2,500	2,875	3,125	715	1,700,000	NELMA
No. 1		1,810	2,085	2,265	715	1,600,000	
No. 2		1,725	1,985	2,155	715	1,500,000	
No. 3		990	1,140	1,240	715	1,300,000	
Stud		980	1,125	1,225	715	1,300,000	
Construction Standard		1,325	1,520	1,655	715	1,400,000	
Standard		750	860	935	715	1,300,000	
Utility		345	395	430	715	1,200,000	
Select Structural	2x6	2,170	2,495	2,710	715	1,700,000	
No. 1		1,570	1,805	1,960	715	1,600,000	
No. 2		1,495	1,720	1,870	715	1,500,000	
No. 3		860	990	1,075	715	1,300,000	
Stud		890	1,025	1,115	715	1,300,000	
Select Structural	2x8	2,000	2,300	2,500	715	1,700,000	
No. 1		1,450	1,665	1,810	715	1,600,000	
No. 2		1,380	1,585	1,725	715	1,500,000	
No. 3		795	915	990	715	1,300,000	
Select Structural	2x10	1,835	2,110	2,295	715	1,700,000	
No. 1		1,330	1,525	1,660	715	1,600,000	
No. 2		1,265	1,455	1,580	715	1,500,000	
No. 3		725	835	910	715	1,300,000	
Select Structural	2x12	1,670	1,920	2,085	715	1,700,000	
No. 1		1,210	1,390	1,510	715	1,600,000	
No. 2		1,150	1,325	1,440	715	1,500,000	
No. 3		660	760	825	715	1,300,000	
<b>COAST SITKA SPRUCE</b>							
Select Structural	2x4	2,245	2,580	2,805	455	1,700,000	NLGA
No. 1/No. 2		1,595	1,835	1,995	455	1,500,000	
No. 3		905	1,040	1,130	455	1,400,000	
Stud		915	1,055	1,145	455	1,400,000	
Construction Standard		1,210	1,390	1,510	455	1,400,000	
Standard		690	795	865	455	1,300,000	
Utility		315	365	395	455	1,200,000	
Select Structural	2x6	1,945	2,235	2,430	455	1,700,000	
No. 1/No. 2		1,385	1,590	1,730	455	1,500,000	
No. 3		785	905	980	455	1,400,000	
Stud		835	960	1,040	455	1,400,000	
Select Structural	2x8	1,795	2,065	2,245	455	1,700,000	
No. 1/No. 2		1,275	1,470	1,595	455	1,500,000	
No. 3		725	835	905	455	1,400,000	
Select Structural	2x10	1,645	1,890	2,055	455	1,700,000	
No. 1/No. 2		1,170	1,345	1,465	455	1,500,000	
No. 3		665	765	830	455	1,400,000	
Select Structural	2x12	1,495	1,720	1,870	455	1,700,000	
No. 1/No. 2		1,065	1,225	1,330	455	1,500,000	
No. 3		605	695	755	455	1,400,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>COTTONWOOD</b>							
Select Structural	2x4	1,510	1,735	1,885	320	1,200,000	NSLB
No. 1		1,080	1,240	1,350	320	1,200,000	
No. 2		1,080	1,240	1,350	320	1,100,000	
No. 3		605	695	755	320	1,000,000	
Stud		600	690	750	320	1,000,000	
Construction		805	925	1,005	320	1,000,000	
Standard		460	530	575	320	900,000	
Utility		200	230	250	320	900,000	
Select Structural	2x6	1,310	1,505	1,635	320	1,200,000	
No. 1		935	1,075	1,170	320	1,200,000	
No. 2		935	1,075	1,170	320	1,100,000	
No. 3		525	600	655	320	1,000,000	
Stud	545	630	685	320	1,000,000		
Select Structural	2x8	1,210	1,390	1,510	320	1,200,000	
No. 1		865	990	1,080	320	1,200,000	
No. 2		865	990	1,080	320	1,100,000	
No. 3		485	555	605	320	1,000,000	
Select Structural	2x10	1,105	1,275	1,385	320	1,200,000	
No. 1		790	910	990	320	1,200,000	
No. 2		790	910	990	320	1,100,000	
No. 3		445	510	555	320	1,000,000	
Select Structural	2x12	1,005	1,155	1,260	320	1,200,000	
No. 1		720	825	900	320	1,200,000	
No. 2		720	825	900	320	1,100,000	
No. 3		405	465	505	320	1,000,000	
<b>DOUGLAS FIR-LARCH</b>							
Select Structural	2x4	2,590	2,975	3,235	625	1,900,000	WCLIB WWPA
No. 1 & Btr		2,070	2,380	2,590	625	1,800,000	
No. 1		1,725	1,985	2,155	625	1,700,000	
No. 2		1,555	1,785	1,940	625	1,600,000	
No. 3		905	1,040	1,130	625	1,400,000	
Stud		885	1,020	1,105	625	1,400,000	
Construction		1,150	1,325	1,440	625	1,500,000	
Standard		660	760	825	625	1,400,000	
Utility		315	365	395	625	1,300,000	
Select Structural	2x6	2,245	2,580	2,805	625	1,900,000	
No. 1 & Btr		1,795	2,065	2,245	625	1,800,000	
No. 1		1,495	1,720	1,870	625	1,700,000	
No. 2		1,345	1,545	1,680	625	1,600,000	
No. 3		785	905	980	625	1,400,000	
Stud		805	925	1,005	625	1,400,000	
Select Structural	2x8	2,070	2,380	2,590	625	1,900,000	
No. 1 & Btr		1,655	1,905	2,070	625	1,800,000	
No. 1		1,380	1,585	1,725	625	1,700,000	
No. 2		1,240	1,430	1,555	625	1,600,000	
No. 3	725	835	905	625	1,400,000		
Select Structural	2x10	1,900	2,180	2,370	625	1,900,000	
No. 1 & Btr		1,520	1,745	1,900	625	1,800,000	
No. 1		1,265	1,455	1,580	625	1,700,000	
No. 2		1,140	1,310	1,425	625	1,600,000	
No. 3	665	765	830	625	1,400,000		
Select Structural	2x12	1,725	1,985	2,155	625	1,900,000	
No. 1 & Btr		1,380	1,585	1,725	625	1,800,000	
No. 1		1,150	1,325	1,440	625	1,700,000	
No. 2		1,035	1,190	1,295	625	1,600,000	
No. 3		605	695	755	625	1,400,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%.  
Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>DOUGLAS FIR-LARCH (NORTH)</b>							
Select Structural	2x4	2,330	2,680	2,910	625	1,900,000	NLGA
No. 1 & Btr		1,985	2,280	2,480	625	1,800,000	
No. 1/ No. 2		1,465	1,685	1,835	625	1,600,000	
No. 3		820	940	1,025	625	1,400,000	
Stud		820	945	1,030	625	1,400,000	
Construction Standard		1,095	1,255	1,365	625	1,500,000	
Standard		605	695	755	625	1,400,000	
Utility		290	330	360	625	1,300,000	
Select Structural	2x6	2,020	2,320	2,525	625	1,900,000	
No. 1 & Btr		1,720	1,975	2,150	625	1,800,000	
No. 1/ No. 2		1,270	1,460	1,590	625	1,600,000	
No. 3		710	815	890	625	1,400,000	
Stud		750	860	935	625	1,400,000	
Select Structural	2x8	1,865	2,140	2,330	625	1,900,000	
No. 1 & Btr		1,585	1,825	1,985	625	1,800,000	
No. 1/ No. 2		1,175	1,350	1,465	625	1,600,000	
No. 3		655	755	820	625	1,400,000	
Select Structural	2x10	1,710	1,965	2,135	625	1,900,000	
No. 1 & Btr		1,455	1,675	1,820	625	1,800,000	
No. 1/ No. 2		1,075	1,235	1,345	625	1,600,000	
No. 3		600	690	750	625	1,400,000	
Select Structural	2x12	1,555	1,785	1,940	625	1,900,000	
No. 1 & Btr		1,325	1,520	1,655	625	1,800,000	
No. 1/ No. 2		980	1,125	1,220	625	1,600,000	
No. 3		545	630	685	625	1,400,000	
<b>DOUGLAS FIR-SOUTH</b>							
Select Structural	2x4	2,330	2,680	2,910	520	1,400,000	WWPA
No. 1		1,595	1,835	1,995	520	1,300,000	
No. 2		1,465	1,685	1,835	520	1,200,000	
No. 3		865	990	1,080	520	1,100,000	
Stud		855	980	1,065	520	1,100,000	
Construction Standard		1,120	1,290	1,400	520	1,200,000	
Standard		635	725	790	520	1,100,000	
Utility		290	330	360	520	1,000,000	
Select Structural	2x6	2,020	2,320	2,525	520	1,400,000	
No. 1		1,385	1,590	1,730	520	1,300,000	
No. 2		1,270	1,460	1,590	520	1,200,000	
No. 3		750	860	935	520	1,100,000	
Stud		775	895	970	520	1,100,000	
Select Structural	2x8	1,865	2,140	2,330	520	1,400,000	
No. 1		1,275	1,470	1,595	520	1,300,000	
No. 2		1,175	1,350	1,465	520	1,200,000	
No. 3		690	795	865	520	1,100,000	
Select Structural	2x10	1,710	1,965	2,135	520	1,400,000	
No. 1		1,170	1,345	1,465	520	1,300,000	
No. 2		1,075	1,235	1,345	520	1,200,000	
No. 3		635	725	790	520	1,100,000	
Select Structural	2x12	1,555	1,785	1,940	520	1,400,000	
No. 1		1,065	1,225	1,330	520	1,300,000	
No. 2		980	1,125	1,220	520	1,200,000	
No. 3		575	660	720	520	1,100,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>EASTERN HEMLOCK-BALSAM FIR</b>							
