



Design Values and Spans for Alaskan Species Lumber

Historically, most Alaskan timber was exported to international markets, with a minimum of manufacturing. In recent years, Alaskan sawn lumber products have become more popular for use in structural applications within the state and elsewhere. New markets for Alaska Yellow Cedar, Alaska Hemlock and Alaska Spruce lumber have created a need for technical information on the structural capabilities of these three species/species groups.

In recognition of the expanding use of Alaskan species in construction, the Ketchikan Wood Technology Center, in conjunction with Western Wood Products Association, conducted testing to determine strength properties. WWPA submitted the resultant test data to the American Lumber Standard Committee, Inc., which formally approved design values for Alaska Yellow Cedar, Alaska Hemlock and Alaska Spruce dimension lumber products.

Each Alaskan species has a distinctive grademark to differentiate its unique properties.

ALASKA YELLOW CEDAR

Alaska Yellow Cedar has traditionally been prized in international markets for its natural durability and grain structure. It is a fine-grained, short-fibered, aromatic cedar and lumber from the species is generally dense, hard and resilient.

The growth range of Alaska Yellow Cedar stretches from Prince William Sound southeast to the Canadian border. It grows primarily on steep terrain, at elevations of 500 feet or more. Much of the commercial timber in Alaska Yellow Cedar is found in southeast Alaska.

**ALASKA
YELLOW
CEDAR**

ALASKA HEMLOCK

Alaska Hemlock includes Western Hemlock and Mountain Hemlock. Its fiber is light and bright in color, varying from a creamy, nearly-white to a light, straw-brown, with little variation in color between the heartwood and sapwood.

Alaska Hemlock trees grow to between 2 and 4 feet in diameter and up to 150 feet in height. It grows in the same forest region as Alaska Yellow Cedar, with nearly all commercial production of Alaska Hemlock in the southeast part of the state.

**ALASKA
HEM**

ALASKA SPRUCE

Spruce species native to Alaska include White Spruce and Sitka Spruce. The growth range of the Spruce species stretches across Alaska, from the river valleys of the interior to the temperate rainforests of the southeast.

**ALASKA
SPRUCE**

DESIGN VALUES AND SPANS

This publication provides technical information for Alaska Yellow Cedar, Alaska Hemlock and Alaska Spruce lumber, including base design values, size-adjusted values, and spans for typical floor, ceiling and roof applications.

These design values have been incorporated in the National Design Specification for Wood Construction (NDS) Supplement of Design Values for Wood Construction which are recognized by the U.S. model building codes such as the International Building Code (IBC) and the NFPA 5000 Building Code.

Base Values for Alaskan Species Lumber

ALASKA YELLOW CEDAR

ALASKA HEMLOCK

ALASKA SPRUCE

Dimension Lumber (2" to 4" Thick by 2" and Wider) Base Values in pounds per square inch¹
Approved by the Board of Review of the American Lumber Standard Committee
Grades described in Western Lumber Grading Rules, Sections 40.00, 41.00, 42.00 and 62.00

Alaska Yellow Cedar

Specific Gravity = 0.46 (ovendry weight & volume)

<i>Grade</i>	Extreme Fiber Stress in Bending (Single Member) Fb	Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression Perpendicular to Grain Fc-perp	Compression Parallel to Grain Fc	Modulus of Elasticity E
Select Structural	1350	800	225	510	1200	1,500,000
No.1	900	525	225	510	1050	1,400,000
No.2	800	450	225	510	1000	1,300,000
No.3	475	250	225	510	575	1,200,000
Construction	925	500	225	510	1250	1,300,000
Standard	500	275	225	510	1050	1,100,000
Utility	250	125	225	510	675	1,100,000
Stud	625	350	225	510	625	1,200,000

Alaska Hemlock

Specific Gravity = 0.46 (ovendry weight & volume)

<i>Grade</i>	Extreme Fiber Stress in Bending (Single Member) Fb	Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression Perpendicular to Grain Fc-perp	Compression Parallel to Grain Fc	Modulus of Elasticity E
Select Structural	1300	825	185	440	1200	1,700,000
No.1	900	550	185	440	1100	1,600,000
No.2	825	475	185	440	1050	1,500,000
No.3	475	275	185	440	600	1,400,000
Construction	950	550	185	440	1250	1,400,000
Standard	525	300	185	440	1050	1,300,000
Utility	250	150	185	440	700	1,200,000
Stud	650	375	185	440	650	1,400,000

