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ABSTRACT:

Wood natural decay resistance is dependent on species selection and use of heartwood only. Rainforest species are not required. US native species offer sustainable alternatives.

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KEYWORDS:

Wood, Black Locust, Ipe, Natural Decay Resistance,

REFERENCES:

Architectural Woodwork Standards, 2009 by AWI, AWMA, and WI
ASLA Black Locust Lumber: A Sustainable Alternative
Dry Kiln Schedules for Commercial Woods USDA Forest Service
Wood Handbook, 1999 by Forest Products Laboratory
WDMA I.S.4 - Industry Specification for Preservative Treatment for Millwork by Window and Door Manufacturers Association

Naturally Decay Resistant Wood

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Background

For exterior applications, wood is commonly used for siding, decking, railings, trim, and decoration. Wood is not permanent. Wood is organic and is subject to decay from exposure to the elements. Exterior wood can be protected to prolong its life expectancy. Paints, stains, and other coatings can be applied during construction. After construction is complete, only the protective coatings exposed to view can be maintained.

And what can be done for those applications where coatings are not practical or architecturally acceptable? Answer: Use naturally decay resistant wood.

We had occasion to recommend Black Locust a native US species for a recent Alabama Veterans Affairs project. The wood was specified for transparent finished ceilings and trim on open air structures. The reason for the recommendation was its extreme decay resistance and its regional availability.

Guiding Standards

The *Architectural Woodwork Standard* (AWS) offers recommendations about lumber species that are naturally decay resistant. The list in the AWS is taken from 1999 *Wood Handbook*. To be considered decay resistant, the wood must be heartwood only, the oldest, densest portion of the tree. AWS categorizes 19 species as Resistant or Very Resistant and 13

species as Moderately Resistant.

Then the species are further categorized the species as domestic (meaning United States and Canada) and imported (meaning the rest of the world).

When none of these species are used for exterior applications, AWS requires the wood to be preservative treated using chemicals approved by WDMA

There are eight species marked with an asterisk that are indicated to be extremely high decay resistant. Of these, only two are domestic species: Black Locust and Pacific Yew. Black Locust is an excellent option to Ipe the commonly selected tropical rainforest species with similar durability. Ipe is known by many other names. See http://ipedecking.com/info/ipe_specifications.php for additional names.

Practical Examples

Walk or bike the Ocean City, NJ boardwalk. Pay attention to the boards. There are two types: preservative treated southern yellow pine and Ipe. The weathered surfaces are so different. The pine grain opens as it ages and the boards begin to cup. The Ipe remains tight, smooth, and flat.

I worked an Ohio farm during high school. We cut our own fence posts from a small stand of Black Locust that was maintained solely for that purpose because they were perfect for the job. Only a little sweat was required when new posts were needed.

A presentation made at the American Society of Landscape Architects (ASLA) in November 2011 showed examples of a variety of structures and site furnishings built with Black Locust.

Black Locust Properties

Black Locust is native to Appalachian Mountains and Ozark Mountains areas. Trees mature in 20 - 30 years. They grow up to 3 feet in diameter and a height of 40 to 100 feet. In forest stands, the tree generally grows straight.

Black Locust is one of the densest American hardwoods, 49 pcf at 15% moisture content. This is equivalent to red oak and about 80% the density of the extremely high decay resistant tropical hardwoods.

Black Locust is extremely strong in bending with a modulus of elasticity of more than 2 million psi. This is bested only by Ipe and Purpleheart naturally decay resistant tropical species.

Black Locust's Janka Hardness (ASTM D1037) is 1700, more than 30% harder than red oak, but less than half the hardness of Ipe. Hardness is the measure of load resistance perpendicular to the grain and represents resistance to wear. Despite the high density, Black Locust is dimensionally stable. Shrinkage when dried from green to 6% moisture content is 3.7% radial (quarter sawn) and 5.8% tangential (plain sawn). This is 30% less shrinkage than for Ipe and slightly less than white oak. The shrinkage is one of the lowest for domestic wood species.

Moisture Content

Lumber should be dried before use to ensure the wood is dimensionally stable. The optimum moisture content is 10 - 15 percent, except for the dry Southwestern US where 7 -12 percent is recommended.

Kiln drying naturally decay resistant wood can be difficult. When it is dried too quickly, it may case harden (meaning the outer surfaces dry, but the interior remains wet). Case hardening induces stress in the lumber and results in unpredictable behavior as the lumber attempts to reach equilibrium.

Thicknesses greater than 6/4 must be dried according to the stringent T3-A1 schedule published by the USDA Forest Service. Particular attention must be given to testing and documenting the moisture content during the drying process to avoid case hardening.



Image: Black Locust Lumber Products
www.blacklocustlumber.com

Conclusion

Specify naturally decay resistant wood to construct durable exterior structures and architectural woodwork where possible. Select the species to suit the project conditions, exposure, and required durability. Choose between moderately resistant, very resistant, and extremely resistant species. Refer to AWS Section 3 Lumber to know what species are included in each category. Be sure to specify the particular wood species and require heartwood only. Sapwood is not naturally decay resistant.

Black Locust, grown in the Eastern US provides a sustainable alternative to rainforest species as an extremely durable, decay resistant wood.

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