

Flame-Spread Ratings & Smoke-Developed Indices; Conformance with Model Building Codes

Western softwood products used as interior finishes on walls and ceilings are required to have assigned flame-spread ratings meeting fire safety regulations in building codes. Western lumber species are well suited for these interior finish applications and often outperform other species and wood-based products in fire safety ratings.

Western Species tested for flame-spread have earned ratings favorable for applications requiring low flame-spread ratings. All tested Western species fall into Class B (or II) or Class C (or III) classifications, as shown in Table A. The low ratings for Western species provide an advantage over other species and wood products used in the same applications. (See Table B for other species and products.)

Flame-spread classifications, developed by Underwriters' Laboratories, Inc., are used in the National Fire Protection Standard Association Life Safety Code, NFPA 101. The numerical scale for flame spread in the fire codes is based on a non-combustible cement board as 0 (zero) and combustible red oak as 100.

The smoke-developed indices are a relative measure of the amount of visible smoke created when a substance burns. This is a visual measurement, different from smoke toxicity, but recognized by the codes as a life safety issue. The numerical scale for smoke-developed values is also based on 0 for non-combustible cement board and 100 for red oak.

ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials, was developed to rate building products for flame-spread characteristics. The Steiner Tunnel Test (ASTM E-84) is used to develop the actual burning and flame-spread data.

Table A

Western Softwoods	Flame-Spread Rating	Flame-Spread Class	Smoke-Developed Index	Source
Western Larch	45	B	20	HPVA
Engelmann Spruce	55	B	35	HPVA
Hem-Fir ¹	60	B	70	HPVA
White Fir	65	B	55	HPVA
Pacific Silver Fir	69	B	58	CWC
Western Red Cedar	69	B	137	W*
West Coast Hemlock	73	B	80	W
Sitka Spruce	74	B	74	CWC
Idaho White Pine	82	C	83	W
Douglas Fir	90	C	70	W
Sugar Pine	95	C	80	HPVA
Lodgepole Pine	98	C	90	W
Ponderosa Pine	115	C	135	HPVA

W* Weyerhaeuser Fire Technology Unit, 1987, sponsored by Council of Forest Industries.

W Weyerhaeuser Fire Technology Unit, 1988

HPVA Hardwood Plywood & Veneer Association, 1995, 2000, 2001.

CWC "Wood and fire Safety" by the Canadian wood Council, 1991.

¹ The Hem-Fir species group for Western softwoods is comprised of Western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), White fir (*Abies concolor*), California red fir (*Abies magnifica*), Noble fir (*Abies procera*) and Grand fir (*Abies grandis*). When lumber is from a single species, refer to the species index.

Code Requirements

The most widely accepted flame-spread classification system appears in the National Fire Protection Association Life Safety Code, NFPA 101. The International Building Code, Section 803, lists the following classification rating ranges:

Example Building Locations:

0-25 flame-spread—Class A (or I)	Enclosed vertical exits
26-75 flame-spread—Class B (or II)	Exit access corridors
76-200 flame-spread—Class C (or III)	Other rooms and areas

The model building codes require a smoke-developed index of 450 or less for most construction applications.

Designers should consult their locally applicable codes for flame-spread and smoke-developed requirements for specific use, areas, and occupancies. When a species does not carry a flame-spread classification appropriate to a desired application, designers may be able to use an intumescent finish or fire-retardant treatment to improve the flame-spread classification and satisfy local building codes.

Fire Retardant Coatings

Flame-spread indices may be reduced through applications of fire-retardant coatings. The effectiveness and degree of surface flammability reduction varies. Please refer to the finish/coating proprietor for specific flame-spread reduction indices or contact the National Paint & Coating Association (www.paint.org).

Table B

Other Wood Products	Flame-Spread Rating	Flame-Spread Class	Smoke-Developed Index	Source
Redwood	70	B	75-115	UL
Elm	76	C	-	HPVA
White Oak 3/4"	77	C	-	HPVA
Red Oak 3/4"	84	C	-	HPVA
Eastern White Pine	85	C	122	CWC
Redwood 3/8" Plywood	95	C	115	UL
SYP 3/8" Plywood	100-105	C	85	APA
Yellow Birch	105-110	C	-	UL
Birch Plywood 1/4"	127	C	-	HPVA
Walnut 3/4"	101	C	-	HPVA
Southern Yellow Pine	130-195	C	-	UL
Red Pine	142	C	229	CWC
Oak 1/4" Plywood	153	C	-	HPVA
Poplar	170-185	C	-	UL

Factory-Applied Finish				
Particleboard	100-180	C	-	HPVA
MDF	121-167	C	-	HPVA
Hardboard	148-166	C	-	HPVA
Hardwood Plywood	99-191	C	-	CWC, APA
Softwood Plywood	110-140	C	-	APA
OSB	150-155	C	-	APA

Source for Other Wood Products and factory applied Finish flame-spread ratings is provided in AF&PA's Design for Code Acceptance, www.awc.org/dca/dca1t1.html.

Smoke-developed indices were not measured for all species and products.

Flame-Spread ratings and smoke-developed indices sources:

APA	APA-The Engineered Wood Association
CWC	Canadian Wood Council
CRA	California Redwood Association
HPVA	Hardwood Plywood & Veneer Association
UL	Underwriters' Laboratory, Inc.

Flame-spread ratings for factory-applied finish products are based on range of indices for different product thicknesses.

Additional Information

Technical information on Western Lumber products manufactured by WWPA mills is available on the Internet in the Association's Online Technical Guide at www.wwpa.org/techguide. The Online Guide features sections on lumber grades, design values, specifications, special products and properties of Western lumber.

A list of WWPA producing mills is available on the web site in the Online Lumber Buyers Guide at: www.wwpa.org/members.asp. For a full description of technical publications available for purchase and a printable order form, go to the WWPA site at www.wwpa.org/publist.htm.

You can also receive an order form via fax through the WWPA Fax Delivery Service by calling 732-544-2876 and following the instructions.



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