Select Structural	2x4	2,155	2,480	2,695	335	1,200,000	NELMA NSLB
No. 1		1,335	1,535	1,670	335	1,100,000	
No. 2		990	1,140	1,240	335	1,100,000	
No. 3		605	695	755	335	900,000	
Stud		570	655	710	335	900,000	
Construction Standard		775	895	970	335	1,000,000	
Standard		430	495	540	335	900,000	
Utility		200	230	250	335	800,000	
Select Structural	2x6	1,870	2,150	2,335	335	1,200,000	
No. 1		1,160	1,330	1,450	335	1,100,000	
No. 2		860	990	1,075	335	1,100,000	
No. 3		525	600	655	335	900,000	
Stud	520	595	645	335	900,000		
Select Structural	2x8	1,725	1,985	2,155	335	1,200,000	
No. 1		1,070	1,230	1,335	335	1,100,000	
No. 2		795	915	990	335	1,100,000	
No. 3		485	555	605	335	900,000	
Select Structural	2x10	1,580	1,820	1,975	335	1,200,000	
No. 1		980	1,125	1,225	335	1,100,000	
No. 2		725	835	910	335	1,100,000	
No. 3		445	510	555	335	900,000	
Select Structural	2x12	1,440	1,655	1,795	335	1,200,000	
No. 1		890	1,025	1,115	335	1,100,000	
No. 2		660	760	825	335	1,100,000	
No. 3		405	465	505	335	900,000	
<b>EASTERN HEMLOCK-TAMARACK</b>							
Select Structural	2x4	2,155	2,480	2,695	555	1,200,000	NELMA NSLB
No. 1		1,335	1,535	1,670	555	1,100,000	
No. 2		990	1,140	1,240	555	1,100,000	
No. 3		605	695	755	555	900,000	
Stud		570	655	710	555	900,000	
Construction Standard		775	895	970	555	1,000,000	
Standard		430	495	540	555	900,000	
Utility		200	230	250	555	800,000	
Select Structural	2x6	1,870	2,150	2,335	555	1,200,000	
No. 1		1,160	1,330	1,450	555	1,100,000	
No. 2		860	990	1,075	555	1,100,000	
No. 3		525	600	655	555	900,000	
Stud	520	595	645	555	900,000		
Select Structural	2x8	1,725	1,985	2,155	555	1,200,000	
No. 1		1,070	1,230	1,335	555	1,100,000	
No. 2		795	915	990	555	1,100,000	
No. 3		485	555	605	555	900,000	
Select Structural	2x10	1,580	1,820	1,975	555	1,200,000	
No. 1		980	1,125	1,225	555	1,100,000	
No. 2		725	835	910	555	1,100,000	
No. 3		445	510	555	555	900,000	
Select Structural	2x12	1,440	1,655	1,795	555	1,200,000	
No. 1		890	1,025	1,115	555	1,100,000	
No. 2		660	760	825	555	1,100,000	
No. 3		405	465	505	555	900,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{cL}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>EASTERN SOFTWOODS</b>							
Select Structural	2x4	2,155	2,480	2,695	335	1,200,000	NELMA NSLB
No. 1		1,335	1,535	1,670	335	1,100,000	
No. 2		990	1,140	1,240	335	1,100,000	
No. 3		605	695	755	335	900,000	
Stud		570	655	710	335	900,000	
Construction		775	895	970	335	1,000,000	
Standard		430	495	540	335	900,000	
Utility		200	230	250	335	800,000	
Select Structural	2x6	1,870	2,150	2,335	335	1,200,000	
No. 1		1,160	1,330	1,450	335	1,100,000	
No. 2		860	990	1,075	335	1,100,000	
No. 3		525	600	655	335	900,000	
Stud	520	595	645	335	900,000		
Select Structural	2x8	1,725	1,985	2,155	335	1,200,000	
No. 1		1,070	1,230	1,335	335	1,100,000	
No. 2		795	915	990	335	1,100,000	
No. 3		485	555	605	335	900,000	
Select Structural	2x10	1,580	1,820	1,975	335	1,200,000	
No. 1		980	1,125	1,225	335	1,100,000	
No. 2		725	835	910	335	1,100,000	
No. 3		445	510	555	335	900,000	
Select Structural	2x12	1,440	1,655	1,795	335	1,200,000	
No. 1		890	1,025	1,115	335	1,100,000	
No. 2		660	760	825	335	1,100,000	
No. 3		405	465	505	335	900,000	
<b>EASTERN WHITE PINE</b>							
Select Structural	2x4	2,155	2,480	2,695	350	1,200,000	NELMA NSLB
No. 1		1,335	1,535	1,670	350	1,100,000	
No. 2		990	1,140	1,240	350	1,100,000	
No. 3		605	695	755	350	900,000	
Stud		570	655	710	350	900,000	
Construction		775	895	970	350	1,000,000	
Standard		430	495	540	350	900,000	
Utility		200	230	250	350	800,000	
Select Structural	2x6	1,870	2,150	2,335	350	1,200,000	
No. 1		1,160	1,330	1,450	350	1,100,000	
No. 2		860	990	1,075	350	1,100,000	
No. 3		525	600	655	350	900,000	
Stud	520	595	645	350	900,000		
Select Structural	2x8	1,725	1,985	2,155	350	1,200,000	
No. 1		1,070	1,230	1,335	350	1,100,000	
No. 2		795	915	990	350	1,100,000	
No. 3		485	555	605	350	900,000	
Select Structural	2x10	1,580	1,820	1,975	350	1,200,000	
No. 1		980	1,125	1,225	350	1,100,000	
No. 2		725	835	910	350	1,100,000	
No. 3		445	510	555	350	900,000	
Select Structural	2x12	1,440	1,655	1,795	350	1,200,000	
No. 1		890	1,025	1,115	350	1,100,000	
No. 2		660	760	825	350	1,100,000	
No. 3		405	465	505	350	900,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>HEM-FIR</b>							
Select Structural	2x4	2,415	2,775	3,020	405	1,600,000	WCLIB WWPA
No. 1 & Btr		1,900	2,180	2,370	405	1,500,000	
No. 1		1,680	1,935	2,100	405	1,500,000	
No. 2		1,465	1,685	1,835	405	1,300,000	
No. 3		865	990	1,080	405	1,200,000	
Stud		855	980	1,065	405	1,200,000	
Construction		1,120	1,290	1,400	405	1,300,000	
Standard		635	725	790	405	1,200,000	
Utility		290	330	360	405	1,100,000	
Select Structural	2x6	2,095	2,405	2,615	405	1,600,000	
No. 1 & Btr		1,645	1,890	2,055	405	1,500,000	
No. 1		1,460	1,675	1,820	405	1,500,000	
No. 2		1,270	1,460	1,590	405	1,200,000	
No. 3		750	860	935	405	1,200,000	
Stud	775	895	970	405	1,300,000		
Select Structural	2x8	1,930	2,220	2,415	405	1,600,000	
No. 1 & Btr		1,520	1,745	1,900	405	1,500,000	
No. 1		1,345	1,545	1,680	405	1,500,000	
No. 2		1,175	1,350	1,465	405	1,200,000	
No. 3		690	795	865	405	1,200,000	
Select Structural	2x10	1,770	2,035	2,215	405	1,600,000	
No. 1 & Btr		1,390	1,600	1,740	405	1,500,000	
No. 1		1,235	1,420	1,540	405	1,500,000	
No. 2		1,075	1,235	1,345	405	1,300,000	
No. 3		635	725	790	405	1,200,000	
Select Structural	2x12	1,610	1,850	2,015	405	1,600,000	
No. 1 & Btr		1,265	1,455	1,580	405	1,500,000	
No. 1		1,120	1,290	1,400	405	1,500,000	
No. 2		980	1,125	1,220	405	1,300,000	
No. 3		575	660	720	405	1,200,000	
<b>HEM-FIR (NORTH)</b>							
Select Structural	2x4	2,245	2,580	2,805	405	1,700,000	NLGA
No. 1 & Btr		2,070	2,380	2,590	405	1,700,000	
No. 1/No. 2		1,725	1,985	2,155	405	1,600,000	
No. 3		990	1,140	1,240	405	1,400,000	
Stud		980	1,125	1,225	405	1,400,000	
Construction		1,325	1,520	1,655	405	1,500,000	
Standard		750	860	935	405	1,400,000	
Utility		345	395	430	405	1,300,000	
Select Structural		2x6	1,945	2,235	2,430	405	
No. 1 & Btr	1,795		2,065	2,245	405	1,700,000	
No. 1/No. 2	1,495		1,720	1,870	405	1,600,000	
No. 3	860		990	1,075	405	1,400,000	
Stud	890		1,025	1,115	405	1,400,000	
Select Structural	2x8	1,795	2,065	2,245	405	1,700,000	
No. 1 & Btr		1,655	1,905	2,070	405	1,700,000	
No. 1/No. 2		1,380	1,585	1,725	405	1,600,000	
No. 3		795	915	990	405	1,400,000	
Stud		795	915	990	405	1,400,000	
Select Structural	2x10	1,645	1,890	2,055	405	1,700,000	
No. 1 & Btr		1,520	1,745	1,900	405	1,700,000	
No. 1/No. 2		1,265	1,455	1,580	405	1,600,000	
No. 3		725	835	910	405	1,400,000	
Stud		725	835	910	405	1,400,000	
Select Structural	2x12	1,495	1,720	1,870	405	1,700,000	
No. 1 & Btr		1,380	1,585	1,725	405	1,700,000	
No. 1/No. 2		1,150	1,325	1,440	405	1,600,000	
No. 3		660	760	825	405	1,400,000	
Stud		660	760	825	405	1,400,000	



