Standardization of Naturally Durable Wood Species

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ABSTRACT

Although conventional North American durable wood species such as cedar and redwood continue to be widely used, there is increasing interest in the use of imported durable wood species. In contrast to native wood species or pressure-treated wood, there is often little data to document the durability of these imported species, and there currently is not an association or standard setting body that lists appropriate applications for naturally durable species. The American Wood Protection Association is currently considering the possibility of incorporating naturally durable species within the Book of Standards. Task forces formed in subcommittees P-1, P-6, P-9 and T-1 have made some progress in outlining an approach for listing naturally durable species. The process for obtaining a listing for a new wood species would be similar to that of a new wood preservative, with presentation of durability data, provisions for analytical methods if possible, and development of quality assurance procedures. Species such as western redcedar and redwood, which are currently listed for durable applications in the building codes, could be incorporated into the standards with minimal additional durability data requirements. It is anticipated that the naturally durable species would be listed in a commodity standard (or standards) that is separate from preservative-treated wood. However, the task forces also determined that listing of naturally durable wood species would present unique challenges and require a substantial time commitment from members of the association. There is now a need for more awareness and input on this issue from a broader range of AWPA members. The purpose of this paper is to better acquaint association members with the status of efforts to standardize naturally durable species, and to solicit input on the value of this effort to AWPA.

INTRODUCTION

Before the advent of treatment processes, mankind relied on naturally durable wood species to provide wood products that would give acceptable service lives under conditions conducive to decay and termite attack or simply replaced non-durable, biodegraded wood when necessary. Indeed, one of the factors prompting the development of modern wood preservation was the depletion of the naturally durable wood resource in Europe and subsequently across the rest of the world. In North America, species such as redwood and cedars remain popular materials for decking, fences, shakes and shingles. In addition to durability, these species are selected for their appearance and dimensional stability. Although cedars and redwood are not as consistently durable as properly treated wood, especially in ground contact, years of experience with their use have provided familiarity with applications where they will be sufficiently durable. However, in recent years there have been increasing amounts of exotic wood species imported into North America that are touted as highly durable. There is much less familiarity with the properties of these species, including their natural durability. Although some data may be available on the durability of these species, it is often incomplete or largely anecdotal. We have also seen the importation of plantation-grown material of species with natural durability claims based on ratings for material from old growth forests. The burden of deciding whether or not the species will have sufficient durability for the intended application falls largely on the user or purchaser. Unfortunately, most users of durable wood products do not have the expertise to evaluate the evidence of durability, if any, provided by the seller. For example, users may not realize that laboratory mold tests, or one year of field exposure, are not adequate to demonstrate durability of a product intended for decking.

Current references or listings of naturally durable species

Unlike pressure-treated wood, there is currently no industry-wide mechanism for review and listing of appropriate end-uses for naturally durable species. The building codes do list some naturally durable species as an alternative to treated

wood for situations where moisture conditions are conducive to decay. The International Building Code (IBC) specifically allows the heartwood of redwood, cedars, black walnut and black locust for exterior, above-ground applications, as well as for most ground-contact applications. The heartwood of redwood and eastern red cedar are listed as termite resistant as is, unaccountably, the sapwood of western red cedar. The IBC does not mention imported species such as ipe that are frequently used in deck construction, nor does it provide an additional source for listings of naturally durable wood species. The IBC does not cite a source of listings of naturally durable species. In some cases, state or local governments can deviate from the IRC and IBC. For example, in 2010, the State of Oregon issued Statewide Alternate Method OSCC/ORCC No. 09/01 to allow use of western juniper in the state's building codes. Interestingly, within this document they also discuss the lack of guidance available for approving naturally durable wood species.

Given the lack of standards for naturally durable species, how do users currently select a species for a specific end use? There appears to be a mix of information available. Industry associations provide recommendations for appropriate use of more commonly used naturally durable woods. For example the California Redwood and Western Red Cedar Lumber Associations have developed recommendations that help to ensure that their respective products perform as expected. Unfortunately, equivalent associations do not exist for most other species. Some species, such as ipe, have been used frequently enough that they have gained name recognition and some level of comfort for the consumer. Another source of information is listings and data generated by government and university researchers. Suppliers of naturally durable species often reference the USDA's Wood Handbook, which groups the durability of heartwood from various species into decay resistance categories. Because these listings are produced by the USDA, they have substantial credibility. However many people are not aware that the Wood Handbook listings are only estimates which in some cases are based on limited data. Listing within a Wood Handbook grouping is not meant to imply that the durability of the species has been rigorously evaluated as it might be for listing in a code or standard. Furthermore, these ratings are for material from old growth forests and may not apply to plantation-grown material. Other online resources are also available to users of naturally durable wood (e.g. Scheffer and Morrell 1998), but these too are often only based on limited data.

