GLOBAL
FIREPROOF SOLUTIONS, INC

AC516

Chris Birchfield, CEO

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Orlando, FL Area Factory

Atlanta, GA Area Factory

Dallas-Fort Worth, TX Area Factory

Company Information:

- 15+ years of experience in applications of high-performance fire-retardant penetrants and intumescent coatings
- Partnered with top-tiered fire protection chemical manufacturers
- Three Intertek-Certified Factories

EDUCATION AND DEMONSTRATIONS

Global Fireproof Solutions has been a provider of Educational Presentations and Live Demonstrations for 15 years.

PURPOSE

The purpose of the AC516 is to provide fire-retardant penetrant technology with the opportunity to be recognized in the industry as a proven method of fire protection that brings a high level of assurance that these products exceed the the requirements of Section 2303.2 of the IBC with regard to quality, strength, effectiveness, fire resistance, durability, and safety.

WHY THE NEED FOR AC516

The key factor as to why the AC516 needs to be approved is because the two primary existing Acceptance Criteria, AC66 and AC479, even though somewhat similar in description, are **fundamentally different**:

- **Chemical Types**
- **Application Methods**
- **Application Limitations**

BUILDING THE FOUNDATION

Fire-Retardant-Treated Wood has been instrumental in providing the basis for fire performance requirements for wood construction as we know it today. This basis has provided chemical manufacturers the foundation to develop fire-retardant penetrants that provide the same level of fire protection through alternative application methods. The AC516 is the foundation that will provide advanced technologies the platform necessary to create fire-retardant solutions, never before imaginable.

AC516 — THE SAME…
BUT DIFFERENT

Advanced fire-retardant technologies have been available for years. These technologies bring many new benefits to the construction industry, while providing the required levels of fire protection required by code.

In recent years, as this technology has grown in popularity, so has the need to provide manufacturers seeking an evaluation report for a fire-retardant penetrant the necessary guidelines to meet the requirements prescribed in Section 2303.2 of the IBC.

FIRE-RETARDANT PENETRANT

“Chemical penetration” or “penetrant” is a chemical compound that when applied to the surface of a wood substrate, uses a carrier to open the pores allowing the chemicals to penetrate into the wood.

The depth of penetration into the wood is not what determines its fire performance…it’s the retention rate of the fire-retardant.

IMPREGNATED WITH CHEMICALS

“Impregnated with chemicals” or “impregnate” means to fill throughout, soak, steep, permeate, or saturate.

Therefore, “impregnated with chemicals” means the wood must be “filled throughout” to meet the fire performance requirements prescribed in Section 2303.2 of the IBC. FRTW manufactured with a pressure process is regulated by the depth of penetration as well as chemical retention.

DURABILITY

It has been an industry question/concern for years of the impact to FRTW exposed to rain during construction. When General Contractors and Inspectors review the FRTW Manufacturers Warranty and Technical Data Sheet, it advises like the following…

- ***Fire treated wood can only be used for interior applications involving dry conditions of use above grade and not exposed to weather, dampness or wetting. It shall be stored, protected, applied and used during construction in accordance with manufacturer's specifications and recommendations.***

- ***FRTW is intended only for above ground uses where it is kept away from direct moisture and shielded from weather.***

DURABILITY

Over the course of the years, a Durability Test has never been implemented for Fire Retardant Treated Wood and does not exist in the AC66.

Much research, industry expert advise and due diligence was performed when seeking an existing Durability Test that could be utilized for an Interior FRTW.

Because a Durability Test for FRTW does not exist, the proponent requested that one be designed to simulate rain exposure during construction by an Accredited Testing Laboratory and included it in the AC516. This is the first proposed performance improvement to Fire Retardant Treatment in years.

Why have AC479, AC66 AND AC516?

The AC479 is designed for an intumescent COATING applied to sheathing and lumber, which is NOT the same as a Pressure Impregnated Fire Retardant or it would be under AC66.

AC516 is…

- ***NOT*** an Intumescent Coating – AC479
- ***NOT*** a pressure impregnated Fire Retardant – AC66

Products manufactured in accordance with the AC479 CANNOT be classified as equal to or an alternate to products manufactured in accordance with AC66 nor vise versa.