**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%.

Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>MIXED MAPLE</b>							
Select Structural	2x4	1,725	1,985	2,155	620	1,300,000	NELMA
No. 1		1,250	1,440	1,565	620	1,200,000	
No. 2		1,210	1,390	1,510	620	1,100,000	
No. 3		690	795	865	620	1,000,000	
Stud		695	800	870	620	1,000,000	
Construction		920	1,060	1,150	620	1,100,000	
Standard		520	595	645	620	1,000,000	
Utility		260	300	325	620	900,000	
Select Structural	2x6	1,495	1,720	1,870	620	1,300,000	
No. 1		1,085	1,245	1,355	620	1,200,000	
No. 2		1,045	1,205	1,310	620	1,100,000	
No. 3		600	690	750	620	1,000,000	
Stud	635	725	790	620	1,000,000		
Select Structural	2x8	1,380	1,585	1,725	620	1,300,000	
No. 1		1,000	1,150	1,250	620	1,200,000	
No. 2		965	1,110	1,210	620	1,100,000	
No. 3		550	635	690	620	1,000,000	
Select Structural	2x10	1,265	1,455	1,580	620	1,300,000	
No. 1		915	1,055	1,145	620	1,200,000	
No. 2		885	1,020	1,105	620	1,100,000	
No. 3		505	580	635	620	1,000,000	
Select Structural	2x12	1,150	1,325	1,440	620	1,300,000	
No. 1		835	960	1,040	620	1,200,000	
No. 2		805	925	1,005	620	1,100,000	
No. 3		460	530	575	620	1,000,000	
<b>MIXED OAK</b>							
Select Structural	2x4	1,985	2,280	2,480	800	1,100,000	NELMA
No. 1		1,425	1,635	1,780	800	1,000,000	
No. 2		1,380	1,585	1,725	800	900,000	
No. 3		820	940	1,025	800	800,000	
Stud		790	910	990	800	800,000	
Construction		1,065	1,225	1,330	800	900,000	
Standard		605	695	755	800	800,000	
Utility		290	330	360	800	800,000	
Select Structural	2x6	1,720	1,975	2,150	800	1,100,000	
No. 1		1,235	1,420	1,540	800	1,000,000	
No. 2		1,195	1,375	1,495	800	900,000	
No. 3		710	815	890	800	800,000	
Stud		720	825	900	800	800,000	
Select Structural	2x8	1,585	1,825	1,985	800	1,100,000	
No. 1		1,140	1,310	1,425	800	1,000,000	
No. 2		1,105	1,270	1,380	800	900,000	
No. 3		655	755	820	800	800,000	
Select Structural	2x10	1,455	1,675	1,820	800	1,100,000	
No. 1		1,045	1,200	1,305	800	1,000,000	
No. 2		1,010	1,165	1,265	800	900,000	
No. 3		600	690	750	800	800,000	
Select Structural	2x12	1,325	1,520	1,655	800	1,100,000	
No. 1		950	1,090	1,185	800	1,000,000	
No. 2		920	1,060	1,150	800	900,000	
No. 3		545	630	685	800	800,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>MIXED SOUTHERN PINE</b>							
Select Structural	2x4	2,360	2,710	2,945	565	1,600,000	SPIB
No.1		1,670	1,920	2,085	565	1,500,000	
No.2		1,495	1,720	1,870	565	1,400,000	
No.3 and Stud		865	990	1,080	565	1,200,000	
Construction		1,150	1,325	1,440	565	1,300,000	
Standard		635	725	790	565	1,200,000	
Utility		315	365	395	565	1,100,000	
Select Structural	2x6	2,130	2,445	2,660	565	1,600,000	
No.1		1,495	1,720	1,870	565	1,500,000	
No.2		1,325	1,520	1,655	565	1,400,000	
No.3 and Stud		775	895	970	565	1,200,000	
Select Structural	2x8	2,015	2,315	2,515	565	1,600,000	
No.1		1,380	1,585	1,725	565	1,500,000	
No.2		1,210	1,390	1,510	565	1,400,000	
No.3 and Stud		720	825	900	565	1,200,000	
Select Structural	2x10	1,725	1,985	2,155	565	1,600,000	
No.1		1,210	1,390	1,510	565	1,500,000	
No.2		1,065	1,225	1,330	565	1,400,000	
No.3 and Stud		605	695	755	565	1,200,000	
Select Structural	2x12	1,610	1,850	2,015	565	1,600,000	
No.1		1,120	1,290	1,400	565	1,500,000	
No.2		1,005	1,155	1,260	565	1,400,000	
No.3 and Stud		575	660	720	565	1,200,000	
<b>NORTHERN RED OAK</b>							
Select Structural	2x4	2,415	2,775	3,020	885	1,400,000	NELMA
No. 1		1,725	1,985	2,155	885	1,400,000	
No. 2		1,680	1,935	2,100	885	1,300,000	
No. 3		950	1,090	1,185	885	1,200,000	
Stud		950	1,090	1,185	885	1,200,000	
Construction		1,265	1,455	1,580	885	1,200,000	
Standard		720	825	900	885	1,100,000	
Utility	345	395	430	885	1,000,000		
Select Structural	2x6	2,095	2,405	2,615	885	1,400,000	
No. 1		1,495	1,720	1,870	885	1,400,000	
No. 2		1,460	1,675	1,820	885	1,300,000	
No. 3		820	945	1,030	885	1,200,000	
Stud	865	990	1,080	885	1,200,000		
Select Structural	2x8	1,930	2,220	2,415	885	1,400,000	
No. 1		1,380	1,585	1,725	885	1,400,000	
No. 2		1,345	1,545	1,680	885	1,300,000	
No. 3		760	875	950	885	1,200,000	
Select Structural	2x10	1,770	2,035	2,215	885	1,400,000	
No. 1		1,265	1,455	1,580	885	1,400,000	
No. 2		1,235	1,420	1,540	885	1,300,000	
No. 3		695	800	870	885	1,200,000	
Select Structural	2x12	1,610	1,850	2,015	885	1,400,000	
No. 1		1,150	1,325	1,440	885	1,400,000	
No. 2		1,120	1,290	1,400	885	1,300,000	
No. 3		635	725	790	885	1,200,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>NORTHERN SPECIES</b>							
Select Structural	2x4	1,680	1,935	2,100	350	1,100,000	NLGA
No. 1/No. 2		1,080	1,240	1,350	350	1,100,000	
No. 3		605	695	755	350	1,000,000	
Stud		600	690	750	350	1,000,000	
Construction		805	925	1,005	350	1,000,000	
Standard		460	530	575	350	900,000	
Utility		200	230	250	350	900,000	
Select Structural	2x6	1,460	1,675	1,820	350	1,100,000	
No. 1/No. 2		935	1,075	1,170	350	1,100,000	
No. 3		525	600	655	350	1,000,000	
Stud		545	630	685	350	1,000,000	
Select Structural	2x8	1,345	1,545	1,680	350	1,100,000	
No. 1/No. 2		865	990	1,080	350	1,100,000	
No. 3		485	555	605	350	1,000,000	
Select Structural	2x10	1,235	1,420	1,540	350	1,100,000	
No. 1/No. 2		790	910	990	350	1,100,000	
No. 3		445	510	555	350	1,000,000	
Select Structural	2x12	1,120	1,290	1,400	350	1,100,000	
No. 1/No. 2		720	825	900	350	1,100,000	
No. 3		405	465	505	350	1,000,000	
<b>NORTHERN WHITE CEDAR</b>							
Select Structural	2x4	1,335	1,535	1,670	370	800,000	NELMA
No. 1		990	1,140	1,240	370	700,000	
No. 2		950	1,090	1,185	370	700,000	
No. 3		560	645	700	370	600,000	
Stud		540	620	670	370	600,000	
Construction		720	825	900	370	700,000	
Standard		405	465	505	370	600,000	
Utility		200	230	250	370	600,000	
Select Structural	2x6	1,160	1,330	1,450	370	800,000	
No. 1		860	990	1,075	370	700,000	
No. 2		820	945	1,030	370	700,000	
No. 3		485	560	605	370	600,000	
Stud		490	560	610	370	600,000	
Select Structural	2x8	1,070	1,230	1,335	370	800,000	
No. 1		795	915	990	370	700,000	
No. 2		760	875	950	370	700,000	
No. 3		450	515	560	370	600,000	
Select Structural	2x10	980	1,125	1,225	370	800,000	
No. 1		725	835	910	370	700,000	
No. 2		695	800	870	370	700,000	
No. 3		410	475	515	370	600,000	
Select Structural	2x12	890	1,025	1,115	370	800,000	
No. 1		660	760	825	370	700,000	
No. 2		635	725	790	370	700,000	
No. 3		375	430	465	370	600,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{cL}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>RED MAPLE</b>							
Select Structural	2x4	2,245	2,580	2,805	615	1,700,000	NELMA
No. 1		1,595	1,835	1,995	615	1,600,000	
No. 2		1,555	1,785	1,940	615	1,500,000	
No. 3		905	1,040	1,130	615	1,300,000	
Stud		885	1,020	1,105	615	1,300,000	
Construction Standard		1,210	1,390	1,510	615	1,400,000	
Standard		660	760	825	615	1,300,000	
Utility		315	365	395	615	1,200,000	
Select Structural	2x6	1,945	2,235	2,430	615	1,700,000	
