

State of Oregon
Building Codes Division

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Statewide Alternate Method OSSC/ORSC No. 09-01
(Ref.: ORS 455.060)

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**WESTERN JUNIPER
NATURALLY DURABLE WOOD**

2007 & 2010 Oregon Structural Specialty Code (OSSC),
Section 2302.1 & 2304.11
2008 & 2011 Oregon Residential Specialty Code (ORSC),
Section R202 & R319

Statewide Alternate Methods are approved by the Division administrator in consultation with the appropriate advisory board. The advisory board's review is limited to the technical and scientific facts of the proposal. In addition:

- *building officials shall approve the use of any material, design, or method of construction addressed in a statewide alternate method*
- *the decision to use a statewide alternate method is at the discretion of the designer*
- *statewide alternate methods do not limit the authority of the building official to consider other proposed alternate methods encompassing the same subject matter*

Requested by: Oregon Building Codes Division

Background:

The purpose of this alternate method is to recognize the heartwood of Western Juniper as being equivalent in natural durability to the heartwood of those wood species noted as such in the OSSC and the ORSC.

Both the OSSC and ORSC require that wood used in prescribed locations subject to moisture, must meet the respective definitions for "naturally durable wood." The definitions indicate that only the "heartwood" of the species noted is considered "naturally durable" with limited exceptions.

The International Building Code (IBC) and the International Residential Code (IRC) include "termite resistance" as well as "decay resistance" in the definition of naturally durable wood. This alternate method addresses both aspects.

Western Juniper is a native tree species found in Central Oregon and the desert southwest which has become invasive given the modern ability to control forest fires as well as other factors. This has resulted in a significant drop in open grasslands. Western Juniper also draws significant amounts of ground water denying the same from grasses and other native plants. For years, private land owners, The Bureau of Land Management, and The US Forest Service have been removing Western Juniper from historic open grasslands. Unfortunately, much of this material has found its way to slash piles and burned. In keeping with good stewardship practices, various state and federal agencies as well as western lumber mills have collaborated in the recovery of much of this material.

In an effort to bring Western Juniper dimensioned lumber to market, steps have been taken to develop grading standards and span ratings in conformance with the *American Forest and Paper Association* for joists and rafters. This is consistent with "I" code requirements. Formal recognition of Juniper's naturally durable properties may assist in finding additional applications for this emerging forest product.

Discussion:

As noted above, both the OSSC and ORSC require that wood used in prescribed locations subject to moisture, must meet the respective definitions for "naturally durable wood" which addresses both the decay and termite resistance of a species.

The definitions also state that only the "*heartwood*" of the species is considered naturally durable. However, corner sapwood is permitted if 90 percent or more of the width of each side on which it occurs is heartwood.

With few exceptions, sapwood is not resistant to decay. In general, *sapwood* contains both living and dead tissue and carries sap from the roots to the leaves. In contrast, *heartwood* is formed by a gradual change in the sapwood and is inactive. Heartwood consists of inactive cells that do not function in either water conduction or food storage. The transition from sapwood to heartwood is accompanied by an increase in extractive content. Frequently, these extractives darken the heartwood and give species such as black walnut and cherry their characteristic color. In some species, such as black locust, western red cedar, and redwood, heartwood extractives make the wood resistant to fungi or insect attack. The basic strength of the wood is essentially not affected by the transition from sapwood cells to heartwood cells.¹

Neither the IBC nor IRC have referenced standards for the determination of decay or termite resistance. Per discussions with staff of the International Codes Council, the inclusion of the species noted in the respective codes appears to have been principally derived from empirical observation.

Furthermore, there are different testing standards available even within the *American Wood Protection Association*, making a direct comparison of results difficult.

¹ <http://www.fpl.fs.fed.us/documnts/fplgtr/fplgtr113/ch02.pdf>

In the absence of a single nationally referenced standard, the justification for this alternate method is derived from research conducted by Oregon State University's (OSU) Forestry Department.