Alaska Spruce

Specific Gravity = 0.41 (ovendry weight & volume)

<i>Grade</i>	Extreme Fiber Stress in Bending (Single Member) Fb	Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression Perpendicular to Grain Fc-perp	Compression Parallel to Grain Fc	Modulus of Elasticity E
Select Structural	1400	900	160	330	1200	1,600,000
No.1	950	600	160	330	1100	1,500,000
No.2	875	500	160	330	1050	1,400,000
No.3	500	300	160	330	600	1,300,000
Construction	1000	575	160	330	1250	1,300,000
Standard	550	325	160	330	1100	1,200,000
Utility	275	150	160	330	700	1,100,000
Stud	675	400	160	330	675	1,300,000

1. Use with Appropriate Size and Use-Conditions Adjustments

Alaska Yellow Cedar

SIZE-ADJUSTED VALUES FOR DIMENSION LUMBER

Design Values in pounds per square inch¹

Nominal sizes: 2" to 4" Thick by 2" and Wider

Grades described in Western Lumber Grading Rules, Sections 40.00, 41.00, 42.00 and 62.00

SIZE 2" to 4" thick by	GRADE	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression		Modulus of Elasticity E
		2" & 3" thick		4" thick single			Perpendicular to Grain Fc-perp	Parallel to Grain Fc	
		single	repetitive						
2"-4" wide (2x2, 2x3, 2x4, 3x3, 3x4, 4x4)	Select Structural	2025	2330	2025	1200	225	510	1380	1,500,000
	No.1	1350	1555	1350	790	225	510	1210	1,400,000
	No.2	1200	1380	1200	675	225	510	1150	1,300,000
	No.3	715	820	715	375	225	510	660	1,200,000
	Construction	925	1065	925	500	225	510	1250	1,300,000
	Standard	500	575	500	275	225	510	1050	1,100,000
	Utility (2x2, 2x3, 3x3)	100	115	---	50	225	510	405	1,100,000
	Utility (2x4, 3x4, 4x4)	250	290	250	125	225	510	675	1,100,000
Stud	690	790	690	385	225	510	655	1,200,000	
6" wide (2x6, 3x6, 4x6)	Select Structural	1755	2020	1755	1040	225	510	1320	1,500,000
	No.1	1170	1345	1170	685	225	510	1155	1,400,000
	No.2	1040	1195	1040	585	225	510	1100	1,300,000
	No.3	620	710	620	325	225	510	635	1,200,000
	Stud	625	720	625	350	225	510	625	1,200,000
8" wide (2x8, 3x8, 4x8)	Select Structural	1620	1865	1755	960	225	510	1260	1,500,000
	No.1	1080	1240	1170	630	225	510	1105	1,400,000
	No.2	960	1105	1040	540	225	510	1050	1,300,000
	No.3/Stud	570	655	620	300	225	510	605	1,200,000
10" wide (2x10, 3x10, 4x10)	Select Structural	1485	1710	1620	880	225	510	1200	1,500,000
	No.1	990	1140	1080	580	225	510	1050	1,400,000
	No.2	880	1010	960	495	225	510	1000	1,300,000
	No.3/Stud	525	600	570	275	225	510	575	1,200,000
12" wide (2x12, 3x12, 4x12)	Select Structural	1350	1555	1485	800	225	510	1200	1,500,000
	No.1	900	1035	990	525	225	510	1050	1,400,000
	No.2	800	920	880	450	225	510	1000	1,300,000
	No.3/Stud	475	545	525	250	225	510	575	1,200,000
14" & wider (2x14 & wider, 3x14 & wider, 4x14 & wider)	Select Structural	1215	1395	1350	720	225	510	1080	1,500,000
	No.1	810	930	900	475	225	510	945	1,400,000
	No.2	720	830	800	405	225	510	900	1,300,000
	No.3/Stud	430	490	475	225	225	510	520	1,200,000

1. Apply end-use adjustment factors when appropriate

Alaska Hemlock

SIZE-ADJUSTED VALUES FOR DIMENSION LUMBER

Design Values in pounds per square inch ¹

Nominal sizes: 2" to 4" Thick by 2" and Wider

Grades described in Western Lumber Grading Rules, Sections 40.00, 41.00, 42.00 and 62.00