No. 1		1,385	1,590	1,730	615	1,600,000	
No. 2		1,345	1,545	1,680	615	1,500,000	
No. 3		785	905	980	615	1,300,000	
Stud		805	925	1,005	615	1,300,000	
Select Structural	2x8	1,795	2,065	2,245	615	1,700,000	
No. 1		1,275	1,470	1,595	615	1,600,000	
No. 2		1,240	1,430	1,555	615	1,500,000	
No. 3		725	835	905	615	1,300,000	
Select Structural	2x10	1,645	1,890	2,055	615	1,700,000	
No. 1		1,170	1,345	1,465	615	1,600,000	
No. 2		1,140	1,310	1,425	615	1,500,000	
No. 3		665	765	830	615	1,300,000	
Select Structural	2x12	1,495	1,720	1,870	615	1,700,000	
No. 1		1,065	1,225	1,330	615	1,600,000	
No. 2		1,035	1,190	1,295	615	1,500,000	
No. 3		605	695	755	615	1,300,000	
<b>RED OAK</b>							
Select Structural	2x4	1,985	2,280	2,480	820	1,400,000	NELMA
No. 1		1,425	1,635	1,780	820	1,300,000	
No. 2		1,380	1,585	1,725	820	1,200,000	
No. 3		820	940	1,025	820	1,100,000	
Stud		790	910	990	820	1,100,000	
Construction Standard		1,065	1,225	1,330	820	1,200,000	
Standard		605	695	755	820	1,100,000	
Utility		290	330	360	820	1,000,000	
Select Structural	2x6	1,720	1,975	2,150	820	1,400,000	
No. 1		1,235	1,420	1,540	820	1,300,000	
No. 2		1,195	1,375	1,495	820	1,200,000	
No. 3		710	815	890	820	1,100,000	
Stud		720	825	900	820	1,100,000	
Select Structural	2x8	1,585	1,825	1,985	820	1,400,000	
No. 1		1,140	1,310	1,425	820	1,300,000	
No. 2		1,105	1,270	1,380	820	1,200,000	
No. 3		655	755	820	820	1,100,000	
Select Structural	2x10	1,455	1,675	1,820	820	1,400,000	
No. 1		1,045	1,200	1,305	820	1,300,000	
No. 2		1,010	1,165	1,265	820	1,200,000	
No. 3		600	690	750	820	1,100,000	
Select Structural	2x12	1,325	1,520	1,655	820	1,400,000	
No. 1		950	1,090	1,185	820	1,300,000	
No. 2		920	1,060	1,150	820	1,200,000	
No. 3		545	630	685	820	1,100,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%.  
Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>REDWOOD</b>							
Clear Structural	2x4	3,020	3,470	3,775	650	1,400,000	RIS
Select Structural		2,330	2,680	2,910	650	1,400,000	
Select Structural, open grain		1,900	2,180	2,370	425	1,100,000	
No. 1		1,680	1,935	2,100	650	1,300,000	
No. 1, open grain		1,335	1,535	1,670	425	1,100,000	
No. 2		1,595	1,835	1,995	650	1,200,000	
No. 2, open grain		1,250	1,440	1,565	425	1,000,000	
No. 3		905	1,040	1,130	650	1,100,000	
No. 3, open grain		735	845	915	425	900,000	
Stud		725	835	910	425	900,000	
Construction		950	1,090	1,185	425	900,000	
Standard		520	595	645	425	900,000	
Utility		260	300	325	425	800,000	
Clear Structural		2x6	2,615	3,010	3,270	650	
Select Structural	2,020		2,320	2,525	650	1,400,000	
Select Structural, open grain	1,645		1,890	2,055	425	1,100,000	
No. 1	1,460		1,675	1,820	650	1,300,000	
No. 1, open grain	1,160		1,330	1,450	425	1,100,000	
No. 2	1,385		1,590	1,730	650	1,200,000	
No. 2, open grain	1,085		1,245	1,355	425	1,000,000	
No. 3	785		905	980	650	1,100,000	
No. 3, open grain	635		730	795	425	900,000	
Stud	660		760	825	425	900,000	
Clear Structural	2x8	2,415	2,775	3,020	650	1,400,000	
Select Structural		1,865	2,140	2,330	650	1,400,000	
Select Structural, open grain		1,520	1,745	1,900	425	1,100,000	
No. 1		1,345	1,545	1,680	650	1,300,000	
No. 1, open grain		1,070	1,230	1,335	425	1,100,000	
No. 2		1,275	1,470	1,595	650	1,200,000	
No. 2, open grain		1,000	1,150	1,250	425	1,000,000	
No. 3		725	835	905	650	1,100,000	
No. 3, open grain		585	675	735	425	900,000	
Clear Structural		2x10	2,215	2,545	2,765	650	
Select Structural	1,710		1,965	2,135	650	1,400,000	
Select Structural, open grain	1,390		1,600	1,740	425	1,100,000	
No. 1	1,235		1,420	1,540	650	1,300,000	
No. 1, open grain	980		1,125	1,225	425	1,100,000	
No. 2	1,170		1,345	1,465	650	1,200,000	
No. 2, open grain	915		1,055	1,145	425	1,000,000	
No. 3	665		765	830	650	1,100,000	
No. 3, open grain	540		620	670	425	900,000	
Clear Structural	2x12		2,015	2,315	2,515	650	
Select Structural		1,555	1,785	1,940	650	1,400,000	
Select Structural, open grain		1,265	1,455	1,580	425	1,100,000	
No. 1		1,120	1,290	1,400	650	1,300,000	
No. 1, open grain		890	1,025	1,115	425	1,100,000	
No. 2		1,065	1,225	1,330	650	1,200,000	
No. 2, open grain		835	960	1,040	425	1,000,000	
No. 3		605	695	755	650	1,100,000	
No. 3, open grain		490	560	610	425	900,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>SOUTHERN PINE</b>							
Dense Select Structural	2x4	3,510	4,035	4,385	660	1,900,000	SPIB
Select Structural		3,280	3,770	4,095	565	1,800,000	
Non-Dense Select Structural		3,050	3,505	3,810	480	1,700,000	
No.1 Dense		2,300	2,645	2,875	660	1,800,000	
No.1		2,130	2,445	2,660	565	1,700,000	
No.1 Non-Dense		1,955	2,250	2,445	480	1,600,000	
No.2 Dense		1,955	2,250	2,445	660	1,700,000	
No.2		1,725	1,985	2,155	565	1,600,000	
No.2 Non-Dense		1,555	1,785	1,940	480	1,400,000	
No.3 and Stud		980	1,125	1,220	565	1,400,000	
Construction Standard		1,265	1,455	1,580	565	1,500,000	
Utility		720	825	900	565	1,300,000	
			345	395	430	565	
Dense Select Structural	2x6	3,105	3,570	3,880	660	1,900,000	
Select Structural		2,935	3,370	3,665	565	1,800,000	
Non-Dense Select Structural		2,705	3,110	3,380	480	1,700,000	
No.1 Dense		2,015	2,315	2,515	660	1,800,000	
No.1		1,900	2,180	2,370	565	1,700,000	
No.1 Non-Dense		1,725	1,985	2,155	480	1,600,000	
No.2 Dense		1,670	1,920	2,085	660	1,700,000	
No.2		1,440	1,655	1,795	565	1,600,000	
No.2 Non-Dense		1,325	1,520	1,655	480	1,400,000	
No.3 and Stud	865	990	1,080	565	1,400,000		
Dense Select Structural	2x8	2,820	3,240	3,520	660	1,900,000	
Select Structural		2,645	3,040	3,305	565	1,800,000	
Non-Dense Select Structural		2,415	2,775	3,020	480	1,700,000	
No.1 Dense		1,900	2,180	2,370	660	1,800,000	
No.1		1,725	1,985	2,155	565	1,700,000	
No.1 Non-Dense		1,555	1,785	1,940	480	1,600,000	
No.2 Dense		1,610	1,850	2,015	660	1,700,000	
No.2		1,380	1,585	1,725	565	1,600,000	
No.2 Non-Dense		1,265	1,455	1,580	480	1,400,000	
No.3 and Stud	805	925	1,005	565	1,400,000		
Dense Select Structural	2x10	2,475	2,845	3,090	660	1,900,000	
Select Structural		2,360	2,710	2,945	565	1,800,000	
Non-Dense Select Structural		2,130	2,445	2,660	480	1,700,000	
No.1 Dense		1,670	1,920	2,085	660	1,800,000	
No.1		1,495	1,720	1,870	565	1,700,000	
No.1 Non-Dense		1,380	1,585	1,725	480	1,600,000	
No.2 Dense		1,380	1,585	1,725	660	1,700,000	
No.2		1,210	1,390	1,510	565	1,600,000	
No.2 Non-Dense		1,095	1,255	1,365	480	1,400,000	
No.3 and Stud	690	795	865	565	1,400,000		
Dense Select Structural	2x12	2,360	2,710	2,945	660	1,900,000	
Select Structural		2,185	2,515	2,730	565	1,800,000	
Non-Dense Select Structural		2,015	2,315	2,515	480	1,700,000	
No.1 Dense		1,555	1,785	1,940	660	1,800,000	
No.1		1,440	1,655	1,795	565	1,700,000	
No.1 Non-Dense		1,325	1,520	1,655	480	1,600,000	
No.2 Dense		1,325	1,520	1,655	660	1,700,000	
No.2		1,120	1,290	1,400	565	1,600,000	
No.2 Non-Dense		1,035	1,190	1,295	480	1,400,000	
No.3 and Stud	660	760	825	565	1,400,000		

