

WESTERN RED CEDAR Designer Handbook





WESTERN RED CEDAR

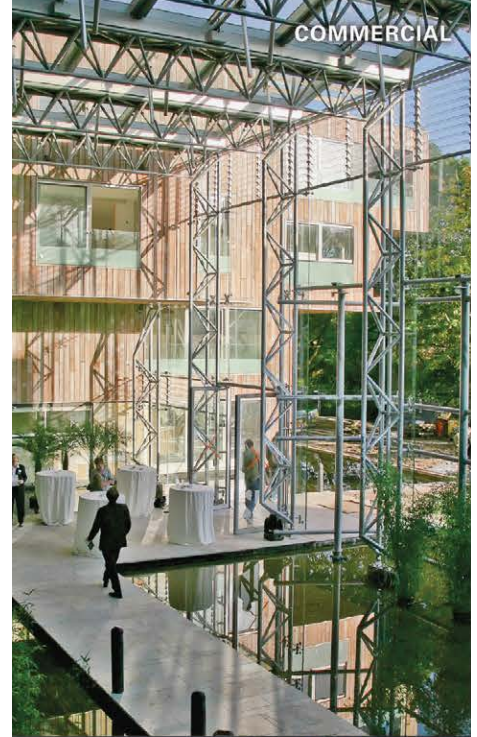
the environmental choice

Western Red Cedar offers unique, natural performance characteristics and exceptional beauty that bring warmth, character and longevity to the interior and exterior of residential and commercial projects around the world. Whether you choose knotty or clear grades, Western Red Cedar offers virtually unlimited versatility and design flexibility in terms of size and profile.

Western Red Cedar is a truly sustainable building material. It has the lowest environmental impact when compared with other materials such as brick and fibre cement. Independently certified, it is harvested legally and sustainably from managed forests British Columbia, Idaho, Oregon and Washington.

Make the right choice for your client and your environment, go green with Western Red Cedar. ◆

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WESTERN RED CEDAR

Beautiful, versatile, sustainable

FEATURES OF WESTERN RED CEDAR

Acoustic properties:	Cedar tends to dampen sound transmission
Density (oven-dry):	21 lb/ft ³
Specific gravity (oven-dry):	0.32
Durability:	Durable species
Fasteners:	Corrosion-resistant only (stainless steel, aluminum, hot-dipped galvanized)
Finishing:	Paints, stains, varnishes, oils and waxes all work well
Flame spread rating:	45 (Class II)
Smoke developed classification:	125
k value (12% mc):	0.74 BTU in./ft ² h°F
R value:	1.35/in. of thickness
Stability:	Cedar is the most stable softwood species
Workability:	Easy to cut, saw, nail and glue

PHYSICAL PROPERTIES

DIMENSIONAL STABILITY

Like all woods, Western Red Cedar is hygroscopic and will absorb or discharge moisture to attain equilibrium with the surrounding atmosphere. However, it has a very low shrinkage factor and is superior to all other coniferous woods in its resistance to warping, twisting and checking. The size differential between dry and unseasoned Western Red Cedar is given in Table 5. Shrinkage in both the radial and tangential directions is given in Table 1.

DENSITY

One of the lightest commercial softwoods, the density of Western Red Cedar at 12% moisture content is approximately 23.5 pounds per cubic foot with a relative density (specific gravity) of 0.32. The density of oven-dry material is 21 pounds per cubic foot. Comparative oven-dry densities of cedar and some other softwood species are given in Table 4.

Cedar's low density enhances its insulation value and makes it an easy wood to transport and handle.

THERMAL CONDUCTIVITY

Wood is an excellent thermal insulator. This is an important characteristic since good thermal insulators help keep buildings cool in the summer and reduce heating costs in winter.

The conduction of heat in wood is directly related to its density. Woods with low density have the highest thermal insulating value because such woods contain a high proportion of cell cavities. In dry wood, these cavities are filled with air which is one of the best known thermal insulators. With its low density and high proportion of air spaces, Western Red Cedar is the best thermal insulator among the commonly available softwood species and is far superior to brick, concrete and steel. It has a coefficient of thermal conductivity (k value) at 12% mc of 0.74 BTU in./ft²h°F.