Why should AWPA consider standardizing naturally durable species?

If one accepts the premise that there is need for some type of standardization or listing of naturally durable species, the next question might be "why AWPA?" There are multiple answers to this question. First, no other code-writing or standard-setting organization has as much expertise in evaluating the durability of wood products, or in writing standards for their use. Second, there currently is no over-arching association representing the interests of producers and users of naturally durable wood species. Third, AWPA members, both producers and users, are being affected by the lack of standardization of naturally durable species. In some cases unproven species are being used for applications where pressure-treated wood should have been used. In other cases, users, such as utilities, are pressured to use naturally durable species as "environmentally preferable" alternatives to treated wood, but find no guidance on the expected durability of the wood species in question. This latter example is the situation that prompted a utility member of AWPA to ask the association to consider standardizing naturally durable species so that utilities and other users would have a reliable source of information. The AWPA Executive Committee subsequently issued instructions to the P and T committees to consider the possibility of adding naturally durable species to AWPA standards. AWPA standardization would also provide the mechanism for submission and review of data packages from proponents of imported wood species. Fourth, proponents of new preservative systems for residential above ground uses are increasingly using naturally durable wood as reference material. Finally, standardization of naturally durable wood species would broaden the base of AWPA membership and expand its relevance to the wood products industry.

There are also valid arguments against AWPA standardization of naturally durable species. There is no doubt that doing so would require the expenditure of considerable time and effort by AWPA members and subcommittees. It would also provide an opportunity for materials that compete with treated wood to gain credibility and market share. But, this latter argument must be considered in light of the current situation in which market share is being lost to species that have not had to demonstrate durability and undergo review. One could argue that standardization of existing species such as western red cedar and redwood would have the effect of lowering the credibility of other species, such as tropical hardwoods, that are not standardized. Imported species could gain credibility by obtaining a listing in AWPA standards, but they would first need to generate data and undergo the review needed to obtain standardization. If so, AWPA will have performed its mission of ensuring that the user has a source for determining which wood products are durable for an intended application. Other arguments against standardizing naturally durable wood species such as the uncertainties caused by variability in durability, wood identification, and quality control procedure also have merit, and will be discussed in more detail below.

Recognizing differences from pressure treated wood

Although in many ways standardization of naturally durable species might be similar to pressure-treated wood, there are some differences that need to be considered. One of these differences is the greater degree of variability in durability that can

occur with some wood species. Durability can vary between trees and even for wood cut from the same tree. There can also be substantial variability in durability of pressure-treated wood, but this can usually be explained by differences in preservative penetration and/or retention. The performance of some naturally durable species also appears to be more sensitive to exposure conditions than pressure treated wood. A species that exhibits excellent durability in northern climates may not perform nearly as well in warm humid climates.

Species confirmation could be another unique challenge, especially for imported woods. Closely related species may differ substantially in durability, but have very similar appearance. In addition, the same trade name and common name might be used for multiple species. Routine species identification and confirmation might require considerable expertise though it may also be possible to develop near infrared (NIR) scanning (Sandak et al 2009) or DNA analysis methods (Deguilloux et al 2004, Loveless and Gunnison 2003, Yoshida and Nishiguchi 2007) to verify species if appropriate reference material is available. A related concern to both species identification and variability in durability is the lack of a test analogous to assaying preservative treated wood for preservative retention. Although research is promising using High Performance Liquid Chromatography for western red cedar (Daniels and Russell 2007, Stirling, 2010) and NIR for larch (Gierlinger et al 2002), for most wood species there is insufficient understanding of the chemistry behind their durability to allow development of assay tests for active ingredients. If such tests could be developed and closely related to durability naturally, durable species could be used with greater confidence. Another difference between treated wood and naturally durable species is the reversed role of heartwood and sapwood. The location of the non-durable sapwood on the exterior of naturally durable species may cause different durability concerns than the untreated heartwood within pressure-treated wood.