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%.  
Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>SPRUCE-PINE-FIR</b>							
Select Structural	2x4	2,155	2,480	2,695	425	1,500,000	NLGA
No. 1/ No. 2		1,510	1,735	1,885	425	1,400,000	
No. 3		865	990	1,080	425	1,200,000	
Stud		855	980	1,065	425	1,200,000	
Construction Standard		1,150	1,325	1,440	425	1,300,000	
Standard		635	725	790	425	1,200,000	
Utility		315	365	395	425	1,100,000	
Select Structural	2x6	1,870	2,150	2,335	425	1,500,000	
No. 1/ No. 2		1,310	1,505	1,635	425	1,400,000	
No. 3		750	860	935	425	1,200,000	
Stud		775	895	970	425	1,200,000	
Select Structural	2x8	1,725	1,985	2,155	425	1,500,000	
No. 1/ No. 2		1,210	1,390	1,510	425	1,400,000	
No. 3		690	795	865	425	1,200,000	
Select Structural	2x10	1,580	1,820	1,975	425	1,500,000	
No. 1/ No. 2		1,105	1,275	1,385	425	1,400,000	
No. 3		635	725	790	425	1,200,000	
Select Structural	2x12	1,440	1,655	1,795	425	1,500,000	
No. 1/ No. 2		1,005	1,155	1,260	425	1,400,000	
No. 3		575	660	720	425	1,200,000	
<b>SPRUCE-PINE-FIR (SOUTH)</b>							
Select Structural	2x4	2,245	2,580	2,805	335	1,300,000	NELMA NSLB WCLIB WWPA
No. 1		1,510	1,735	1,885	335	1,200,000	
No. 2		1,335	1,535	1,670	335	1,100,000	
No. 3		775	895	970	335	1,000,000	
Stud		760	875	950	335	1,000,000	
Construction Standard		1,005	1,155	1,260	335	1,000,000	
Standard		575	660	720	335	900,000	
Utility	260	300	325	335	900,000		
Select Structural	2x6	1,945	2,235	2,430	335	1,300,000	
No. 1		1,310	1,505	1,635	335	1,200,000	
No. 2		1,160	1,330	1,450	335	1,100,000	
No. 3		675	775	840	335	1,000,000	
Stud		690	795	865	335	1,000,000	
Select Structural	2x8	1,795	2,065	2,245	335	1,300,000	
No. 1		1,210	1,390	1,510	335	1,200,000	
No. 2		1,070	1,230	1,335	335	1,100,000	
No. 3		620	715	775	335	1,000,000	
Select Structural	2x10	1,645	1,890	2,055	335	1,300,000	
No. 1		1,105	1,275	1,385	335	1,200,000	
No. 2		980	1,125	1,225	335	1,100,000	
No. 3		570	655	710	335	1,000,000	
Select Structural	2x12	1,495	1,720	1,870	335	1,300,000	
No. 1		1,005	1,155	1,260	335	1,200,000	
No. 2		890	1,025	1,115	335	1,100,000	
No. 3		520	595	645	335	1,000,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>WESTERN CEDARS</b>							
Select Structural	2x4	1,725	1,985	2,155	425	1,100,000	WCLIB WWPA
No. 1		1,250	1,440	1,565	425	1,000,000	
No. 2		1,210	1,390	1,510	425	1,000,000	
No. 3		690	795	865	425	900,000	
Stud		695	800	870	425	900,000	
Construction Standard		920	1,060	1,150	425	900,000	
Standard		520	595	645	425	800,000	
Utility		260	300	325	425	800,000	
Select Structural	2x6	1,495	1,720	1,870	425	1,100,000	
No. 1		1,085	1,245	1,355	425	1,000,000	
No. 2		1,045	1,205	1,310	425	1,000,000	
No. 3		600	690	750	425	900,000	
Stud		635	725	790	425	900,000	
Select Structural	2x8	1,380	1,585	1,725	425	1,100,000	
No. 1		1,000	1,150	1,250	425	1,000,000	
No. 2		965	1,110	1,210	425	1,000,000	
No. 3		550	635	690	425	900,000	
Select Structural	2x10	1,265	1,455	1,580	425	1,100,000	
No. 1		915	1,055	1,145	425	1,000,000	
No. 2		885	1,020	1,105	425	1,000,000	
No. 3		505	580	635	425	900,000	
Select Structural	2x12	1,150	1,325	1,440	425	1,100,000	
No. 1		835	960	1,040	425	1,000,000	
No. 2		805	925	1,005	425	1,000,000	
No. 3		460	530	575	425	900,000	
<b>WESTERN WOODS</b>							
Select Structural	2x4	1,555	1,785	1,940	335	1,200,000	WCLIB WWPA
No. 1		1,165	1,340	1,455	335	1,100,000	
No. 2		1,165	1,340	1,455	335	1,000,000	
No. 3		645	745	810	335	900,000	
Stud		665	765	830	335	900,000	
Construction Standard		890	1,025	1,115	335	1,000,000	
Standard		490	560	610	335	900,000	
Utility		230	265	290	335	800,000	
Select Structural	2x6	1,345	1,545	1,680	335	1,200,000	
No. 1		1,010	1,160	1,260	335	1,100,000	
No. 2		1,010	1,160	1,260	335	1,000,000	
No. 3		560	645	700	335	900,000	
Stud		605	695	755	335	900,000	
Select Structural	2x8	1,240	1,430	1,555	335	1,200,000	
No. 1		930	1,070	1,165	335	1,100,000	
No. 2		930	1,070	1,165	335	1,000,000	
No. 3		520	595	645	335	900,000	
Select Structural	2x10	1,140	1,310	1,425	335	1,200,000	
No. 1		855	980	1,065	335	1,100,000	
No. 2		855	980	1,065	335	1,000,000	
No. 3		475	545	595	335	900,000	
Select Structural	2x12	1,035	1,190	1,295	335	1,200,000	
No. 1		775	895	970	335	1,100,000	
No. 2		775	895	970	335	1,000,000	
No. 3		430	495	540	335	900,000	