AC479 vs AC516

Intumescent Coating vs Fire-Retardant Penetrant

Nail Penetration Delaminated Surface on OSB, Pneumatically Placed Roofing Nails at Industry Standard 90psi

Roof Deck OSB - Intumescent Coating flaking off

Fire-Retardant Penetrant – Nail Penetration through the Surface, No Delamination, NOT a coating!

AC516 Benefits to the Industry

The intention of the AC516 is to expand the fire performance solutions necessary to support the growing needs of fire protection in the Wood Construction Industry.

The fire-retardant acceptance criteria available today, does not provide the proper foundation to support the new capabilities of Fire-Retardant Penetrants.

- The AC516 not only meets the performance requirements of 2303.2 of the IBC, it is not limited to the species of wood or Engineered Wood (OSB)
- The AC516 Non-Pressure application method does not impact the Wood Structural Design Values
- The AC516 has the foundation for future fire performance solutions on all Engineered Wood Products and Certified Field Applications for Existing Wood Structures

Summary

AC516 provides the necessary criteria for new, innovative Fire-Retardant Penetrants and Application Methods to meet the IBC 2303.2 performance requirements.

HOOVER
TREATED WOOD PRODUCTS, INC.

AC516 Comments
ICC-ES Committee Meeting

October 6 - 7, 2020 Los Angeles, CA

Evolution of AC516

1. Proponents expand scope of AC479 to include solid sawn lumber.
2. Fall 2019: Staff requests a mail ballot to modify durability testing requirements of AC479. Committee votes against modification.
3. Fall 2019: After proposed changes to AC479 were disapproved, proponents create a new approach with AC516 and reclassify the product from a coating to undefined term of ‘penetrant.’
4. Feb 2020: Committee sends AC516 back to staff for further study.
5. June 2020: Proponents of AC516 ask for similar testing regimen to that rejected in Fall 2019 for AC479. Staff withdrew AC516 discussion from agenda and moved discussion to October 2020 agenda.
6. October 2020: New version of AC516 removes use limitations and replaces ‘impregnated with chemical’ with ‘chemically penetrates’ but asserts it is not FRTW as defined in 2303.2 or AC66.

Proposed Acceptance Criteria

- The test in §3.3.1 has no published procedure or protocol.
  - How do we know if it is relevant or effective?
- Why is the product not a coating or FRTW?
  - Why are the products not subject to AC479, AC66, or IBC §2303.2?
- The product wants to be used for all FRTW applications in the codes.
  - ICC ES staff directly states that AC516 condenses the quality control required for FRTW under AC66.
  - There is no rationale to lessen it for a product or process that does not have the background or history in performance.

Proposed Acceptance Criteria

Quality Control Summary For FRTW

- Wood products are received at the pressure impregnation plant, checked for grade, moisture content, dimensions and count.
- Chemicals are received and tested for conformance to their Certificate of Analysis or other product specifications.
- Treating solutions are manufactured to formula, tested for pH, specific gravity and elemental balance. Nonconforming solutions are rebalanced.
- Wood is pressure impregnated, tested for conformance to penetration and analyzed for retention, nonconforming product is retreated.
- FRTW is dried and tested for moisture content to meet standards.
- FRTW is labeled, third party quality marks applied and packaged for shipment.

Incoming Wood

Conformance to Purchase Order or shipping document details, complete Inbound Wood Quality report.

Inspected by plant receiving clerk for:

- Grade
- Dimensions
- Moisture Content (MC)
- Piece / Bundle Count
- Mold
- Determine heartwood content

Receiving Chemical

- Certificate of Analysis (COA) must accompany shipments.
- Confirm concentration as specified on purchase order.
- Concentration determined via Specific Gravity (SpG) test. Density meter (Anton-Parr) or hydrometers are used to confirm % solids.
- Physical examination of dry components to confirm bag contents. Confirm pounds delivered as shipped.

Process Chemicals

QC at plants: Frequency of Analysis for Work Tanks

- At the beginning of every shift
- Before and after every mix into that tank
- After any addition (such as adding reclaim water)
- Prior to first charge after a period of inactivity

Treated Wood QC at plants: Penetration and Retention

In accordance with Underwriters Laboratories (UL) Procedures for Fire Retardants:

- Penetration of all lumber charges
- Note: Fire Tube test may be required as a method of resolving nonconformance
- Assay Logs are to be kept and filed. These logs detail the results obtained from daily analysis test.