The R value (the reciprocal of k) for Western Red Cedar is 1.35/ in. of thickness.

ACOUSTICAL PROPERTIES

An important acoustical property of wood is its ability to damp vibrations. Wood has a cellular network of minute interlocking pores which converts sound energy into heat by frictional and viscoelastic resistance.

Because of the high internal friction created by the cellular pore network, wood has more sound damping capacity than most structural materials. Floor, ceiling and wall assemblies of wood can provide effective economical sound insulation and absorption when properly utilized. Western Red Cedar is particularly effective in this regard and can be used to help reduce noise or to confine it to certain areas.

FLAME SPREAD RATING

Flame spread ratings describe the surface burning characteristics of interior finishes. They are used to regulate the use of interior finish materials to reduce the probability of rapid fire spread. Materials are burned in a test furnace for a relative assessment of flammability. The lower the flame spread rating, the more the material resists the spread of fire.

Building codes in North America generally define as interior finish any exposed material that forms part of the building. This usually includes interior wall and ceiling finishes, flooring, windows, doors and other wood products. US codes set the maximum flame spread rating for interior wall and ceiling finishes in most buildings at 200. The flame spread rating for Western Red Cedar is 45 (Class 11).

Smoke developed classifications reflect the amount of smoke released by burning material. They are used in conjunction with flame spread ratings to regulate the use of interior finish materials where the potential to generate smoke or control smoke movement is of major fire safety importance.

US codes set the maximum smoke developed classification for interior wall and ceiling finishes in most buildings at 450. The smoke developed classification for Western Red Cedar is 125.

Western Red Cedar's flame spread rating and smoke developed classification compare well with the ratings of many other species both softwood and hardwood. Because of its favorable fire performance, Western Red Cedar can be used for interior finish in some building applications where other species would not be permitted.

DURABILITY

Historically, native peoples of the Pacific coast prized cedar for its long lasting qualities and used wood and bark from cedar trees for most of their building needs. Evidence of cedar's durability are found in many native artifacts.

Properly finished and maintained, cedar will deliver decades of trouble-free service. If exposed for prolonged periods to conditions where decay could be a factor, such as where the wood is in contact with the ground, cedar should be treated with suitable wood preservatives.

FASTENING

Western Red Cedar has good fastening properties but its natural preservatives have a corrosive effect on some unprotected metals in contact with the wood, causing black or blue/black stains. Fasteners should be corrosion-resistant such as aluminum, hot-dipped galvanized or stainless steel.

Nails and screws used to fasten Western Red Cedar should be about one-third longer than those used to fasten hardwood species.

Because it is free of pitch and resin, Western Red Cedar has excellent gluing properties. It works well with a wide range of adhesives.



Orange Memorial Park

Architect:

Marcy Wong & Donn Logan Architects

Orange Memorial Park in San Francisco is the context for the new 6,400 sq. ft. recreation building which is encircled by soccer, basketball, picnic and other outdoor amenities. The recreation building is conceived as a pavilion in a park and an icon for the community. Towards that goal, the use of natural materials that are sustainable, that have a sense of quality and longevity, that are complementary to each other and to the park context, and that are attractive, was of fundamental importance both to the designers and the client. For that reason, wood—in particular Western Red Cedar—and natural basalt stone are two of the most prominent materials in the building's materials palette. Western Red Cedar wood grilles form a rain screen of longevity and beauty for the walls, while evoking the sense of lightness, transparency and horizontality ♦



FINISHING

Although cedar is a naturally durable species, leaving it untreated is not recommended because a finish or protective coating will greatly increase its service life. Cedar is free of pitch and with its high degree of dimensional stability, it is the best of the softwoods for accepting paints, stains, oils and other coatings. For details, see *How to Finish Western Red Cedar* published by the Western Red Cedar Lumber Association.

WORKABILITY

With its straight grain and uniform texture, Western Red Cedar is among the easiest and most rewarding woods to work with. It takes a fine finish in all hand and machine operations, takes fasteners without splitting and is easily sawn and nailed. When working with Western Red Cedar, sharp cutters are recommended.