**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>WHITE OAK</b>							
Select Structural	2x4	2,070	2,380	2,590	800	1,100,000	NELMA
No. 1		1,510	1,735	1,885	800	1,000,000	
No. 2		1,465	1,685	1,835	800	900,000	
No. 3		820	940	1,025	800	800,000	
Stud		820	945	1,030	800	800,000	
Construction Standard		1,095	1,255	1,365	800	900,000	
Standard		605	695	755	800	800,000	
Utility		290	330	360	800	800,000	
Select Structural	2x6	1,795	2,065	2,245	800	1,100,000	
No. 1		1,310	1,505	1,635	800	1,000,000	
No. 2		1,270	1,460	1,590	800	900,000	
No. 3		710	815	890	800	800,000	
Stud	750	860	935	800	800,000		
Select Structural	2x8	1,655	1,905	2,070	800	1,100,000	
No. 1		1,210	1,390	1,510	800	1,000,000	
No. 2		1,175	1,350	1,465	800	900,000	
No. 3		655	755	820	800	800,000	
Select Structural	2x10	1,520	1,745	1,900	800	1,100,000	
No. 1		1,105	1,275	1,385	800	1,000,000	
No. 2		1,075	1,235	1,345	800	900,000	
No. 3		600	690	750	800	800,000	
Select Structural	2x12	1,380	1,585	1,725	800	1,100,000	
No. 1		1,005	1,155	1,260	800	1,000,000	
No. 2		980	1,125	1,220	800	900,000	
No. 3		545	630	685	800	800,000	
<b>YELLOW CEDAR</b>							
Select Structural	2x4	2,070	2,380	2,590	540	1,600,000	NLGA
No. 1/ No. 2		1,380	1,585	1,725	540	1,400,000	
No. 3		820	940	1,025	540	1,200,000	
Stud		790	910	990	540	1,200,000	
Construction Standard		1,065	1,225	1,330	540	1,300,000	
Standard		605	695	755	540	1,200,000	
Utility		290	330	360	540	1,100,000	
Select Structural		2x6	1,795	2,065	2,245	540	
No. 1/ No. 2	1,195		1,375	1,495	540	1,400,000	
No. 3	710		815	890	540	1,200,000	
Stud	720		825	900	540	1,200,000	
Select Structural	2x8	1,655	1,905	2,070	540	1,600,000	
No. 1/ No. 2		1,105	1,270	1,380	540	1,400,000	
No. 3		655	755	820	540	1,200,000	
Select Structural	2x10	1,520	1,745	1,900	540	1,600,000	
No. 1/ No. 2		1,010	1,165	1,265	540	1,400,000	
No. 3		600	690	750	540	1,200,000	
Select Structural	2x12	1,380	1,585	1,725	540	1,600,000	
No. 1/ No. 2		920	1,060	1,150	540	1,400,000	
No. 3		545	630	685	540	1,200,000	