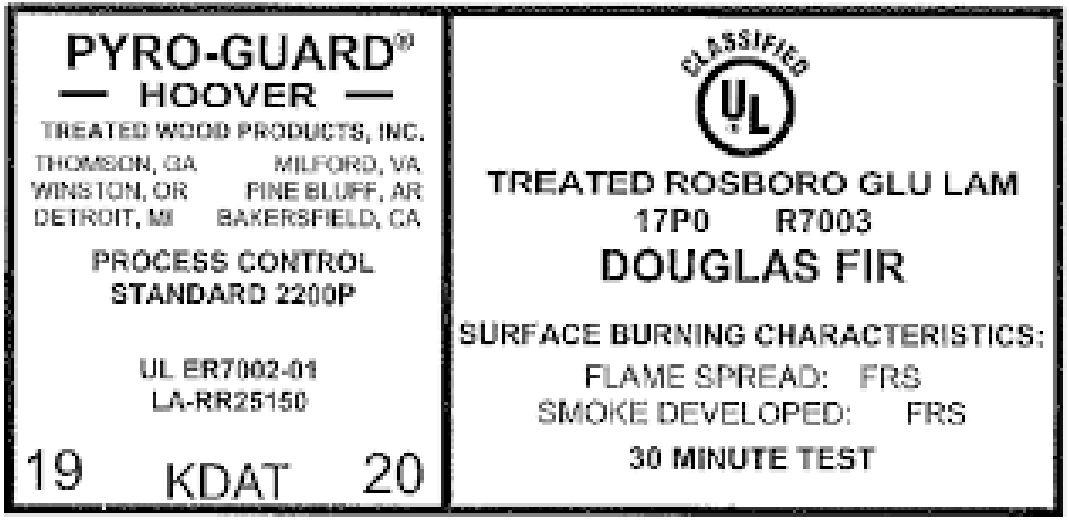
Third Party Overview

Underwriters Laboratories:

- Fire Retardant
  - Review mix sheets (Recognized Component Procedure)
  - Review treating sheets for conformance to standards
  - Analysis of treating solutions and concentrates
  - Penetration test
  - Review kiln records
  - Audit stamps
  - Calibration audit
  - May conduct Fire Tube Test if required for resolution of nonconformance

Linking Code Requirements to Product Production Through Quality Control and Labeling

- Confirm that labels are applied only to materials fully in compliance with manufacturing and third party quality requirements.
- Labels are applied at a minimum of one per piece of treated wood, unless otherwise stipulated by customer.



Linking Code Required Adjustment to Design Values Through Quality Control and Labeling

Adjustments to Design Values for Pyro-Guard® Treated Lumber[2]

Property	Service Temperature to 100°F/38°C			Pyro-Guard® Roof Framing, Climate Zone					
				1A		1B		2	
	SP	DF	Other	SP	DF	SP	DF	SP	DF
Extreme fiber in bending	.91	.97	.88	.80	.90	.85	.93	.89	.96
Tension parallel to grain	.88	.95	.83	.80	.80	.84	.87	.88	.93
Compression parallel to grain	.94	1.00	.94	.94	.94	.94	.98	.94	1.00
Horizontal shear	.95	.96	.93	.92	.95	.93	.95	.94	.96
Modulus of elasticity	.95	.96	.94	.95	.96	.95	.96	.95	.96
Compression perp. to grain	.95	.95	.95	.95	.95	.95	.95	.95	.95
Fasteners/connectors	.90	.90	.90	.90	.90	.90	.90	.90	.90

Current Acceptance Criteria

1. AC66: Acceptance Criteria for Fire-Retardant-Treated Wood

1. AC479: Acceptance Criteria For Wood Structural Panels and Sawn Lumber with a Factory-Applied Fire-Retardant Coating

The proponents already have two well defined means in which to achieve code compliance

Western Wood Preservers Institute

Comments on

Proposed ICC-ES Acceptance Criteria 516

Dallin Brooks
Dallin@WWPI.org
360-693-9958

WWPI represents the Wood Treating Industry

- Mostly this consists of pressure treating but some members do engage in dipping, coatings and other products that protect wood
- As such, we have a clear desire for equivalency and equal opportunity
- **We desire AC 516 be created uniform with AC 66, AC 479 and AC 264**
- All wood fire-retardant protection methods should be harmonized in the Acceptance Code to ensure safety in performance, equivalency in quality and equality in testing

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I am a Wood Scientist Specializing in Wood Durability

- I understand wood structures better than anyone on this webinar.
- I have spent considerable time looking and working with different chemicals that penetrate into the surface of wood.
  - Mostly preservatives but also fire retardants and glues.
- As such, I would like to take a minute to describe to you wood on the cellular level.