PRODUCTS, GRADES & SIZES

There are few more versatile building materials than Western Red Cedar which is ideal both for indoor and outdoor uses. Western Red Cedar lumber is available in visual stress grades for construction and finishing uses in a range of lengths, widths and thicknesses. It is available in clear or knotty grades with smooth surfaced, combed or rough sawn finishes; kiln dried, air dried or unseasoned (green); flat grain and vertical grain.

Table 7 gives nominal widths, thicknesses and grades of commonly available Western Red Cedar products. Western Red Cedar is used to manufacture a range of specialty products such as siding, paneling, structural decking and outdoor decking. Detailed product information is available from the Western Red Cedar Lumber Association.

Cedar produced by the Western Red Cedar Lumber Association members includes specialty end use grades as well as products graded to National Lumber Grading Authority (NLGA), West Coast Lumber Inspection Bureau (WCLIB) or Western Wood Products Association (WWPA) rules. These grades are approved by the American Lumber Standards Board of Review and are accepted under all US building codes.

SECTION PROPERTIES

Section properties are used in various design calculations. For convenience, the following are formulas to calculate the section properties of rectangular beam cross sections.

DEFINITIONS:

Neutral Axis, in the cross section of a beam, is the line in which there is neither tension nor compression stress.

Moment of Inertia (I) of the cross section of a beam is the sum of the products of each of its elementary areas multiplied by the square of their distance from the neutral axis of the section.

Section Modulus (S) is the moment of inertia divided by the distance from the neutral axis to the extreme fiber of the section.

Cross Section is a section taken through the member perpendicular to its longitudinal axis.

FORMULAS:

The following symbols and formulas apply to rectangular beam cross sections:

X-X = Neutral axis for edgewise bending (load applied to narrow face)

Y-Y = neutral axis for flatwise bending (load applied to wide face)

b = breadth of rectangular bending member (in.)

d = depth of rectangular bending member (in.)

A = bd = area of cross section (in.²)

c = distance from neutral axis to extreme fiber of cross section (in.)

I_{xx} = $bd^3/12$ = moment of inertia about the X-X axis (in.⁴)

I_{yy} = $db^3/12$ = moment of inertia about the Y-Y axis (in.⁴)

r_{xx} = $\sqrt{I_{xx}/A} = d/\sqrt{12}$ = radius of gyration about the X-X axis (in.)

r_{yy} = $\sqrt{I_{yy}/A} = b/\sqrt{12}$ = radius of gyration about the Y-Y axis (in.)

S_{xx} = $I_{xx}/c = bd^2/6$ = section modulus about the X-X axis (in.³)

S_{yy} = $I_{yy}/c = bd^2/6$ = section modulus about the Y-Y axis (in.³)

Sizes of rough and dressed Western Red Cedar are shown in Tables 3 and 14.



BASE DESIGN VALUES (UNITED STATES ONLY)

Since different sizes of visually-graded lumber have different values, the design values shown in Table 2 are tabulated in a 'base value' approach. Base values are provided for a base size that depends on the grade. For Select Structural, No. 1, No. 2 and No. 3 grades, the base strength values are published on a 2 x 12 basis. For Construction, Standard and Utility grades, the base strength values are published on a 2 x 4 basis (the size factor is always 1.0). For Stud grade, the base strength values are published on a 2 x 6 basis. These values are for use in the United States only. To determine the value for a given size, the designer selects a base value for a given grade then multiplies the base value by a size factor from Table 15.

The base design values apply to Western Red Cedar manufactured by members of the Western Red Cedar Lumber Association and graded to National Lumber Grading Authority Rules (NLGA), West Coast Lumber Inspection Bureau (WCLIB) or Western Wood Products Association (WWPA) rules. These grades and sizes conform to the requirements of applicable American Standards.

SPAN TABLES

Spans for Western Red Cedar lumber used as joists and rafters in residential and commercial structures are published in the *U.S. Span Book for Major Lumber Species* available for a small fee from the Canadian Wood Council at www.cwc.ca. An online Span Calculator is available from the American Wood Council at www.awc.org.