**TABLE W-1 DESIGN VALUES FOR JOISTS AND RAFTERS - VISUALLY GRADED LUMBER<sup>1,2</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the  $F_b$  values shall be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, $F_b$			Compression perpendicular to grain, $F_{c\perp}$	Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading			
<b>YELLOW POPLAR</b>							
Select Structural	2x4	1,725	1,985	2,155	420	1,500,000	NSLB
No. 1		1,250	1,440	1,565	420	1,400,000	
No. 2		1,210	1,390	1,510	420	1,300,000	
No. 3		690	795	865	420	1,200,000	
Stud		695	800	870	420	1,200,000	
Construction Standard		920	1,060	1,150	420	1,300,000	
Standard		520	595	645	420	1,100,000	
Utility		230	265	290	420	1,100,000	
Select Structural	2x6	1,495	1,720	1,870	420	1,500,000	
No. 1		1,085	1,245	1,355	420	1,400,000	
No. 2		1,045	1,205	1,310	420	1,300,000	
No. 3		600	690	750	420	1,200,000	
Stud		635	725	790	420	1,200,000	
Select Structural	2x8	1,380	1,585	1,725	420	1,500,000	
No. 1		1,000	1,150	1,250	420	1,400,000	
No. 2		965	1,110	1,210	420	1,300,000	
No. 3		550	635	690	420	1,200,000	
Select Structural	2x10	1,265	1,455	1,580	420	1,500,000	
No. 1		915	1,055	1,145	420	1,400,000	
No. 2		885	1,020	1,105	420	1,300,000	
No. 3		505	580	635	420	1,200,000	
Select Structural	2x12	1,150	1,325	1,440	420	1,500,000	
No. 1		835	960	1,040	420	1,400,000	
No. 2		805	925	1,005	420	1,300,000	
No. 3		460	530	575	420	1,200,000	

**TABLE W-1 FOOTNOTES - VISUALLY GRADED LUMBER**

1. When dimension lumber is used where moisture content will exceed 19% for an extended time period,  $F_b$  shall be multiplied by 0.85 if  $F_b$  exceeds 1150 psi, and E shall be multiplied by 0.9.

2. Following is a list of agencies certified by the American Lumber Standard Committee Board of Review (as of 2011) for inspection and grading of untreated lumber under the rules indicated. For the most up-to-date list of certified agencies contact:

American Lumber Standard Committee  
P.O. Box 210  
Germantown, Maryland 20874  
www.alsc.org

**Rules for which grading  
is authorized**

**Rules Writing Agencies**

Northeastern Lumber Manufacturers Association (NELMA) ...	NELMA, NLGA, NSLB, SPIB, WCLIB, WWPA
272 Tuttle Road, P.O. Box 87A, Cumberland Center, Maine 04021	
Northern Softwood Lumber Bureau (NSLB).....	NLGA, NSLB, WCLIB, WWPA
272 Tuttle Road, P.O. Box 87A, Cumberland Center, Maine 04021	
Redwood Inspection Service (RIS) .....	RIS, WCLIB, WWPA
818 Grayson Road, Suite 201, Pleasant Hill, CA 94523	
Southern Pine Inspection Bureau (SPIB) .....	NELMA, NLGA, NSLB, SPIB, WCLIB, WWPA
4709 Scenic Highway, Pensacola, Florida 32504	
West Coast Lumber Inspection Bureau (WCLIB) .....	NLGA, RIS, SPIB, WCLIB, WWPA
6980 SW Varnes Road, P.O. Box 23145, Tigard, Oregon 97223	
Western Wood Products Association (WWPA).....	NELMA, NLGA, RIS, SPIB, WCLIB, WWPA
522 S.W. 5th Avenue, Yeon Building, Portland, OR 97204	
National Lumber Grades Authority (NLGA)	
13401-108th Avenue, Suite 105, Surrey, BC, Canada V3T 5T3	

**Non-Rules Writing Agencies**

American Institute of Timber Construction.....	NLGA, SPIB, WCLIB, WWPA
Continental Inspection Agency, LLC .....	NLGA, RIS, WCLIB, WWPA
Pacific Lumber Inspection Bureau, Inc .....	NLGA, RIS, WCLIB, WWPA
Renewable Resource Associates, Inc. ....	NELMA, NLGA, NSLB, SPIB, WCLIB, WWPA
Stafford Inspection and Consulting, LLC .....	NELMA, NLGA, NSLB, SPIB, WCLIB, WWPA
Timber Products Inspection.....	NELMA, NLGA, NSLB, RIS, SPIB, WCLIB, WWPA
Alberta Forest Products Association .....	NLGA
Canadian Mill Services Association.....	NLGA, WWPA
Canadian Softwood Inspection Agency, Inc.....	NLGA, WCLIB, WWPA
Central Forest Products Association.....	NELMA, NLGA
Council of Forest Industries .....	NLGA, WWPA
Macdonald Inspection.....	NLGA, WCLIB, WWPA
Maritime Lumber Bureau .....	NELMA, NLGA
Newfoundland and Labrador Lumber Producers Association .....	NLGA
Ontario Forest Industries Association – Home of CLA Grading and Inspection .....	NELMA, NLGA
Ontario Lumber Manufacturers Agency.....	NELMA, NLGA
Quebec Forest Industry Council.....	NELMA, NLGA

**TABLE W-2 DESIGN VALUES FOR JOISTS AND RAFTERS - MECHANICALLY GRADED LUMBER<sup>1,2,3</sup>**

These  $F_b$  values are for use where repetitive members are spaced not more than 24 inches. For wider spacing,  $F_b$  values shall be reduced 13%.

Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Grade Designation	Size	Design Value in Bending, $F_b$			Modulus of Elasticity, E	Grading Rules Agency
		Normal Duration	Snow Loading	7-Day Loading		
<b>MACHINE STRESS RATED (MSR) LUMBER</b>						
900f-1.0E	2x4 and wider	1,035	1,190	1,295	1,000,000	WCLIB, WWPA, NELMA, NSLB
1200f-1.2E		1,380	1,585	1,725	1,200,000	NLGA, WCLIB, WWPA, NELMA, NSLB
1250f-1.4E		1,440	1,655	1,795	1,400,000	WCLIB, WWPA
1350f-1.3E		1,555	1,785	1,940	1,300,000	NLGA, WCLIB, WWPA, NELMA, NSLB
1400f-1.2E		1,610	1,850	2,015	1,200,000	NLGA, WWPA
1450f-1.3E		1,670	1,920	2,085	1,300,000	NLGA, WCLIB, WWPA, NELMA, NSLB
1450f-1.5E		1,670	1,920	2,085	1,500,000	WCLIB, WWPA
1500f-1.4E		1,725	1,985	2,155	1,400,000	NLGA, WCLIB, WWPA, NELMA, NSLB
1600f-1.4E		1,840	2,115	2,300	1,400,000	NLGA, WWPA
1650f-1.3E		1,900	2,180	2,370	1,300,000	NLGA, WWPA
1650f-1.5E		1,900	2,180	2,370	1,500,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
1650f-1.6E-1075f <sub>t</sub>		1,900	2,180	2,370	1,600,000	WCLIB, WWPA
1650f-1.6E		1,900	2,180	2,370	1,600,000	WCLIB, WWPA
1650f-1.8E		1,900	2,180	2,370	1,800,000	WCLIB, WWPA
1700f-1.6E		1,955	2,250	2,445	1,600,000	WCLIB, WWPA
1750f-2.0E		2,015	2,315	2,515	2,000,000	WCLIB, WWPA
1800f-1.5E		2,070	2,380	2,590	1,500,000	NLGA, WWPA
1800f-1.6E		2,070	2,380	2,590	1,600,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
1800f-1.8E		2,070	2,380	2,590	1,800,000	WCLIB, WWPA
1950f-1.5E		2,245	2,580	2,805	1,500,000	SPIB, WWPA
1950f-1.7E		2,245	2,580	2,805	1,700,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
2000f-1.6E		2,300	2,645	2,875	1,600,000	NLGA, WWPA
2100f-1.8E		2,415	2,775	3,020	1,800,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
2250f-1.7E		2,590	2,975	3,235	1,700,000	NLGA, WWPA
2250f-1.8E		2,590	2,975	3,235	1,800,000	NLGA, WCLIB, WWPA
2250f-1.9E		2,590	2,975	3,235	1,900,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
2250f-2.0E-1600f <sub>t</sub>		2,590	2,975	3,235	2,000,000	WCLIB, WWPA
2250f-2.0E		2,590	2,975	3,235	2,000,000	WCLIB, WWPA
2400f-1.8E		2,760	3,175	3,450	1,800,000	NLGA, WWPA
2400f-2.0E		2,760	3,175	3,450	2,000,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB
2500f-2.2E	2,875	3,305	3,595	2,200,000	WCLIB, WWPA	
2500f-2.2E-1925f <sub>t</sub>	2,875	3,305	3,595	2,200,000	WCLIB, WWPA	
2550f-2.1E	2,935	3,370	3,665	2,100,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB	
2700f-2.0E	3,105	3,570	3,880	2,000,000	WCLIB, WWPA	
2700f-2.2E	3,105	3,570	3,880	2,200,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB	
2850f-2.3E	3,280	3,770	4,095	2,300,000	NLGA, SPIB, WCLIB, WWPA, NELMA, NSLB	
3000f-2.4E	3,450	3,970	4,315	2,400,000	NLGA, SPIB	
<b>MACHINE EVALUATED LUMBER (MEL)</b>						
M-5	2x4 and wider	1,035	1,190	1,295	1,100,000	SPIB
M-6		1,265	1,455	1,580	1,000,000	SPIB
M-7		1,380	1,585	1,725	1,100,000	SPIB
M-8		1,495	1,720	1,870	1,300,000	SPIB
M-9		1,610	1,850	2,015	1,400,000	SPIB
M-10		1,610	1,850	2,015	1,200,000	NLGA, SPIB
M-11		1,785	2,050	2,230	1,500,000	NLGA, SPIB
M-12		1,840	2,115	2,300	1,600,000	NLGA, SPIB
M-13		1,840	2,115	2,300	1,400,000	NLGA, SPIB
M-14		2,070	2,380	2,590	1,700,000	NLGA, SPIB
M-15		2,070	2,380	2,590	1,500,000	NLGA, SPIB
M-16		2,070	2,380	2,590	1,500,000	SPIB
M-17 <sup>[3]</sup>		2,245	2,580	2,805	1,700,000	SPIB
M-18		2,300	2,645	2,875	1,800,000	NLGA, SPIB
M-19		2,300	2,645	2,875	1,600,000	NLGA, SPIB
M-20 <sup>[3]</sup>		2,300	2,645	2,875	1,900,000	SPIB
M-21		2,645	3,040	3,305	1,900,000	NLGA, SPIB
M-22		2,705	3,110	3,380	1,700,000	NLGA, SPIB
M-23		2,760	3,175	3,450	1,800,000	NLGA, SPIB
M-24		3,105	3,570	3,880	1,900,000	NLGA, SPIB
M-25		3,165	3,635	3,955	2,200,000	NLGA, SPIB
M-26		3,220	3,705	4,025	2,000,000	NLGA, SPIB
M-27 <sup>[3]</sup>		3,450	3,970	4,315	2,100,000	SPIB
M-28		2,530	2,910	3,165	1,700,000	SPIB
M-29		1,785	2,050	2,230	1,700,000	SPIB
M-30		2,360	2,710	2,945	1,700,000	SPIB
M-31		3,280	3,770	4,095	1,900,000	SPIB

**TABLE W-2 FOOTNOTES - MECHANICALLY GRADED LUMBER**

- 1. COMPRESSION PERPENDICULAR TO GRAIN,  $F_{c\perp}$ .** Design values for compression perpendicular to grain,  $F_{c\perp}$ , are identical to the design values given in Table W1 for No. 2 visually graded lumber of the appropriate species. When the  $F_{c\perp}$  values shown on the grade stamp differ from the values shown in Table W1, the values shown on the grade stamp shall be used for design.
- 2. MODULUS OF ELASTICITY, E, AND TENSION PARALLEL TO GRAIN,  $F_t$ .** For any given bending design value,  $F_b$ , the average modulus of elasticity, E, design value may vary depending upon species, timber source or other variables. The E values included in the  $F_b$ -E grade designations in Table W2 are those usually associated with each  $F_b$  level. Grade stamps may show higher or lower values if machine rating indicates the assignment is appropriate. When the E values shown on a grade stamp differ from the values in Table W2, the values shown on the grade stamp shall be used for design.
- 3. COMPRESSION PARALLEL TO GRAIN,  $F_c$ .** This grade requires  $F_c$  qualification and quality control.

## **American Wood Council**

### **AWC Mission Statement**

*To increase the use of wood by assuring the broad regulatory acceptance of wood products, developing design tools and guidelines for wood construction, and influencing the development of public policies affecting the use and manufacture of wood products.*

**American Wood Council**  
**info@awc.org**  
**www.awc.org**