Because when we talk about wood, the answer is always "It depends."

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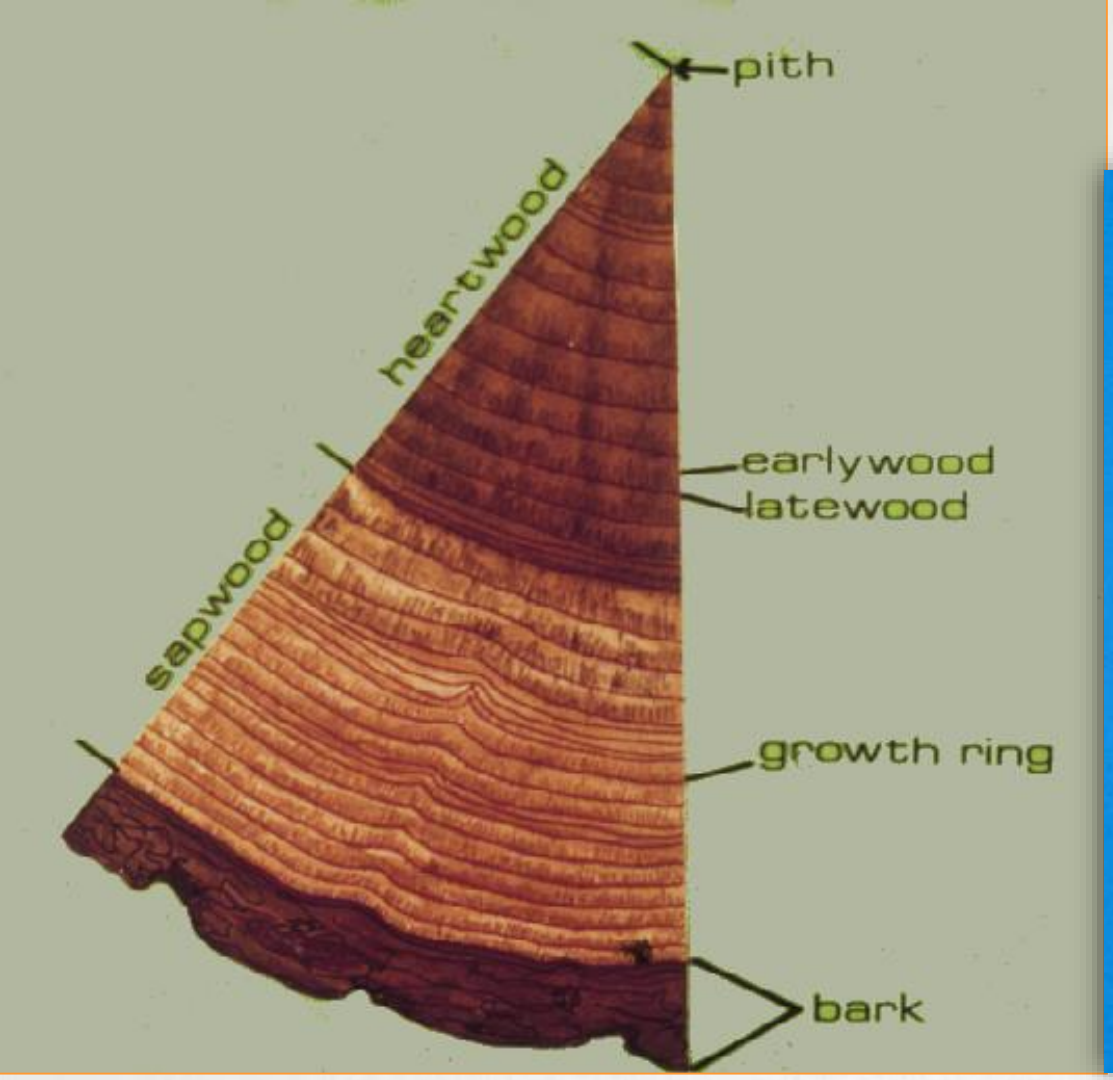
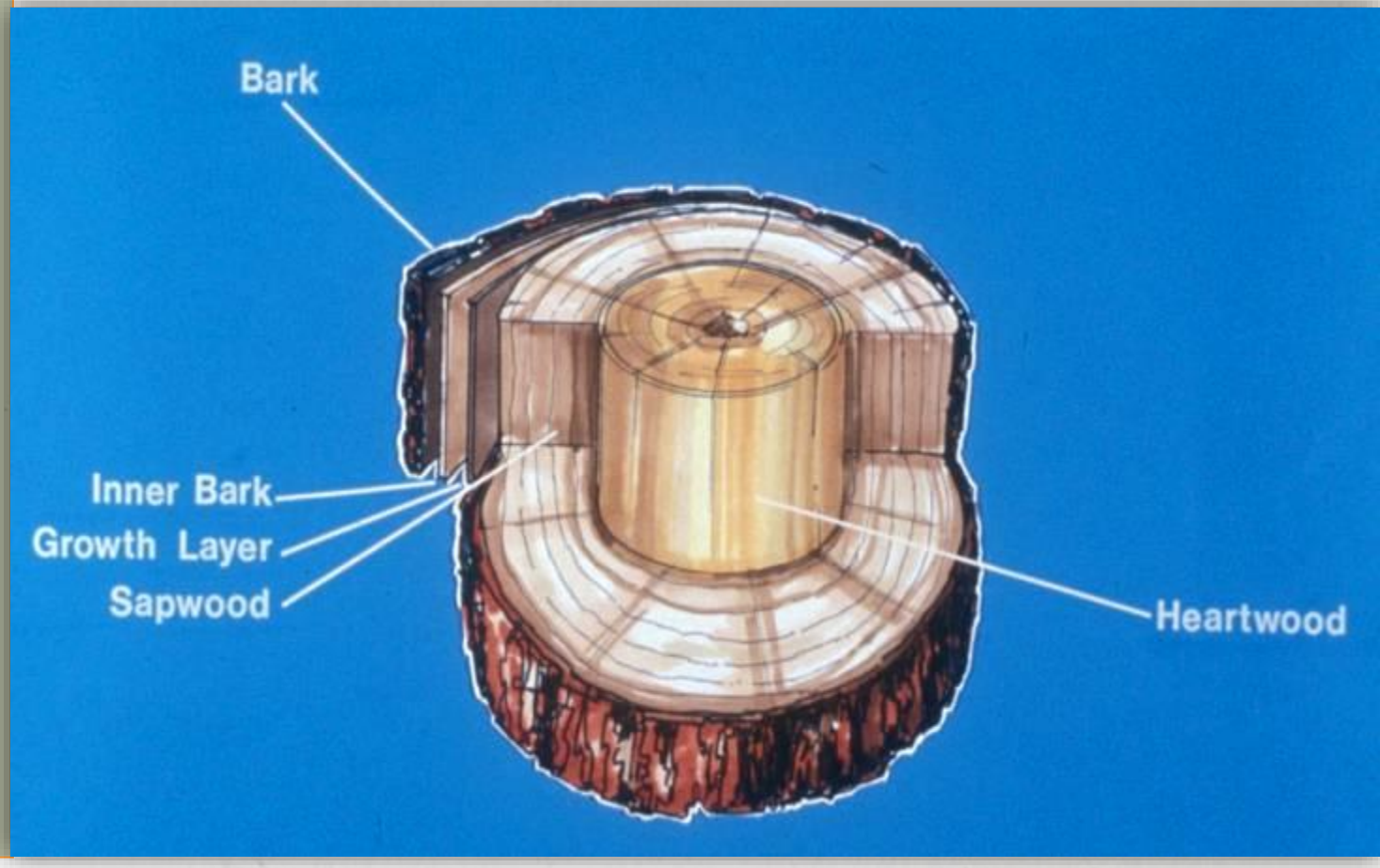
Southern Yellow Pine