Hudson - Panos House

Architect:
Swatt Architects

The Hudson-Panos House is a vacation home located in Healdsburg, California. The plan of the house consists of two parallel wings which are slightly offset to create a linear courtyard. A detached carport anchors the east side of the house, while a swimming pool terminates the linear composition to the west. A large, two-story volume with clerestory glazing creates an exciting vertical counterpoint to the mostly horizontal design, and bathes the interior with natural light. The exterior is clad in clear finished 1 x 4 Western Red Cedar boards, along with gray integral colored stucco and silver painted aluminum-clad windows. To add warmth to the home, Western Red Cedar was also selected for soffits, ceilings, overhangs and trellises, which combined with interior exposed glue-laminated beams extending views outward, blurring the boundary between interior and exterior spaces. ♦



TABLE 1. Shrinkage of Western Red Cedar

Direction of Shrinkage	Shrinkage in Percentage					
	From green (25% or greater moisture content) to:			From kiln dried (15% average moisture content) to:		
	15%	12%	6%	15%	12%	6%
Radial	0.96	1.2	1.8	0	0.3	1.0
Tangential	2.0	2.6	3.8	0	0.7	2.1

Notes:

1. Radial shrinkage applies to the width of vertical grain lumber; tangential to the width of flat grain lumber.
2. Shrinkage does not begin until the fiber saturation point is reached.
3. 15% is the average equilibrium moisture content of wood during the summer in the Pacific Northwest.
4. 12% is the average equilibrium moisture content in most areas of the US.
5. 6% is the average equilibrium moisture content for interiors of heated buildings.

TABLE 2. Base design values for use in the USA for Western Red Cedar. Visually graded (WCLIB, WWPA) 2-4 in. thick x 2 in. & wider.

Grade	Extreme Fiber Stress in bending Fb	Tension Parallel Parallel to Grain Ft	Compression			Modulus of Elasticity (million psi) E
			Horizontal Shear Fv	Perpendicular to Grain Fc	Parallel to Grain Fc	
Select Structural No. 1/No. 2 No. 3	1,000	600	155	425	1,000	1.1
	725/700	425/425	155	425	825/650	1.0/1.0
	400	250	155	425	375	0.9
Construction Standard Utility	800	475	155	425	850	1.0
	450	275	155	425	650	0.9
	225	125	155	425	425	0.8
Stud	550	325	155	425	400	0.9

TABLE 3. Sizes of rough Western Red Cedar

Thicknesss (in.)	1	1-3/4	2	3	4	6	8	10	12	14
Width (in.)	2	4	6	8	10	12	14			



TABLE 4. Comparative Softwood Densities (pcf)

Species	Oven-Dry Density
Western Red Cedar	21
Douglas Fir	31
Ponderosa Pine	27
Southern Pine	34

TABLE 5. Size differential between unseasoned & dry lumber

Nominal Dimension (in.)	Size Differential Between Unseasoned and Dry Lumber After Surfacing (in.)
1-1/2 or less	1/32
2 to 4	1/16
5 to 7	1/8
8 or more	¼

TABLE 6. Wet Use Factors (CM) for tabulated design values

The recommended design values are for applications where the moisture content of the wood does not exceed 19%. For use conditions where the moisture content of dimension lumber will exceed 19%, the Wet Use Adjustment Factors below are recommended.

Property	Adjustment Factor
Fb Extreme Fiber Stress in Bending	0.85*
Ft Tension Parallel to Grain	1.0
Fc Compression Parallel to Grain	0.8**
Fv Horizontal Shear	0.97
Fc Compression Perpendicular to Grain	0.67
E Modulus of Elasticity	0.9

* Bending Wet Use Factor = 1.0 where $F_b \times CF$ (Base Value x Size Factor) does not exceed 1,150 psi.

