

# TECHNICAL NOTE NUMBER 264

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FOREST SERVICE

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## WOOD SCAFFOLD PLANKS

Wood is widely used for scaffold planks because it is abundant and high in strength for its weight. This note is prepared to help users of wood scaffold planks get the maximum of utility and safety from them.

Almost any species of wood can be used satisfactorily for scaffold planks. Heavier woods generally are higher in strength and shock resistance than lighter woods. Following are weights and comparative index values for bending strength and shock resistance of a number of woods that are commonly used for scaffold planks:

Species	Weight <sup>1</sup>	Comparative index values in--	
		Bending strength	Shock resistance
	<u>Lb. per</u>		
	<u>cu. ft.</u>		
Oak, white.....	47	102	127
Pine, longleaf.....	42	103	109
Larch, western.....	39	97	107
Pine, shortleaf.....	36	87	96
Douglas-fir, coast....	34	90	86
Hemlock, western.....	30	74	73
Yellow-poplar.....	30	76	76
Hemlock, eastern.....	29	72	67
Pine, ponderosa.....	29	64	57
Redwood, old growth..	29	82	66
Spruce, white.....	29	68	68
Spruce, Sitka.....	28	72	76
Fir, white.....	27	72	58
Pine, eastern white....	25	62	54
Western redcedar.....	23	60	52

<sup>1</sup>At 15 percent moisture content.

A certificate of grade from one of the recognized lumber inspection agencies is one of the best ways to insure that new scaffold planks are of good quality. The user can make his own inspection of lumber he has on hand by referring to the published grade descriptions.

Any of the structural grades of lumber may be used for scaffold planks. The West Coast Lumber Inspection Bureau also specifies special scaffold plank grades in Douglas-fir and Sitka spruce. Most of these grades specify that the wood must be "free of heart center." Some grades limit the rate of growth. Both of these requirements tend to exclude rapidly grown wood that is found near the pith of the tree, because it may be deficient in strength and shock resistance or cause warp in drying. Scaffold planks may be fully surfaced, or the top side may be left rough (S1S1E) to provide better footing for the workers.

Some structural grades are designed for lumber that will be used with supports at both ends; thus, these have closer restrictions on strength-reducing characteristics, such as knots and slope of grain, only in the middle third of the length of the lumber. In the special scaffold plank grades, however, restrictions of knots and slope of grain are specified for the entire length of the plank since planks may be used continuously over three or more supports in scaffolding.

It is common to restrict the size of a single knot or the sum of sizes of two or more knots in any 6 inches of length to one-quarter of the width of the plank. A general slope of grain (disregarding the distorted grain around knots) should not exceed 1 inch in 15 inches of length. More details on how to measure knots or slope of grain can be found in U.S. Department of Agriculture Handbook No. 72, "Wood Handbook," which can be obtained from the Superintendent of Documents, GPO, Washington 25, D. C., for \$2.

Planks that are unusually lightweight for their species are likely to be below average in strength and shock resistance and should not be used for scaffold planks. Planks that are excessively warped also should not be used. Endsplits, on the other hand, have little effect on the strength of a plank unless there is a split whose length exceeds the width of the plank. Planks showing decay, however, should not be used for scaffold planks, for decay seriously reduces the strength of wood.

Preservative treatments are given planks that are used on jobs where they frequently get wet, while fire-retardent treatments are given planks that are used on interior and large scaffoldings. To be absolutely certain that any reduction in strength resulting from such treatment is allowed for, a reduction in 10 percent in the safe working stress should be made in calculating the load such planks will carry.

Safe working stresses for structural and scaffold plank grades are specified by the lumber inspection agencies. Those grades that are not stress rated can be given a working stress by the user if he follows a few simple additional rules in making his selection. These rules can be obtained from the U.S. Forest Products Laboratory.

The following formula can be used to calculate concentrated safe loads for scaffold planks

$$P = \frac{2wt^2f}{3L}$$

in which: P is the safe load in pounds

w is the actual width of the plank in inches

t is the actual thickness of the plank in inches

f is the safe working stress in bending, in pounds per square inch

L is the span between supports, in inches.

It is good practice always to have the same side up when a scaffold plank is used. When too heavy a load is put on a plank, incipient failures (which are also called compression failures) can occur. The layers of wood on the top side of the plank are compressed, or squeezed, lengthwise. The layers of wood on the bottom, on the other hand, are stretched so that they tend to pull apart lengthwise. The result is the appearance of transverse wrinkles on the plank surface, which are almost invisible in ordinary light. These wrinkles become areas of weakness and the plank is apt to collapse when it is turned over and these wrinkles are stretched under load.

Incipient failures often occur as a result of proof loading, which is a common practice. The Laboratory does not recommend proof loading however, except under carefully controlled circumstances. Instead, when seeking to ascertain the strength of a plank, the user should make a careful inspection of it from the standpoint of strength-reducing characteristics. More details on incipient failures are available in "Studies of Compression Failures and Their Detection in Ladder Rails," Forest Products Laboratory Report No. 4773: 1733.

Scaffolding used outside should be erected so that the planks will drain rapidly after rains. Planks should be kept dry when not in use and should be inspected periodically to make certain decay or other damage has not occurred. Wood does not lose strength from aging alone; old planks in good condition can carry the same loads as new planks of equal size and grade.

A final note of caution: Scaffolding planks should be selected and used with care because the cost of a single accident on a scaffold may far outweigh the expense of years of painstaking regard for safety.