SIZE 2" to 4" thick by	GRADE	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression		Modulus of Elasticity E
		2" & 3" thick		4" thick single			Perpendicular to Grain Fc-perp	Parallel to Grain Fc	
		single	repetitive						
2"-4" wide (2x2, 2x3, 2x4, 3x3, 3x4, 4x4)	Select Structural	1950	2245	1950	1240	185	440	1380	1700000
	No.1	1350	1555	1350	825	185	440	1265	1600000
	No.2	1240	1425	1240	715	185	440	1210	1500000
	No.3	715	820	715	415	185	440	690	1400000
	Construction	950	1095	950	550	185	440	1250	1400000
	Standard	525	605	525	300	185	440	1050	1300000
	Utility (2x2, 2x3, 3x3)	100	115	---	60	185	440	420	1200000
	Utility (2x4, 3x4, 4x4)	250	290	250	150	185	440	700	1200000
Stud	715	820	715	415	185	440	685	1400000	
6" wide (2x6, 3x6, 4x6)	Select Structural	1690	1945	1690	1075	185	440	1320	1700000
	No.1	1170	1345	1170	715	185	440	1210	1600000
	No.2	1075	1235	1075	620	185	440	1155	1500000
	No.3	620	710	620	360	185	440	660	1400000
Stud	650	750	650	375	185	440	650	1400000	
8" wide (2x8, 3x8, 4x8)	Select Structural	1560	1795	1560	990	185	440	1260	1700000
	No.1	1080	1240	1170	660	185	440	1155	1600000
	No.2	990	1140	1075	570	185	440	1105	1500000
	No.3/Stud	570	655	620	330	185	440	630	1400000
10" wide (2x10, 3x10, 4x10)	Select Structural	1430	1645	1560	910	185	440	1200	1700000
	No.1	990	1140	1080	605	185	440	1100	1600000
	No.2	910	1045	990	525	185	440	1050	1500000
	No.3/Stud	525	600	570	305	185	440	600	1400000
12" wide (2x12, 3x12, 4x12)	Select Structural	1300	1495	1430	825	185	440	1200	1700000
	No.1	900	1035	990	550	185	440	1100	1600000
	No.2	825	950	910	475	185	440	1050	1500000
	No.3/Stud	475	545	525	275	185	440	600	1400000
14" & wider (2x14 & wider, 3x14 & wider, 4x14 & wider)	Select Structural	1170	1345	1300	745	185	440	1080	1700000
	No.1	810	930	900	495	185	440	990	1600000
	No.2	745	855	825	430	185	440	945	1500000
	No.3/Stud	430	490	475	250	185	440	540	1400000

1. Apply end-use adjustment factors when appropriate

Alaska Spruce

SIZE-ADJUSTED VALUES FOR DIMENSION LUMBER

Design Values in pounds per square inch¹

Nominal Sizes: 2" to 4" thick by 2" and Wider

Grades described in Western Lumber Grading Rules, Sections 40.00, 41.00, 42.00 and 62.00

SIZE 2" to 4" thick by	GRADE	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain Ft	Horizontal Shear Fv	Compression		Modulus of Elasticity E
		2" & 3" thick		4" thick single			Perpendicular to Grain Fc-perp	Parallel to Grain Fc	
		single	repetitive						
2"-4" wide (2x2, 2x3, 2x4, 3x3, 3x4, 4x4)	Select Structural	2100	2415	2100	1350	160	330	1380	1,600,000
	No.1	1425	1640	1425	900	160	330	1265	1,500,000
	No.2	1315	1510	1315	750	160	330	1210	1,400,000
	No.3	750	865	750	450	160	330	690	1,300,000
	Construction	1000	1150	1000	575	160	330	1250	1,300,000
	Standard	550	635	550	325	160	330	1050	1,200,000
	Utility (2x2, 2x3, 3x3)	110	125	-----	60	160	330	420	1,100,000
	Utility (2x4, 3x4, 4x4)	275	315	275	150	160	330	700	1,100,000
Stud	745	855	745	440	160	330	710	1,300,000	
6" wide (2x6, 3x6, 4x6)	Select Structural	1820	2095	1820	1170	160	330	1320	1,600,000
	No.1	1235	1420	1235	780	160	330	1210	1,500,000
	No.2	1140	1310	1140	650	160	330	1155	1,400,000
	No.3	650	750	650	390	160	330	660	1,300,000
Stud	675	775	675	400	160	330	675	1,300,000	
8" wide (2x8, 3x8, 4x8)	Select Structural	1680	1930	1680	1080	160	330	1260	1,600,000
	No.1	1140	1310	1235	720	160	330	1155	1,500,000
	No.2	1050	1210	1140	600	160	330	1105	1,400,000
No.3/Stud	600	690	650	360	160	330	630	1,300,000	
10" wide (2x10, 3x10, 4x10)	Select Structural	1540	1770	1680	990	160	330	1200	1,600,000
	No.1	1045	1200	1140	660	160	330	1100	1,500,000
	No.2	965	1105	1050	550	160	330	1050	1,400,000
	No.3/Stud	550	635	600	330	160	330	600	1,300,000
12" wide (2x12, 3x12, 4x12)	Select Structural	1400	1610	1540	900	160	330	1200	1,600,000
	No.1	950	1095	1045	600	160	330	1100	1,500,000
	No.2	875	1005	965	500	160	330	1050	1,400,000
	No.3/Stud	500	575	550	300	160	330	600	1,300,000
14" & wider (2x14 & wider, 3x14 & wider, 4x14 & wider)	Select Structural	1260	1450	1400	810	160	330	1080	1,600,000
	No.1	855	985	950	540	160	330	990	1,500,000
	No.2	790	905	875	450	160	330	945	1,400,000
No.3/Stud	450	520	500	270	160	330	540	1,300,000	