** Compression Parallel Wet Use Factor = 1.0 where $F_c \times CF$ (Base Value x Size Factor) does not exceed 750 psi.

IJsselstein Train Station, Netherlands

Architect:

Hans Goverde - Kraaijvanger Urbis

Selected for its beauty, performance and sustainability, Western Red Cedar is featured as cladding on this high profile commercial project in the Netherlands. It beautifully complements the modern design and offers a warm contrast to the “coolness” of the glass, steel and concrete. ♦



TABLE 7. Western Red Cedar Products

Product	Thickness in. (nominal)	Width in. (nominal)	Grade	Grading Rule Paragraph		
				NLGA	WWPA	WCLIB
Bevel Siding Clear	1/2, 3/4	4, 6, 8, 10	Clear V.G. Heart A Rustic B C Proprietary	201a 201b 201d 201c 201e N/A	21.11 21.12 N/A 21.13 21.14 N/A	106-aa 106-a N/A 106-b 106-c N/A
Knotty	5/8, 11/16, 3/4, 7/8	6, 8, 10, 12	Select Knotty Quality Knotty Proprietary	205a 205b N/A	N/A N/A N/A	111-e 111-f N/A
Knotty- Rabbetted	3/4, 5/4	6, 8, 10	Select Knotty Quality Knotty	205a 205b	N/A N/A	111-e 111-f
Knotty-Wavy Edged	7/8	10, 12	Select Knotty Quality Knotty	205a 205b	N/A N/A	111-e 111-f
Pattern Siding Clear	1	4, 6, 8	Clear Heart A B	200a 200b 200c	20.11 20.12 20.13	102-b 102-c 102-d
Knotty	1	4, 6, 8	Select Knotty Quality Knotty Standard and Better Proprietary	204a 204b 3 114-a, b, c N/A	N/A N/A N/A N/A	111-e 111-f 118-a, b, c N/A
Clear Finish	1, 5/4, 2	2, 3, 4, 6, 8, 10, 12	Clear Heart A B	200a 200b 200c	20.11 20.12 20.13	102-b 102-c 102-d
Boards	1	2, 3, 4, 6, 8 10, 12	Select Knotty Quality Knotty Standard and Better	204a 204b 114-a, b, c	N/A N/A 30.50 (118-a, b, c)	111-e 111-f 118-a, b, c
Fence Boards	1	6, 8, 10	Select Knotty Quality Knotty Rustic	210a 210b N/A	N/A N/A N/A	117-a 117-b 117-c
Roof Decking	2, 3, 4	6, 8	Select Commercial	127b 127c	55.11 55.12	127-b 127-c
Outdoor Decking Clear	5/4, 2	4, 6	Architect Clear Architect Knotty	N/A N/A	N/A N/A	N/A N/A
Knotty	5/4, 2	4, 6	Architect Knotty Custom Knotty	N/A N/A	N/A N/A	N/A N/A
Paneling Clear	1	4, 6, 8	Clear Heart A B	200a 200b 200c	20.11 20.12 20.13	102-b 102-c 102-d
Paneling Knotty	1	4, 6, 8	Select Knotty Quality Knotty	204a 204b	N/A N/A	111-e 111-f
Joists & Planks	2, 3, 4 2, 3, 4	2, 3, 4 6, 8, 10, 12	Appearance Standard and Better Appearance No. 2 and Better	N/A 122-b, c N/A 124-a, b, c	N/A 40.11, 40.12 N/A 62.10, 62.11, 62.12	N/A 122-b, c N/A 123-a, b, c
Timbers	5, 6, 8, 10, 12	5, 6, 8, 10 12 and wider	Appearance Standard and Better	N/A 131-a, b, c	N/A 80.10, 80.11, 80.12	N/A 131-a, b, c
Beams & Stringers	5, 6, 8, 10, 12	5, 6, 8, 10, 12	No. 2 and Better Width more than 2" greater than thickness	130-a, b, cc	70.10, 70.11, 70.12	130-a, b, cc

TABLE 8. Flat Use Factors (Cfu)

The recommended design values are for applications where the moisture content of the wood does not exceed 19%. For use conditions where the moisture content of dimension lumber will exceed 19%, the Wet Use Adjustment Factors below are recommended.

Nominal Width (in.)	Nominal Thickness (in.)	
Less than 4	Less than 4	4
4	1.00	—
5	1.10	1.00
6	1.10	1.05
8	1.15	1.05
10 & wider	1.15	1.10

Note:

These factors apply to all dimension lumber except tongue and groove decking grades. For T&G decking, the following adjustments may be used.