Softwood from Conifer Trees

Variation by Species

Douglas Fir





Heartwood

Trees Change as they Grow

Variation Within Species

Sapwood

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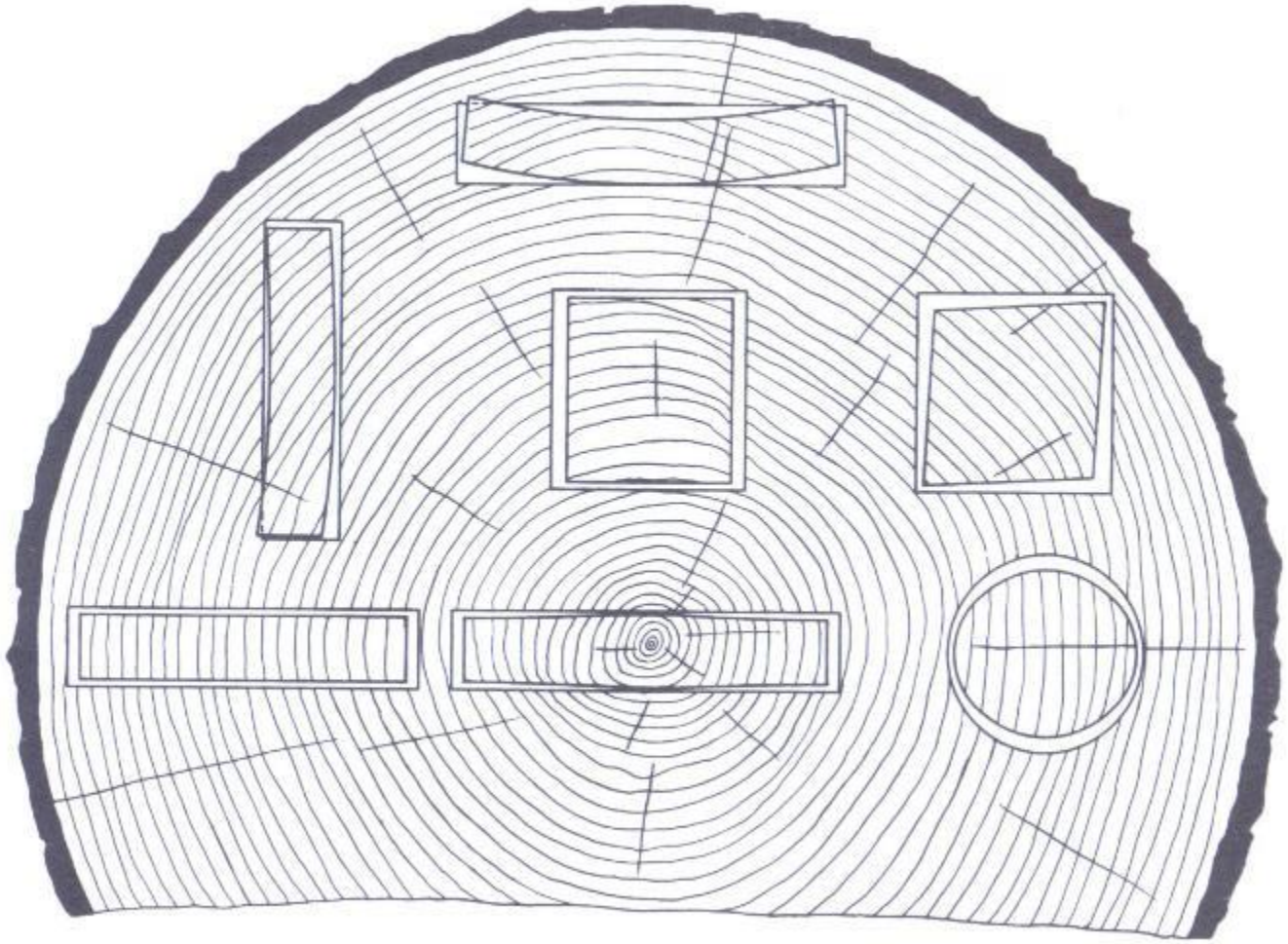