1. Apply end-use adjustment factors when appropriate

Framing Span Tables for Alaska Species Visually Graded Lumber

ALASKA YELLOW CEDAR ALASKA HEMLOCK ALASKA SPRUCE

Spans in Feet and Inches																	
FLOOR JOISTS																	
Design Criteria:		40# Live Load				10# Dead Load				L/360 Deflection				DOL=1.0 (normal load)			
Species		2x8				2x10				2x12				2x14			
Group	Grade	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc
Alaska	Sel. Str.	13-10	12-7	11-10	11-0	17-8	16-0	15-1	14-0	21-6	19-6	18-4	17-0	25-3	23-0	21-7	20-1
Yellow	No.1	13-6	12-3	11-7	10-5	17-3	15-7	14-3	12-9	20-11	18-1	16-6	14-9	23-4	20-3	18-5	16-6
Cedar	No.2	13-2	12-0	11-0	9-10	16-10	14-9	13-5	12-0	19-8	17-1	15-7	13-11	22-0	19-1	17-5	15-7
	No.3	10-9	9-3	8-6	7-7	13-1	11-4	10-4	9-3	15-2	13-2	12-0	10-9	17-0	14-8	13-5	12-0
Alaska	Sel. Str.	14-5	13-1	12-4	11-5	18-5	16-9	15-9	14-7	22-5	20-4	19-2	17-9	26-4	23-11	22-2	19-10
Hemlock	No.1	14-2	12-9	11-8	10-5	18-0	15-7	14-3	12-9	20-11	18-1	16-6	14-9	23-4	20-3	18-5	16-6
	No.2	13-10	12-3	11-2	10-0	17-3	14-11	13-8	12-2	20-0	17-4	15-10	14-2	22-4	19-4	17-8	15-10
	No.3	10-9	9-3	8-6	7-7	13-1	11-4	10-4	9-3	15-2	13-2	12-0	10-9	17-0	14-8	13-5	12-0
Alaska	Sel. Str.	14-2	12-10	12-1	11-3	18-0	16-5	15-5	14-4	21-11	19-11	18-9	17-5	25-10	23-6	22-1	20-6
Spruce	No.1	13-10	12-7	11-10	10-9	17-8	16-0	14-8	13-1	21-6	18-7	17-0	15-2	24-0	20-9	19-0	17-0
	No.2	13-6	12-3	11-6	10-3	17-3	15-5	14-1	12-7	20-7	17-10	16-3	14-7	23-0	19-11	18-2	16-3
	No.3	11-0	9-6	8-8	7-9	13-5	11-8	10-7	9-6	15-7	13-6	12-4	11-0	17-5	15-1	13-9	12-4
CEILING JOISTS																	
Design Criteria:		20# Live Load				10# Dead Load				L/240 Deflection				DOL=1.0 (normal load)			
Species		2x4				2x6				2x8				2x10			
Group	Grade	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc
Alaska	Sel. Str.	9-8	8-9	8-3	7-8	15-2	13-9	12-11	12-0	19-11	18-2	17-1	15-10	25-5	23-1	21-9	20-2
Yellow	No.1	9-5	8-7	8-1	7-3	14-9	13-0	11-11	10-8	19-1	16-6	15-1	13-6	23-3	20-2	18-5	16-5
Cedar	No.2	9-2	8-4	7-8	6-10	14-2	12-3	11-2	10-0	17-11	15-7	14-2	12-8	21-11	19-0	17-4	15-6
	No.3	7-6	6-6	5-11	5-3	10-11	9-6	8-8	7-9	13-10	12-0	10-11	9-9	16-11	14-8	13-4	11-11