TABLE 9. Repetitive Member Factor (Cr)

Applies to Tabulated Design Values for Extreme Fiber Stress in Bending when members are used as joists, truss chords, rafters, studs, planks, decking or similar members which are in contact or spaced not more than 24_ on centers, are not less than 3 in number and are joined by floor, roof or other load distributing elements adequate to support the design load.

1.5



Lake Washington Residence, USA

Architect:

The Miller Hull Partnership

This 4000 sf residence and carport is located on a steep wooded site on Lake Washington. Entered from above via a bridge, this residence transitions between a steep forest and open sweeping views of Lake Washington. The architect left the flora intact, where possible, and site the two volumes among mature cedars, firs, maples and ferns. The structure is clad in clear Western Red Cedar which carries through to the interior ceiling. Edges are trimmed in contrasting aluminum. ◆



TABLE 10. Coverage of Western Red Cedar Siding

To obtain the coverage of a specified width of siding from Table 7, perform the following calculations:

1. Calculate total wall area (length x height).
2. Subtract square footage of openings (windows, doors) to determine wall area for siding.
3. Add 10% for trim loss.
4. Multiply figure by the appropriate factor from the table for linear or board feet.

Example:

- | | | | |
|--------------------|-------------------|--------------------------|------------------------------|
| 1. Length x height | = 160 square feet | 3. Add 10% for trim loss | = 120 + 12 = 132 square feet |
| 2. Door | = 20 square feet | 4. Assuming 6 in. siding | |
| Window | = 20 square feet | 132 x 2.67 | = 357.4 linear feet |
| Area for siding | = 120 square feet | 132 x 1.33 | = 175.6 board feet |

Siding Type	Nominal Width (in.)	Dressed Width (in.)	Exposed Face Width (in.)	Linear Feet Factor	Board Feet Factor
Bevel Siding ¹	4	3-1/2	2-1/2	4.80	1.60
	6	5-1/2	4-1/2	2.67	1.33
	8	7-1/2	6-1/2	1.85	1.23
	10	9-1/2	8-1/2	1.41	1.18
	12	11-1/2	10-1/2	1.14	1.14
Tongue and Groove Siding	4	3-3/8	3	4.00	1.33
	6	5-3/8	5	2.40	1.20
	8	7-1/8	6-3/4	1.77	1.19
Channel Siding	6	5-1/2	4-3/4	2.53	1.27
	8	7-3/8	6-5/8	1.81	1.21
	10	9-3/8	8-5/8	1.39	1.16
Board-and-Batten Siding	2	1-9/16	varies with width of board	see footnote 2	
	4	3-9/16			
	6	5-9/16			
	8	7-3/8			
	10	9-3/8			
	12	11-3/8			

TABLE 11. Design values for use in the USA for visually graded (WCLIB, WWPA). Western Red Cedar timbers (5 x 5 and larger)

Size Grade	Classification	Design values in pounds per square inch (psi)					
		Extreme Fiber Stress in Bending F _b	Tension Parallel to Grain F ₁	Shear Parallel to Grain F _v	Compression Perpendicular to Grain F _c	Compression Parallel to Grain F _c	Modulus of Elasticity E
Select Structural No. 1 No. 2	Beams and Stringers	1,150	675	140	425	875	1,000,000
		975	475	140	425	725	1,000,000
		625	325	140	425	475	800,000
Select Structural No. 1 No. 2	Posts and Timber	1,100	725	140	425	925	1,000,000
		875	600	140	425	800	1,000,000
		550	350	140	425	550	800,000

TABLE 12. Duration of Load Adjustment (CD) for tabulated design values

Load Duration	Factor
Permanent	0.9
Ten Years (Normal Load)	1.0
Two Months (Snow Load)	1.15
Seven Days	1.25
Ten Minutes (Wind, Earthquake)	1.6
Impact	2.0

Confirm load requirements with local codes. Refer to Model Building Codes or the National Design Specification for high temperature or fire-retardant treated adjustment factors.

