

# TECHNICAL NOTE NUMBER 246

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## SUITABILITY OF WOODS FOR USE IN BARNs AND OTHER FARM STRUCTURES

A knowledge of the structural properties of various woods suitable for farm structures saves money and helps farm woodlot owners make better use of their timber for farm purposes.

A superficial selection of building material on the farm often results in needless waste. For instance, a farmer may assume that he wants a wood of high strength for barn siding when what he needs mainly is a wood having good painting and weathering qualities and ability to stay in place.

Detailed information based on actual tests on all of the strength and other physical properties of all the woods available for use on the farm are not at hand from any one source. The accumulated fund of information that is available, however, together with the observations and mature judgment of technical workers and builders affords a sound basis for the selection of building lumber items. It is on such a combination of actual test data and practical judgment that the following recommendations are based:

### Joists, Rafters, Plates (Barn)

#### Usual requirements:

High bending strength, good nail-holding power, moderate shrinkage, and medium ease of working. Woods of moderate bending strength can be used with fully satisfactory results if lower strength is compensated for by the use of larger members.

#### Woods combining usual requirements in a high degree:

Douglas-fir, western larch, southern yellow pine.

Ash, American beech, birch, maple, oak. (Hard to nail and work.)

#### Woods combining usual requirements in a good degree:

Cypress, eastern hemlock, western hemlock, redwood, eastern spruce, Sitka spruce, white fir, elm, sweetgum, hackberry, American sycamore, tupelo, yellowpoplar.

#### Woods combining usual requirements in a fair degree:

Cedar, eastern white pine, ponderosa pine, sugar pine, western white pine, Engelmann spruce, American basswood, American chestnut, cottonwood. (Strength and stiffness equal to that of strongest species can be obtained by use of larger sizes.)

#### Grades used:

The No. 1 Timber or Dimension grade of most softwood species is used in large barns. Added strength and nail-holding power in large, high-class barns can be obtained by the use of the select merchantable grade of Douglas-fir or the Dense No. 1 grade of southern pine. The No. 2 Timber or Dimension grade of all softwood species is used in small and low-cost barns. The hardwood grades used are sound square edge for large barns and common timber for small barns.

### Mangers (Barn)

#### Usual requirements:

Hardness, nonsplintering.

Woods combining usual requirements in a high degree:

Ash, American beech, birch, black locust, osageorange, rock elm, hickory, maple, oak, American elm, sweetgum, tupelo.

Woods combining usual requirements in a fair degree:

Cypress, Douglas-fir, western larch, southern yellow pine, redwood.

Grades used:

The hardwoods are used in No. 1 Common and No. 2 Common grades, the softwoods in No. 1 or No. 2. In the more economical type of work softwood grades as low as No. 4 and hardwood grades as low as No. 3 Common are sometimes used.

### Roof Boards (Barn)

#### Usual requirements:

High stiffness, good nail-holding power, low shrinkage, medium decay resistance, freedom from splitting.

Woods combining usual requirements in a high degree:

Cypress, Douglas-fir, western larch, southern yellow pine, redwood.

Woods combining usual requirements in a good degree:

Eastern hemlock, western hemlock, eastern white pine, ponderosa pine, sugar pine, eastern spruce, Sitka spruce, white fir, American beech, birch, maple, red oak. (Render good service in barns having low decay hazard.)

American chestnut, elm, sweetgum, white oak, yellowpoplar. (Sometimes available from locally grown timber.)

Grades used:

No. 1 and No. 2 grades are used in large, high-class barns. No. 2 is serviceable. No. 2 or No. 3 is used in small and low-cost barns. No. 3 may entail some waste in cutting.

### Siding and Barn Boards (Barn)

#### Usual requirements:

Good painting or weathering qualities, freedom from warping or splitting, medium decay resistance. Medium bending strength in walls without foundation or interior lining.

Woods combining usual requirements in a high degree:

Cypress, redwood. (Heartwood only. Adapted to barns without foundation walls or interior lining.)