Alaska	Sel. Str.	10-0	9-1	8-7	8-0	15-9	14-4	13-6	12-6	20-10	18-11	17-9	16-2	26-6	24-1	22-1	19-9
Hemlock	No.1	9-10	8-11	8-2	7-3	15-0	13-0	11-11	10-8	19-1	16-6	15-1	13-6	23-3	20-2	18-5	16-5
	No.2	9-8	8-6	7-9	7-0	14-5	12-6	11-5	10-2	18-3	15-9	14-5	12-11	22-3	19-3	17-7	15-9
	No.3	7-6	6-6	5-11	5-3	10-11	9-6	8-8	7-9	13-10	12-0	10-11	9-9	16-11	14-8	13-4	11-11
Alaska	Sel. Str.	9-10	8-11	8-5	7-10	15-6	14-1	13-3	12-3	20-5	18-6	17-5	16-2	26-0	23-8	22-3	20-6
Spruce	No.1	9-8	8-9	8-3	7-6	15-2	13-5	12-3	10-11	19-7	16-11	15-6	13-10	23-11	20-8	18-11	16-11
	No.2	9-5	8-7	8-0	7-2	14-9	12-10	11-9	10-6	18-9	16-3	14-10	13-3	22-11	19-10	18-2	16-3
	No.3	7-8	6-8	6-1	5-5	11-2	9-8	8-10	7-11	14-2	12-4	11-3	10-0	17-4	15-0	13-8	12-3
ROOF RAFTERS																	
Design Criteria:		30# Live Load				10# Dead Load				L/240 Deflection				DOL=1.15 (snow load)			
Species		2x6				2x8				2x10				2x12			
Group	Grade	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc	12' oc	16' oc	19.2' oc	24' oc
Alaska	Sel. Str.	13-3	12-0	11-4	10-6	17-5	15-10	14-11	13-10	22-3	20-2	19-0	17-8	27-1	24-7	23-1	21-6
Yellow	No.1	12-11	11-9	11-0	9-10	17-0	15-4	14-0	12-6	21-7	18-9	17-1	15-3	25-1	21-8	19-10	17-9
Cedar	No.2	12-7	11-5	10-5	9-4	16-7	14-5	13-2	11-9	20-4	17-8	16-1	14-5	23-7	20-5	18-8	16-8
	No.3	10-2	8-9	8-0	7-2	12-10	11-2	10-2	9-1	15-8	13-7	12-5	11-1	18-2	15-9	14-5	12-10
Alaska	Sel. Str.	13-9	12-6	11-9	10-11	18-2	16-6	15-6	14-5	23-2	21-1	19-10	18-4	28-2	25-7	23-10	21-3
Hemlock	No.1	13-6	12-1	11-0	9-10	17-8	15-4	14-0	12-6	21-7	18-9	17-1	15-3	25-1	21-8	19-10	17-9
	No.2	13-3	11-7	10-7	9-5	16-11	14-8	13-5	12-0	20-8	17-11	16-4	14-8	24-0	20-9	19-0	17-0
	No.3	10-2	8-9	8-0	7-2	12-10	11-2	10-2	9-1	15-8	13-7	12-5	11-1	18-2	15-9	14-5	12-10
Alaska	Sel. Str.	13-6	12-3	11-7	10-9	17-10	16-2	15-3	14-2	22-9	20-8	19-5	18-0	27-8	25-1	23-7	22-11
Spruce	No.1	13-3	12-0	11-4	10-2	17-5	15-9	14-4	12-10	22-2	19-3	17-7	15-8	25-9	22-3	20-4	18-2
	No.2	12-11	11-9	10-11	9-9	17-0	15-1	13-9	12-4	21-4	18-5	16-10	15-1	24-8	21-5	19-6	17-6
	No.3	10-5	9-0	8-3	7-4	13-2	11-5	10-5	9-4	16-1	13-11	12-9	11-5	18-8	16-2	14-9	13-2

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