Technical and Scientific facts:

DECAY RESISTANCE: The technical and scientific basis for the decay resistance portion of this alternate method is derived from extensive research by OSU dating back to 1928. One particular study documents untreated Western Juniper fence posts which have been in continuous use for more than 60 years². Other OSU studies indicate that Western Juniper is superior to Redwood and Cedar in its natural durability³.

The following values were extracted from the study and compare Western Juniper with certain wood species noted in the OSSC and ORSC as being "Naturally Durable:"

- Western Juniper = 1 or "Very Resistant"
- Black Locust = 1-2 or "Resistant to Very Resistant"
- Black Walnut = 1-2 or "Resistant to Very Resistant"
- Redwood = 2 or "Resistant"
- Western Red Cedar = 2 or "Resistant"

TERMITE RESISTANCE: The technical and scientific basis for the termite resistance portion of this alternate method is derived from recent research conducted by OSU's Forestry Department and detailed in the attached document entitled "*Decay and Termite Resistance of Western Juniper Sapwood and Heartwood under Tropical Conditions.*" In this research, Western Juniper was exposed to foraging termites for a one-year period in Hawaii following testing protocols established by the American Wood Protection Association (AWPA). The results of this study indicated that "*Western juniper heartwood exhibited excellent resistance to termite attack with no evidence of attack 1 year after treatment.*"

Many of the available test standards for termite resistance are based on lab-scale testing. In following the AWWPA field test protocol in a tropical environment, the OSU research may be considered a "litmus test." The climatic conditions found in Hawaii readily promote both termite promulgation and the degeneration of untreated wood. Sustained tropical conditions as encountered in the research would not be expected in Oregon.

*Additional information and research on Western Juniper is available through OSU's "Western Juniper Homepage."*⁴

² <http://juniper.orst.edu/post-farm.pdf>

³ <http://owic.oregonstate.edu/pubs/durability.pdf>

⁴ <http://juniper.oregonstate.edu/index.php>

The scientific and technical facts of this alternate method ruling have been reviewed by the Building Codes Structures Board and the Residential Structures Board.

Applicable Code Citations

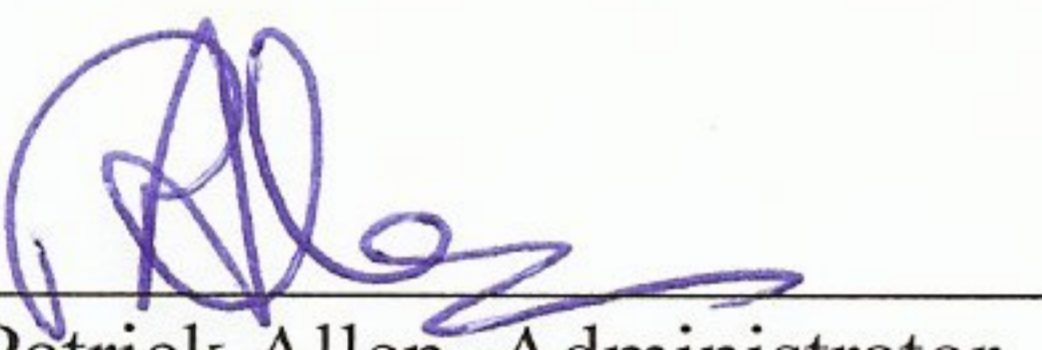
Specialty Code	Naturally Durable Definition	Required Locations
2007 & 2010 Oregon Structural Specialty Code	2302.1	2304.11
2008 & 2011 Oregon Residential Specialty Code	R202	R319

Statewide Alternate Method:

The heartwood of Western Juniper is deemed to be equivalent in durability to the heartwood of those wood species noted in the 2007 OSSC and the 2008 ORSC as “naturally durable wood.”

In anticipating future model code adoptions, the heartwood of Western Juniper is deemed to be equivalent in durability to the heartwood of those wood species noted in the 2010 OSSC and the 2011 ORSC as “naturally durable wood.”

The recommendation and findings of the *Building Codes Structures Board* and the Residential and Manufactured Structures Board are accepted and are adopted:


Patrick Allen, Administrator
Building Codes Division

January 6, 2010
Date