Northern white-cedar, western redcedar, American chestnut. (Heartwood only. Require foundation wall or interior lining.)

Woods combining usual requirements in a good degree:

Eastern white pine, ponderosa pine, sugar pine, western white pine, yellowpoplar. (Heartwood only. Require foundation wall or interior lining.)

Douglas-fir, western larch, southern yellow pine. (Heartwood only.)

When given special priming coats and protected against weathering by good paint maintenance. Adapted to barns without foundation walls or interior lining.)

Woods combining usual requirements in a fair degree:

Hemlocks, eastern spruce, Sitka spruce, white fir.

Grades used:

The grade of bevel siding used is generally higher than the grade used with drop siding or barn boards. When bevel siding is used it is usually in D to A grades. When drop siding is used it is usually in B and Better grade in the highest type barns, but No. 2 is serviceable and is used extensively in more economical types of barns. Barn boards are customarily used in lower grades than are either bevel or drop siding. No. 1 is used in the highest type barns and No. 2 in the more economical type. No. 3 and No. 4 barn boards are also used, but entail some waste.

#### Sills on Foundation Walls (Barn)

Usual requirements:

Good nail-holding power, hardness, good decay resistance. High bending strength is important when piers or posts are used in lieu of walls.

Woods combining usual requirements in a high degree:

Cedars, cypress, American chestnut, redwood, white oak. (Heartwood has high decay resistance.)

Woods combining usual requirements in a good degree:

Douglas-fir, western larch, southern yellow pine, rock elm, yellow-poplar. (High in strength and nail-holding. Heartwood has medium decay resistance.)

Woods combining usual requirements in a fair degree:

Eastern hemlock, western hemlock, eastern white pine, ponderosa pine, sugar pine, western white pine, spruce, white fir, ash, American beech, birch, American elm, maple, red oak, American sycamore. (Require good preservative treatment.)

Grades used:

Softwood sills in large barns are generally of the No. 1 Timber or No. 1 Dimension grade. No. 2 Dimension is used in small and low-cost barns. Both No. 1 and No. 2 Dimension grades have a high percentage of heartwood. All-heartwood pieces should be selected for sills, especially where foundation walls are low or where condensed moisture is liable to be absorbed by sills. Hardwood sills are usually of the sound square-edge grade in large barns and of the common-timber grade in small barns.

#### Stall Flooring (Barn)

Usual requirements:

High decay resistance, uniform hardness (nonsplintering).

Woods combining usual requirements in a high degree:

White oak (heartwood only). (Principal wood used. Adapted to use

where horses are sharp-shod.)

Black locust, osageorange. (Not usually available. Adapted to use where horses are sharp-shod.)

Ash, American beech, birch, elms, blackgum, hickory, maple, red oak, tupelo. (Require thorough preservative treatment.

Adapted to use where horses are sharp-shod.)

Woods combining usual requirements in a good degree:

Cypress, Douglas-fir, western larch, southern yellow pine, redwood, sweetgum. (Heartwood only. Adapted to uses where the wear is light.)

Grades used:

The No. 2 Dimension softwood grade is used in all types of construction and is serviceable. No. 3 Dimension in softwoods is sometimes used and is serviceable when sound. The hardwood grades used for stall flooring are No. 1 and No. 2 Bridge Plank.

### Stanchions and Stalls (Barn)

Usual requirements:

High bending strength, medium decay resistance, hardness.

Woods combining usual requirements in a high degree:

Rock elm, black locust, white oak, osageorange.

Woods combining usual requirements in a good degree:

Ash, American beech, birch, American elm, sweetgum, hickory, maple, red oak. (Best adapted to use where mechanical wear is more important than decay hazard.)

Woods combining usual requirement in a fair degree:

Cypress, Douglas-fir, western larch, southern yellow pine, redwood. (Best adapted to use where mechanical wear is less important than decay hazard.)