Current activities within AWPA

Following Executive Committee instructions to the Preservatives and Treatments committees, task forces were developed in subcommittees P-1, P-6, P-9 and T-1. These task forces have begun exploring the possibility of incorporating naturally durable species into AWPA standards, and in some cases draft standards have been created to provide focus and direction for task force discussion. However, there is still some disagreement within the task forces as to whether AWPA should put in the time and effort required to list naturally durable species. Progress has also reached a point where involvement of associations representing North American naturally durable species is necessary. There is now a need for more awareness and input on this issue from a broader range of AWPA members. The purpose of this paper is to better acquaint association members with the status of efforts to standardize naturally durable species, and to solicit input on the value of this effort to AWPA.

POSSIBLE APPROACHES TO STANDARDIZATION

Task force members have developed general approaches to standardization of naturally durable species, although substantial challenges remain, particularly in the area of quality assurance and quality control. These proposed approaches are works in progress and not intended to represent the only alternative.

P-Standard Listings of Naturally Durable Species

It is proposed that naturally durable wood species would fall under the jurisdiction of the recently formed Subcommittee P-9, Nonbiocidal Wood Protection. An example of a species listing has been prepared in a format similar to that used for wood preservatives (Figure 1). In this case the distinguishing features are key anatomical properties and the presence of certain types of extractives. An effort has been made to address known variability in the durability of this wood species by creating three “types” of the species depending on source. These types can then be considered separately for subsequent listing in use categories. As discussed above, a question remains in regards to analytical methods to assay for active compounds in naturally durable species.

Obtaining a listing for a new wood species

Presumably the process for obtaining a listing for a new wood species would be similar to that of a new wood preservative. As with wood preservatives, guidelines for data needed would be provided in an appendix to the AWPA standards. A draft “Appendix X: Data Requirement Guidelines for Listing of Naturally Durable Woods in the AWPA Standards Without Preservative Treatment” has been prepared by the P-1 task force (see attachment at the end of this paper). The format and content of the draft “Appendix X” is similar to that of the existing Appendix A (AWPA, 2010a) which provides data requirement guidelines for new wood preservatives. One important exception is the increased emphasis on sourcing of the material for test specimens. Natural durability can vary greatly between geographic regions, and the draft Appendix X requires obtaining the specimens from at least three locations across the geographic range of the wood species. Another difference from the preservative guidelines is the absence of tests for preservative leaching. These leaching tests would not be relevant until the specific compound(s) in the wood responsible for durability are identified. However, leaching of specimens could still be required for efficacy tests such as the soil-block test.

Standardization of species already listed in building codes

It has been suggested that species currently listed in the International Building Code would be considered as already having demonstrated some degree of durability, and would be eligible for listing in P-standards without submitting full data packages. Relevant P-standard information similar to that shown in Figure 1 would still need to be developed and considered by subcommittees P-1 and P-9. There are several reasons for taking this grandfathering approach. Given their code listings and long history of use, it would appear somewhat absurd to question that the heartwood of species such as western red cedar and redwood has sufficient naturally durability to meet customer expectations. Although, it could also be argued that this market acceptance and long history of use is based primarily on the performance of lumber from old growth trees. It is unclear whether lumber from these species that is currently on the market has the same performance. However, inclusion of these common North American species will also provide an example for other wood species and allow development of the T standards. Finally, listing these species will help encourage the support and involvement of the major associations that represent North American durable woods. Without the cooperation of these associations it is less likely that durable species standards developed by the AWPA would be widely utilized.

Pxx-yy AMERICAN WOOD PROTECTION ASSOCIATION **STANDARD**
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STANDARD FOR WESTERN RED CEDAR TYPES A, B AND C

Jurisdiction: AWPA Subcommittee P-9

This Standard was developed by AWPA's Technical Committees in an open, consensus-based process. Any modifications, deviations, or exceptions to this Standard invalidate any references to this Standard and nullifies any statements of compliance with this Standard.