TABLE 13. Adjustments for compression perpendicular to grain to deformation basis of 0.02

Design values for compression perpendicular to grain are established in accordance with the procedures set forth in ASTM D 2555 and D 245. ASTM procedures consider deformation under bearing loads as a serviceability limit state comparable to bending deflection because bearing loads rarely cause structural failures. Therefore, ASTM procedures for determining compression perpendicular to grain values are based on a deformation of 0.04_ and are considered adequate for most classes of structures. Where more stringent measures need be taken in design, the following formula permits the designer to adjust design values to a more conservative deformation basis of 0.02_.

$$Y_{02} = 0.73Y_{04} + 5.60$$



The Mint, Australia

Architect:

Francis-Jones Morehen Thorp

Western Red Cedar was chosen for the new head office of the historic houses trust of New South Wales, Australia for its appearance, durability and color. It simultaneously compliments and contrasts the sandstone of the existing building. Cedar was used for interior and exterior cladding and to form the dynamic louvred screen. ♦

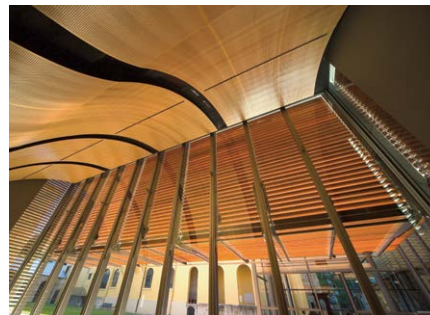


TABLE 14. Sizes of Dressed Western Red Cedar Lumber

Item	Thickness (in.)			Width (in.)		
	Nominal	Actual		Nominal	Actual	
		Dry	Green		Dry	Green
Boards	1	11/16	3/4	2	1-1/2	1-9/16
	1-1/4	1	1-1/32	3	2-1/2	2-9/16
				4	3-1/2	3-9/16
				6	5-1/2	5-9/16
				8	7-1/4	7-3/8
				10	9-1/4	9-3/8
12	11-1/4	11-3/8				
Garden Lumber	2	1-1/2	1-9/16	2	1-1/2	1-9/16
	3	2-1/2	2-9/16	3	2-1/2	2-9/16
				4	3-1/2	3-9/16
				6	5-1/2	5-9/16
				8	7-1/4	7-3/8
				10	9-1/4	9-3/8
12	11-1/4	11-3/8				
Timbers*	5		4-1/2	5		4-1/2
	6		5-1/2	6		5-1/2
	8		7-1/2	8		7-1/2

TABLE 15. Size Factors (CF) for tabulated design values

Grades	Nominal Width (depth) (in.)	Fb less than 4 in. thick	Fb 4 in. thick nominal	Ft	Fc	Other Properties
Select Structural No. 1 No. 2 & No. 3	4 & less	1.5	1.5	1.5	1.15	1.0
	5	1.4	1.4	1.4	1.1	1.0
	6	1.3	1.3	1.3	1.1	1.0
	8	1.2	1.3	1.2	1.05	1.0
	10	1.1	1.2	1.1	1.0	1.0
	12	1.0	1.1	1.0	1.0	1.0
14 & wider	0.9	1.0		0.9	0.9	1.0
Construction & Standard	4 & less	1.0	1.0	1.0	1.0	1.0
Utility	4	1.0	1.0	1.0	1.0	1.0
Stud*	4 & less	1.1	1.1	1.1	1.05	1.0
	5 & 6	1.0	1.0	1.0	1.0	1.0
MSR and plank Decking All grades & sizes	1.0	1.0		1.0	1.0	1.0

TABLE 16. Horizontal Shear Adjustment for tabulated design values (CH)

All horizontal shear base values are established as if a piece were split full length and as such the values are reduced from those permitted to be assigned in accordance with ASTM standards. This reduction is made to compensate for any degree of shake, check or split that might develop in a piece.