Grades used:

No. 1 or No. 2 Dimension is commonly used, although grades as low as No. 4 are used. Grades lower than No. 2 may contain some decay that will require culling or cutting of some pieces. The hardwood grade, sound square edge, is commonly used in the best construction and the common hardwood lumber in more economical construction. The common hardwood lumber may require some cutting.

### Studding (Barn)

Usual requirements:

Good stiffness, good nail-holding power, medium freedom from warp, moderate ease of working. In some barns, especially dairy, preservative treated or good natural decay resistance is an added requirement.

Woods combining usual requirements in a high degree:

Douglas-fir, western larch, southern yellow pine.

Cypress, redwood. (Heartwood decay resistance is high.)

Woods combining usual requirements in a good degree:

Hemlocks, eastern white pine, ponderosa pine, sugar pine, western white pine, eastern spruce, Sitka spruce, white fir, American chestnut, yellowpoplar.

Ash, American beech, birch, black locust, maple, oak. (Hard to nail and fabricate.)

Elms, sweetgum, hackberry, American sycamore. (Difficult to fabricate because of warped pieces.)

Grades used:

No. 1 Dimension is the principal softwood grade used for studing in high-class construction. No. 2 Dimension is serviceable, but is more difficult to fabricate because it contains more crooked pieces. No. 2 and No. 3 Dimensions are used in small, inexpensive barns. No. 3 entails some waste in cutting. Hardwoods in common dimension are used in all types of construction.

### Concrete Forms

Usual requirements:

Good stiffness, good bending strength, resistance to warping and splitting incident to installation and reuse, ease of nailing and cutting. With compensations in size of material or in frequency of bracing, almost all woods can be used in ordinary construction for concrete forms.

Woods combining usual requirements in a high degree:

Cypress, Douglas-fir, western larch, southern yellow pine. (High strength and good reuse value.)

Western hemlock, eastern spruce, Sitka spruce. (Easy to cut and nail. Reuse high, but lack strength of preceding group of woods.)

Woods combining usual requirements in a good degree:

Eastern white pine, eastern hemlock, ponderosa pine, western white pine, redwood, white fir.

Woods combining usual requirements in a fair degree:

American basswood, American beech, birch, cottonwood, gum, maple, oak. (Difficult to assemble or have low reuse value.)

Grades used:

No. 1 and No. 2 grades of softwoods and No. 2 Common hardwoods are used in forms with minimum of bracing. Forms in which the spacing is close or the loads are small use No. 2 or No. 3 softwood grades or No. 3 Common hardwoods. No. 4 in softwoods is sometimes used for simple rough forms. The percentage of No. 4 material that can be reused is smaller than with the better grades.

### Fence Posts

Usual requirements:

High decay resistance, narrow sapwood ring, medium bending

strength, high nail-holding power. Practically all species can be used if given a good preservative treatment.

Woods combining usual requirements in a high degree:

Black locust, osageorange. (Meet all requirements. Not readily available in all parts of the United States.)

American chestnut, white oak. (Sawed or split. Heartwood only. Generally available in the eastern states, but life shorter than preceding group.)

Cedars, cypress, juniper, redwood, catalpa. (Sawed or split. Heartwood only. Readily available, but do not hold nails so well as preceding groups.)

Woods combining usual requirements in a good degree:

Douglas-fir, western larch, southern yellow pine, tamarack. (Sawed or split. Heartwood only.)

Woods requiring thorough preservative treatment for long service:

American beech, birch, maple, red oak, elms. Equal the best woods when given a good preservative treatment.)

Hemlocks, spruces, white fir, American basswood, cottonwood, sweetgum, tupelo, yellowpoplar.

Grades used:

Fence posts are frequently round and have no standard grades.

It is not practical to limit the amount of sapwood in round posts by rules or specifications.

#### Gates and Fences (Exclusive of Posts)

Usual requirements:

Moderate bending strength, medium decay and weather resistance, high nail-holding power, freedom from warp.

Woods combining usual requirements in a high degree:

Cypress, Douglas-fir, western larch, southern yellow pine, redwood, white oak.