Wood Species Code	WRC
Latin Name and Authority	*Thuja plicata* Donn ex D. Don
Latin Synonyms	N/A
Vernacular Name(s)	Western Red Cedar, Western Redcedar, Giant Arbor Vitae, Pacific Red Cedar, British Columbia Cedar, Canoe Cedar, Giant Cedar
Description of the Wood Product	Naturally durable wood species
Use pattern	Heartwood may be used untreated or with preservative treatment depending on use category and desired service life
Distinguishing Features	
• **Country of Origin**	WRC-A Old growth: USA, Canada WRC-B Managed forest: USA, Canada WRC-C Plantation: UK, Norway
• **Heartwood Color**	Straw colored to very dark brown
• **Basic Density Range**	312 kg/m^3 ± ????
• **Distinctive Wood Anatomy**	Aromatic odor, Resin canals and pitch pockets absent. Bordered pits in one or two rows without obvious torus. Axial and ray parenchyma present. Rays uniseriate, rarely more than 10 cells.
• **Distinctive Extractive(s) and Minimum Content(s) to aid in identification**	Plicatic acid (> 500 ppm), beta-thujaplicin (> 50 ppm), gamma-thujaplicin (> 50 ppm), thujic acid (> 100 ppm)
Miscellaneous	
Analytical methods	AWPA Axx*
Enforcement	
Jurisdiction	AWPA Committee P9
Historical	N/A
Reaffirmation	N/A
Amendments	N/A

* HPLC etc.

Figure 1. Example of durable species listing as a "P" standard.

Process for use category listing

Again, this process would be somewhat similar to that for preservative treatments. Data would first be submitted to the P-1 and P-9 Subcommittees to obtain a listing as a durable wood species, and then to the T subcommittees for consideration. However, at this point several major differences emerge from the conventional T subcommittee process. First, it is has not yet been determined what additional data might be expected for review by the T subcommittees. It is worth noting that guidance on data requirements for submitting preservative treatments to the T subcommittees is still under development at present. For a preservative treatment the additional data would focus on demonstrating treatability, as well as durability in a specific use category. For a naturally durable species the proponent might be expected to provide evidence that producers routinely provide material that is of the correct species and that lots meet specified limitations on sapwood content. As with wood preservatives, evidence of durability in the proposed use category would also be necessary.

The T-1 task force on naturally durable species is currently proposing that naturally durable species be listed separately from treated wood. A separate commodity specification would allow more flexibility in accounting for their greater variability in durability, as well as the inclusion of necessary caveats and explanation. For example, species could be limited for use in specific decay hazard zones, as is currently done with decking of refractory species with reduced preservative penetration requirements (Figure 2). It may be possible to incorporate all naturally durable commodities into a single commodity specification, although this may depend on the range of commodities ultimately listed. The T subcommittee jurisdiction of this standard has also not been determined. Joint jurisdiction is a possibility, but becomes cumbersome when each responsible subcommittee must consider each change to the standard. The placement of species in use categories, including those species currently listed in the IBC/ is expected to be the subject of substantial debate within the task force and appropriate subcommittee(s). Since several naturally durable species are already listed in T standards with preservative treatment, it will be necessary to clearly delineate the use of naturally durable species in the treated and untreated condition.

Table ND-1. Durable species and Use Category limitations. FOR EXAMPLE ONLY. THERE HAS BEEN NO SUBSTANTIVE DISCUSSION ON PLACEMENT OF SPECIES WITHIN THE TABLE.

Species	UC1, UC2 and UC3A	UC3B	UC4A	UC4B	UC4C	UC5
Moderately Durable *Western Red cedar Type C* *Bald Cypress (2nd Growth)*	General Use, all Deterioration Zones	General Use Zones 1- 4. Not recommended for structurally critical members in Zone 4.	NR	NR	NR	NR
Durable *Western red cedar Type B* *Redwood (2nd Growth)* *Eastern red cedar* *Northern white cedar* *Alaskan yellow cedar*	General Use, all Deterioration Zones	General Use Zones 1- 4. Not recommended for structurally critical members in Zone 4.	Deterioration Zones 1 – 4. Includes fence posts, sign posts, arbor supports and similar non-critical applications. Not recommended for structurally critical members	NR	NR	NR
Highly Durable *Western red cedar Type C* *Redwood (old growth)* *Bald Cypress (old growth)*	General Use, all Deterioration Zones	General Use Zones 1- 5. Not recommended for structurally critical members in Zone 5.	Deterioration Zones 1 – 4. Includes fence posts, sign posts, arbor supports and similar non-critical applications. Not recommended for structurally critical members			
Very Durable *Black Locust* *Osage Orange*	General Use, all Deterioration Zones	General Use, all Deterioration Zones	General Use, all Deterioration Zones. Not recommended for structurally critical members	NR	NR	NR

Figure 2. Example of naturally durable species commodity standard.