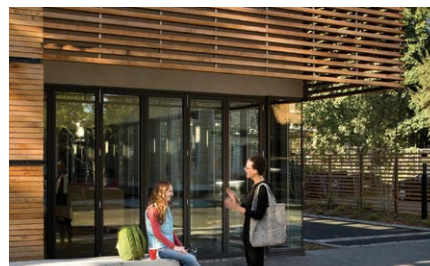
2 in. Thick (Nom.) Lumber		3 in. and Thicker (Nom.) Lumber	
For convenience, the table below may be used to determine horizontal shear values for any grade of 2" thick lumber in any species when the length of split or check is known:		Horizontal shear values for 3_ and thicker lumber also are established as if a piece were split full length. When specific lengths of splits are known and any increase in them is not anticipated, the following adjustments may be applied:	
When length of split on wide face does not exceed:	Multiply tabulated Fv value by:	When length of split on wide face does not exceed:	Multiply tabulated Fv value by:
No split	2.00	No split	2.00
1/2 x wide face	1.67	1/2 x narrow face	1.67
3/4 x wide face	1.50		
1 x wide face	1.33	1 x narrow face	1.33
1-1/2 x wide face or more	1.00	1-1/2 x narrow face or more	1.00



Yale Sculpture Gallery

Architect:
KieranTimberlake

The Yale Sculpture Gallery sits at the end of a row of two-story 19th century houses. Scaled to fit this streetscape, the gallery is a taut wood box with side walls that subtly bow out. The warm Western Red Cedar cladding contrasts with the glass walls of the adjacent studio building and the cement cladding of the parking structure. The entrance is set within a recessed glass enclosure along the north end of the gallery, where an open screen of spaced cedar slats is suspended veil-like from the roof plate. The gallery's exterior wall is a ventilated wood rain screen. Strips of glass at open corners and the clerestory admit daylight. The cedar cladding pulls back at the corners to reveal narrow slit windows, while bands of horizontal metal wrap the walls at intervals, forming a visual strapping to hold the wall planes together. ♦



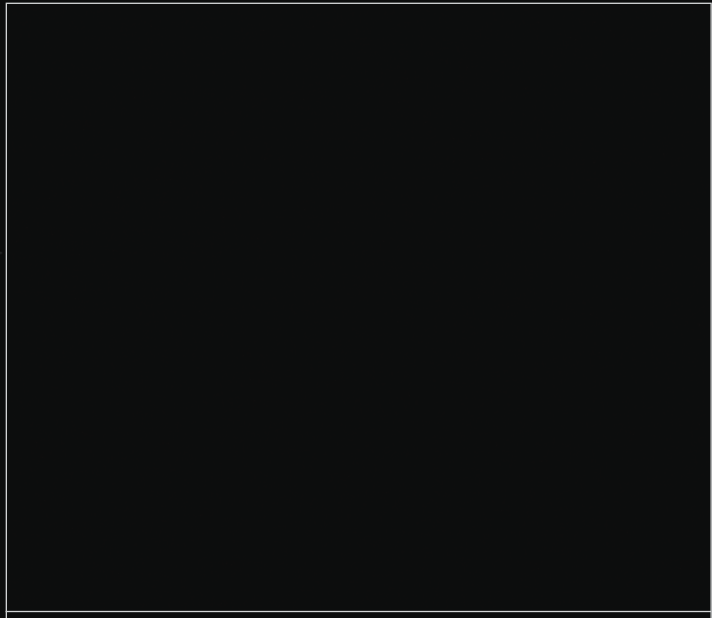
WESTERN RED CEDAR LUMBER ASSOCIATION

The Western Red Cedar Lumber Association (WRCLA) is an organization of Western Red Cedar producers, distributors and retailers throughout North America. Founded in 1954, the association is known worldwide as "the voice of the cedar industry." Its members account for more than 65 percent of the world's production of cedar and have an annual volume of nearly 1 billion board feet.

The association offers extensive resources to assist with the selection, specification and application of a wide range of Western Red Cedar products. Online, print and in-person AIA certified education courses are available at no cost.

The WRCLA's Architect Advisors are product specialists and available by calling **1 866 778 9096** or visiting the website **www.realcedar.com**.

When selecting Western Red Cedar, assure yourself of quality by specifying products from WRCLA members who are listed on our website.



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