Woods combining usual requirements in a good degree:

Cedar, eastern white pine, ponderosa pine, sugar pine, western white pine, American chestnut, yellowpoplar. (Small tendency to warp, weather well, but low in strength and nail-holding power.)

American beech, birch, sweetgum, maple, red oak, tupelo.

(Strong, hard, high in nail-holding power, but have greater tendency to warp and do not weather so well as preceding group.)

Eastern hemlock, western hemlock, white fir, spruce. (Intermediate between preceding groups.)

Grades used:

The No. 1 or No. 2 softwood and No. 2 Common hardwood grades are used in better and more substantial gates and fences. In lighter and more economical gates and fences No. 2 or No. 3 Common hardwood are used. A softwood grade as low as No. 4 may be used, but entails some waste.

### Scaffolding

#### Usual requirements:

High bending strength, high stiffness, high nail-holding power, medium weight.

#### Woods combining usual requirements in a high degree:

Douglas-fir, western larch, southern yellow pine, white ash.

#### Woods combining usual requirements in a good degree:

Cypress, redwood, spruces.

Birch, elm, maple, oak. (Hard to saw and nail.)

#### Woods combining usual requirements in a fair degree:

Sugar pine, ponderosa pine, western white pine.

#### Grades used:

Structural grades are usually required for scaffolding that must support loads under conditions which involve hazards to life or limb. Light scaffolding should be selected from softwood made of No. 1 Dimension or Better, and in hardwoods uprights can be selected from Common Dimension and planking from No. 1 Bridge Plank. Selection should eliminate all pieces with large or unsound knots and crossgrain. Some state building codes designate the grades to be used for scaffolding.

### Silos, Tanks, and Vats

#### Usual requirements:

High decay resistance, low shrinkage.

#### Woods combining usual requirements in a high degree:

Cedars, cypress, redwood. (Heartwood only.)

American chestnut, white oak. (Quarter-sawn heartwood only.)

#### Woods combining usual requirements in a good degree:

Douglas-fir, western larch, southern yellow pine. (Heartwood only, edge grain.)

#### Grades used:

The requirements for silos, tanks, and vats are best met by grades prepared especially for these uses. Such special grades are sold as tank, tank and boat, or silo stock and are available in most of the softwoods well adapted to these uses. The clear-heart grades available in cypress and redwood are also used extensively where requirements are high. There are no special grades in hardwoods for silos, tanks, or vats. Hardwoods, when used, should be bought on special order calling for all-heart, tight stock.

### Troughs (Feed) and Supports

#### Usual requirements:

Medium decay resistance, medium bending strength, nonsplintering, hardness.

#### Woods combining usual requirements in a high degree:

Cypress, redwood, American chestnut, white oak. (Adaptable to use where decay hazard is high.)

Douglas-fir, western larch, southern yellow pine. (Adaptable to uses that are subjected to rough treatment, but only moderate decay hazards.)

Grades used:

No. 1 or No. 2 boards are used in the softwoods for large long troughs. A softwood grade as low as No. 4 can sometimes be used to advantage in troughs in which the lumber is cut to short lengths. Of the hardwoods, the No. 2 Common grade is the most used. The No. 3 Common hardwood grade can sometimes be used if the material is cut to short lengths.

Windmill and Well Platforms

Usual requirements:

High decay resistance, good bending strength.

Woods combining usual requirements in a high degree:

Cypress, redwood, American chestnut, black locust, white oak.  
(Heartwood only.)

Woods combining usual requirements in a good degree:

Cedar, Douglas-fir, western larch, southern yellow pine, rock elm. (Heartwood only.)

Grades used:

No. 1 or No. 2 Dimension in softwoods and sound square in hardwoods are the grades ordinarily used.

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The foregoing information is a part of U. S. Department of Agriculture Farmers' Bulletin 1756, "Selection of Lumber for Farm and Home Building," copies of which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5¢ each, stamps not accepted.