The content and form of a processing standard and QA/QC procedures for naturally durable species remains largely an open question. Items of interest would include confirming geographic source, and species, and quantifying sapwood content. However, the supply chain for naturally durable species is different from treated wood, and is unclear who would conduct inspections, where they would be conducted, and how frequently they would be conducted. This is an area of standard

development where input is needed from the associations that represent naturally durable species. Species such as redwood and western red cedar have an existing structure for grading and evaluation, and perhaps the AWPA T-standard criteria could be incorporated into this process. A somewhat analogous situation arose with Nonpressure Composites (Section J of AWPA standards) and in that situation the AWPA standards did utilize existing industry process quality procedures (AWPA, 2010b). However, difficulty would arise with imported species where there currently is no formal mechanism of grading or evaluation. The issue of processing standards and inspection appears to be one of greatest obstacles to standardizing naturally durable species.

CONCLUDING REMARKS

There is a perceived need for better guidance to users on use categories where the various naturally durable woods will meet consumer expectations for durability. The AWPA is the one organization with the expertise and systems in place to standardize the full range of commonly used and newly imported naturally durable woods. However, there are a number of known issues that will make the process of standardizing naturally durable species even more complicated than we have already experienced for new wood preservatives. As the chairs of the relevant AWPA Task Forces, the authors would appreciate any input on the pros and cons of moving forward with this process.

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APPENDIX X: DATA REQUIREMENT GUIDELINES FOR LISTING NATURALLY DURABLE WOODS IN THE AWPA STANDARDS WITHOUT PRESERVATIVE TREATMENT

Maintained by Subcommittee P-1

This Appendix to AWPA's Technical Committee Regulations is not an AWPA Standard. It is a non-mandatory guidelines document presented to enable the user to understand the basic testing requirements for naturally durable wood and to assist the AWPA Technical Committees in the development of AWPA Standards. The testing of products in accordance with this Appendix does not constitute conformance with any AWPA Standard. No product can be considered to conform with an AWPA Standard until it has been subjected to complete technical review and voting by AWPA's Technical Committees, and procedural review and final action by the AWPA Executive Committee pursuant to the AWPA Technical Committee Regulations.

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1. GENERAL INFORMATION AND PURPOSE

New naturally durable wood species are listed in the AWPA Standards without a requirement for preservative treatment by means of a proposal and supporting data package submitted to the appropriate AWPA Subcommittee, followed by a discussion and voting process. The complete listing procedure is outlined in the AWPA Technical Committee Regulations. A similar procedure is followed to expand the applications for a listed species. The purpose of this Appendix is to guide proponents in the type of data necessary to be included in a supporting data package to propose listing a new species or modify the listing of an existing one. A proponent should be familiar with the AWPA Use Category System (UCS). Refer to the AWPA Book of Standards for information on the UCS. For more specific guidance on standardization, proposal sponsors are encouraged to interact with the appropriate Technical Committees early in the evaluation process. This can be initiated by asking Association Staff (see www.awpa.com for contact information) for the appropriate Subcommittee Chair to contact.

This document specifies certain data requirements for consideration of new naturally durable wood species for addition to the listing of existing species. While the proponent of a wood species is expected to provide all data required by this document, it is understood that it may not be possible to develop one or more types of data in some cases. In the event required data is not submitted, the proponent shall provide justification for not doing so. Notwithstanding the stated requirements of this document, the appropriate Subcommittee shall be the final arbiter of the type, quantity, and validity of the data needed for the listing of a naturally durable wood species.

After standardization of a new wood species, the proponents shall provide yearly data updates to the appropriate Subcommittee on critical field tests for a period of five years. Standards are then reaffirmed at 5 year intervals (see Appendix I of the AWPA Technical Committee Regulations).

2. TYPES OF PROPOSALS

These guidelines cover two types of proposals:

Type 1 **- Listing of a new species in the AWPA Standards.**

Type 2 **- Listing an AWPA standardized wood species in a new use category or categories.**

3. HOW TO USE THESE GUIDELINES

To use these guidelines, the proponent should:

1. Determine what type of proposal is being considered (see Section 2 of this Appendix).

2. Decide in what Use Categories the wood product will be used (see Section 2 of Standard U1, this describes the different Use Categories).

3. Determine what other information should be included in the proposal and data package by referring to Section 4 of this Appendix.

4. Depending on the proposal type and Use Categories of interest, determine the performance data requirements by referring to Table 1 of this Appendix. This Table is used in conjunction with Section 5, Methodology for Generating Performance Data, which describes the individual data requirements in more detail.

4. REQUIREMENTS FOR ALL SUBMISSIONS

4.1 Information Required for All *Type 1* Submissions – All *Type 1* proposals shall include the following information:

4.1.1 Proposed wording for the species listing in the appropriate Standard. The proponent should model the proposed wording on what is currently used in the relevant Standard.

4.1.2 Listing of the proposed Use Categories for which the species is proposed to be used.

4.1.3 Latin name and all common names for the wood species to be standardized.

4.1.4 Forest Type and Age
Information on the type of forest from which the wood will be harvested shall be provided. In particular it shall be noted whether the wood is from old-growth or managed natural forest or whether it is from plantation. The average age of the trees harvested shall be noted.

4.1.5 Methods for determination of:
Heartwood vs sapwood, if not distinguishable by color.

4.1.6 Heartwood content. At a minimum, information on range in the percentage of the cross section of the stem consisting of sapwood shall be provided. Sapwood for each commodity?

4.1.8 Performance data as specified in Table 1 and Section 5.

4.2 Information Required for All *Type 2* Submissions – All *Type 2* proposals shall include information on items 1, 2, and 3 as listed in Section 4.1, above.

4.3 Use of Reference Species – All evaluations shall include comparative information from pine sapwood controls and at least one AWPA-listed wood species with a commercial history of use in the same Use Category or Categories as the proposed wood.

4.4 Source of Test Material – Test material shall include material from at least three locations across the range of distribution of the wood species.

5. Methodology for Generating Performance Data

This section describes the performance testing requirements listed in Table 1 in more detail and gives some example methods to obtain the performance data. Standard test methods are not available for evaluating all of the performance criteria. Whenever standard methods are not available, non-standard methods are suggested. Use of methods other than those suggested (or modified suggested methods) may also be acceptable provided they are based on sound experimental principles. A decision on the acceptability of data generated by new or modified test methods will be made by the particular AWPA Subcommittee that has jurisdiction over listing the proposed species. The name of the institution or company which performed the test shall be stated. The use of third-party testing labs and agencies for critical tests is recommended.

The final decision on whether the data package supports the proposed wood species lies with the appropriate Subcommittee. Data substitutions may be allowed by the Subcommittee. For example, extensive and long term field test data may mean that supporting laboratory soil block data is not necessary. Appropriate in-ground field data may also preclude the need for above-ground data for species intended for UC3B applications. Data from inspection of long-term service trials may be substituted for field test data, provided the material produced today is from the same forest type and age class as the material in the service trial. Allowing such data substitutions is the prerogative of the Subcommittee. Guidance on such issues can be obtained from the appropriate Subcommittee Chair. Contact information can be obtained from Association Staff (found at www.awpa.com).

5.1 Natural Durability
This section refers to fungal and insect resistance of the species.

5.1.1 Laboratory Test Data

5.1.1.1 Soil Block

Preferred Method: ASTM D2017 *Standard Method of Accelerated Laboratory Test of Natural Decay Resistance of Woods*. **(Note discussion needed on fungus species, an AWPA version of D2017 with appropriate fungal species?)**

The soil block test is the most commonly used lab method for evaluating the performance of naturally durable wood against basidiomycete wood decay fungi. In addition to leaching, samples shall be exposed to evaporative ageing.

Preferred Method: EN 73, *Accelerated aging of treated wood prior to biological testing. Part I: Evaporative aging procedure*.

Data from a minimum of three basidiomycete species is required. For softwoods, two brown-rot and one white-rot fungi shall be used. For hardwoods, two white-rot and one brown-rot fungi shall be used.

5.1.1.2 Soft Rot

Preferred Method: Modified AWPA E14, *Standard Method of Evaluating Wood Preservatives in a Soil Bed*.

E14 can be modified for soft rot testing through the use of smaller test specimen sizes (e.g. 3 mm x 14 mm x 150 mm) and maintaining the soil water holding capacity (WHC) at 150% ± 10 % minimum. Ratings should be performed visually or, by use of a modified Modulus of Elasticity (MOE) test apparatus to measure static MOE as compared to a water soaked control (see Y.Q. Gui, D.D. Nicholas, and D. Crawford.1996. A Miniature Mechanical Apparatus and Test Protocol for Bending and Crushing Test in Wood Preservation Research. Forest Prod. J. 46[10]:77-80).

5.1.1.3 Termite

Preferred Method: AWPA E1, *Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites*.

The eastern subterranean termite (*Reticulitermes flavipes*) should be used as the test organism. If the species will be used in regions where the Formosan subterranean termite (FST, *Coptotermes formosanus*) is present, testing this insect shall also be done. If such data is not provided, recommendation for use of the species in FST regions cannot be provided.

In addition to leaching, samples shall be exposed to evaporative ageing.

Preferred Method: EN 73, *Accelerated aging of treated wood prior to biological testing. Part I: Evaporative aging procedure*.

5.1.1.4 Soil Bed

Preferred Method: AWPA E14, *Standard Method of Evaluating Wood Preservatives in a Soil Bed.*

The test method accommodates some exposure variability. Soil physical characteristics, average soil moisture content as expressed as a percentage of the water holding capacity, and bin maintenance procedures (soil replacement, etc.) shall be reported.

5.1.2 Field Testing

5.1.2.1 Field Stake

For UC4 and UC5 applications, the field stake test is mandatory.

Preferred Method: AWPA E7, *Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes*.

Data from a minimum of two geographically separated test sites are required. These sites should be selected so that they provide two distinctly different climates and soil types. In known high decay hazard areas (e.g. Gulf Coast region and windward Hawaii) the minimum exposure time is three years, provided that field depletion data from the same site over the same time period is also included (Section 5.2.2.1). For areas of lower decay hazard (e.g. Wisconsin), or if depletion data over the same exposure period is not available, longer exposure times are required. In these cases, the Subcommittee evaluating the proposal will determine whether the length of exposure time is adequate.

5.1.2.2 Posts

Preferred Method: AWPA E8, *Standard Method for Field Tests with Posts*.

Post evaluation is recommended when the species is to be used in roundwood commodities.

5.1.2.3 Above-Ground

Preferred Methods: AWPA Standards
E9, *Standard Field Test for the Evaluation of Wood Preservatives to be used in Non-Soil Contact*);
E16, *Standard Field Test for Evaluation of Wood Preservatives to be used Out of Ground Contact: Horizontal Lap-Joint Method*; or
E18, *Standard Field Test for Evaluation of Wood Preservatives Intended for Use Category 3B Applications, Exposed, Out of Ground Contact, Uncoated Ground Proximity Decay Method*.

E9 was designed for evaluating millwork. E16 and E18 are more general tests. In known high above-ground decay rate climates (e.g. windward Hawaii) the minimum exposure time is three years, provided that field depletion data from the same site over the same time period is also included (Section 5.2.2.2). For areas of lower above-ground decay hazard (e.g. Gulf Coast states), or if depletion data over the same exposure period is not available, longer exposure times are required. In these cases, the Subcommittee evaluating the proposal will determine whether the length of exposure time is adequate.

5.1.2.4 Termite

Preferred Method: E26, *Standard Test Method for the Preservative Treatments for Lumber and Timbers Against Subterranean Termites in Above Ground Protected Applications (UC1 and UC2)*

A minimum of two years exposure is required. Substantial attack of sapwood controls should be observed at the end of the test exposure time. At a minimum, testing should be done with the Eastern subterranean termite (*Reticulitermes flavipes*). If the species will be used in regions where the Formosan subterranean termite (FST, *Coptotermes formosanus*) is present, testing with this insect shall be done as well. If such data is not provided, recommendation for use of the species in FST regions cannot be provided.

E7 field stake data from a field site with apparent high termite activity may be used to substitute for data from a termite-specific test method as described above.

5.1.2.5 Marine Panels

Preferred Method: AWPA E5, *Standard Test Method for Accelerated Evaluation of Wood Preservatives for Marine Services by Means of Small Size Specimens* (Type A or B panels)

Test sites shall be chosen based on the proposed marine Use Category application(s). See Standard U1, Section 2, for the geographical and hazard organism specifications for the 5A, 5B, and 5C Use Categories. Also see Commodity Specification G of Standard U1 for further information. Data from a minimum of two geographically separated test sites are required. The minimum exposure time is two years provided that marine depletion data from the same sites over the same time period are also included (Section 5.2.2.3). If depletion data over the same exposure period is not available, longer exposure times are required. In these cases, the Subcommittee evaluating the proposal will determine whether the length of exposure time is adequate.

5.2 Wood Physical Properties

Preferred Methods: The preferred method depends on the type of material being considered. For solid wood use the general methods of ASTM D 5664-02; for composite products use the methods of ASTM D 5516-01.

5.2.1 Strength

5.2.1.1 Strength of Solid Sawn Wood Products

For solid wood products that are NOT intended for any in-service exposure to elevated temperatures (>50C), the preferred method is ASTM D 5664-02 Procedure #1 using small-clear specimens cut from 2x4's (see section 4.2 of ASTM D5664-02). For solid wood products that are intended for an in-service exposure at elevated temperatures (>50C), the preferred method is both ASTM D 5664-02 Procedure#1 and #2 (see section 4.2 and 4.3 of that Standard). Alternatively, ASTM D 5664-02 Procedure #3 which evaluates full-size lumber may be instead substituted for this latter testing requirement.

5.2.1.2 Strength of Composite Wood Products

For composite wood products that are NOT intended for any in-service exposure to elevated temperatures (>50C), the preferred method is ASTM D 5516-03 using composite specimens from naturally durable panels and reference material of the appropriate composite as detailed in the D 5516-03 Standard except skipping the requirements of sections 7.1 and 7.2 of D 5516-03 for high-temperature exposure and subsequent testing of that material. For composite wood products that are intended for an in-service exposure to elevated temperatures (>50C), the preferred method is to follow all recommendations of ASTM D 5516-03 procedures.

5.2.1.3 Strength of Roundwood Products

The preferred method is……??????

5.3 Corrosivity

Preferred Method: AWPA E12, *Standard Method of Determining Corrosion of Metal in Contact with Treated Wood*.

AWPA E12 is a lab test. Field testing of commercial fasteners in the wood is also useful. Consult with AWPA Subcommittee P-6 for typical non-standardized fastener/wood field test methods.

Table 1. Summary of data required in a data package used to support a proposal to list a new naturally durable species in the AWPA Standards, or expand the applications for a naturally durable species into new use categories. See Section 5.0 of these Guidelines for further information on test methods.

(M = Mandatory, R = Recommended)

TESTING REQUIREMENTS	Section	UC1	UC2	UC3A	UC3B Non-structural	UC3B Structural	UC4A-C	UC5A-C
Natural Durability								
Laboratory Testing								
Soil Block	5.1.1.1		M	M	M	M	M	M
Soft-Rot	5.1.1.2						M	M
Termite	5.1.1.3	M	M	M	M	M	M	M
Soil Bed	5.1.1.4			R		R	R	R
FieldTesting								
Field Stakes	5.1.2.1			R		R	M	M
Post	5.1.2.2						R	R
Above-Ground	5.1.2.3		M	M	M*	M		
Termite	5.1.2.4	M	M	M	M*	M	M	M
Marine Panels	5.1.2.5							M
Physical Properties of Wood								
Strength	5.3	M	M	M		M	M	M
Corrosivity								
Wood	5.4	M	M	M	M	M	M	M

* Well documented service trials may be substituted.

In: Proceedings, One Hundred Seventh Annual Meeting of the American Wood Protection Association, Mariott Harbor Beach Hotel, Fort Lauderdale, FL. May 15-17, pp. 154-164 2011.