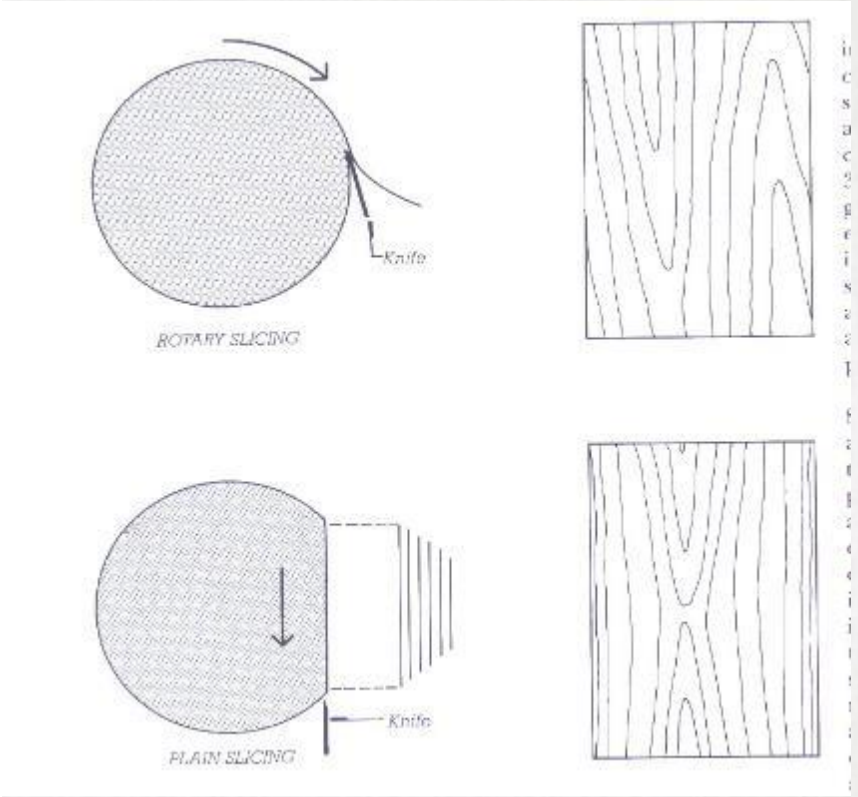

Lumber Cut With Different Orientations

Wood is Round

Variation Within Orientation

Veneers Cut and Oriented Differently in Plywood and OSB

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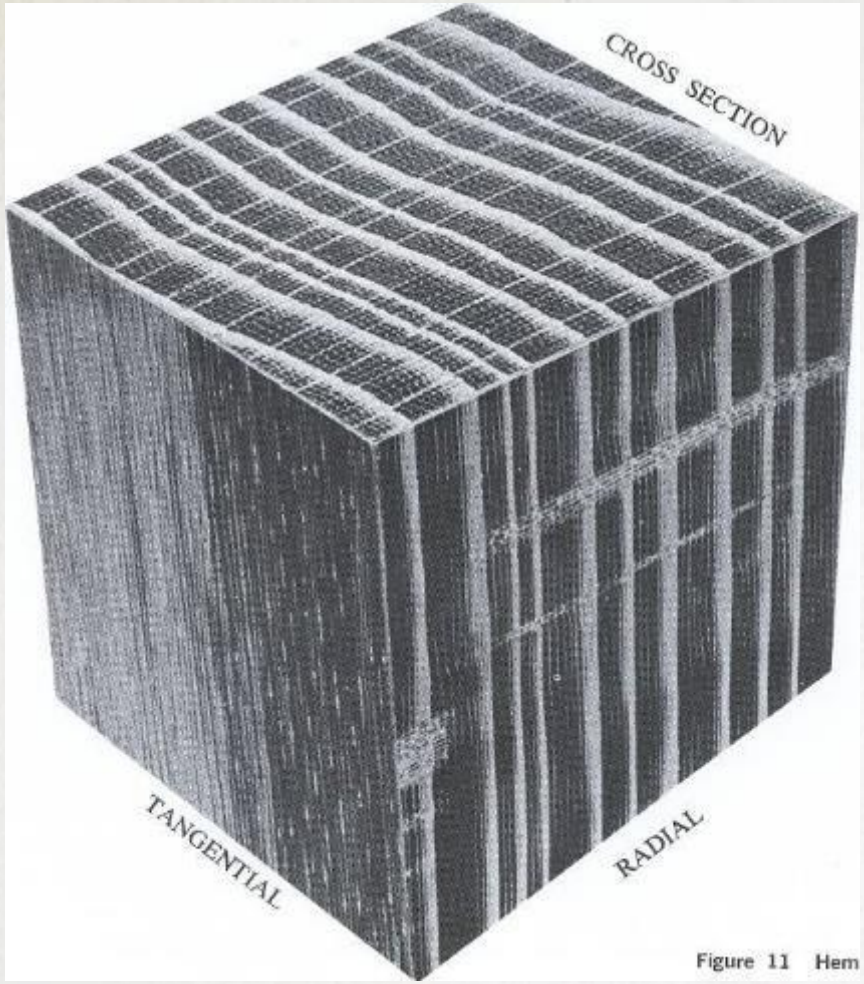
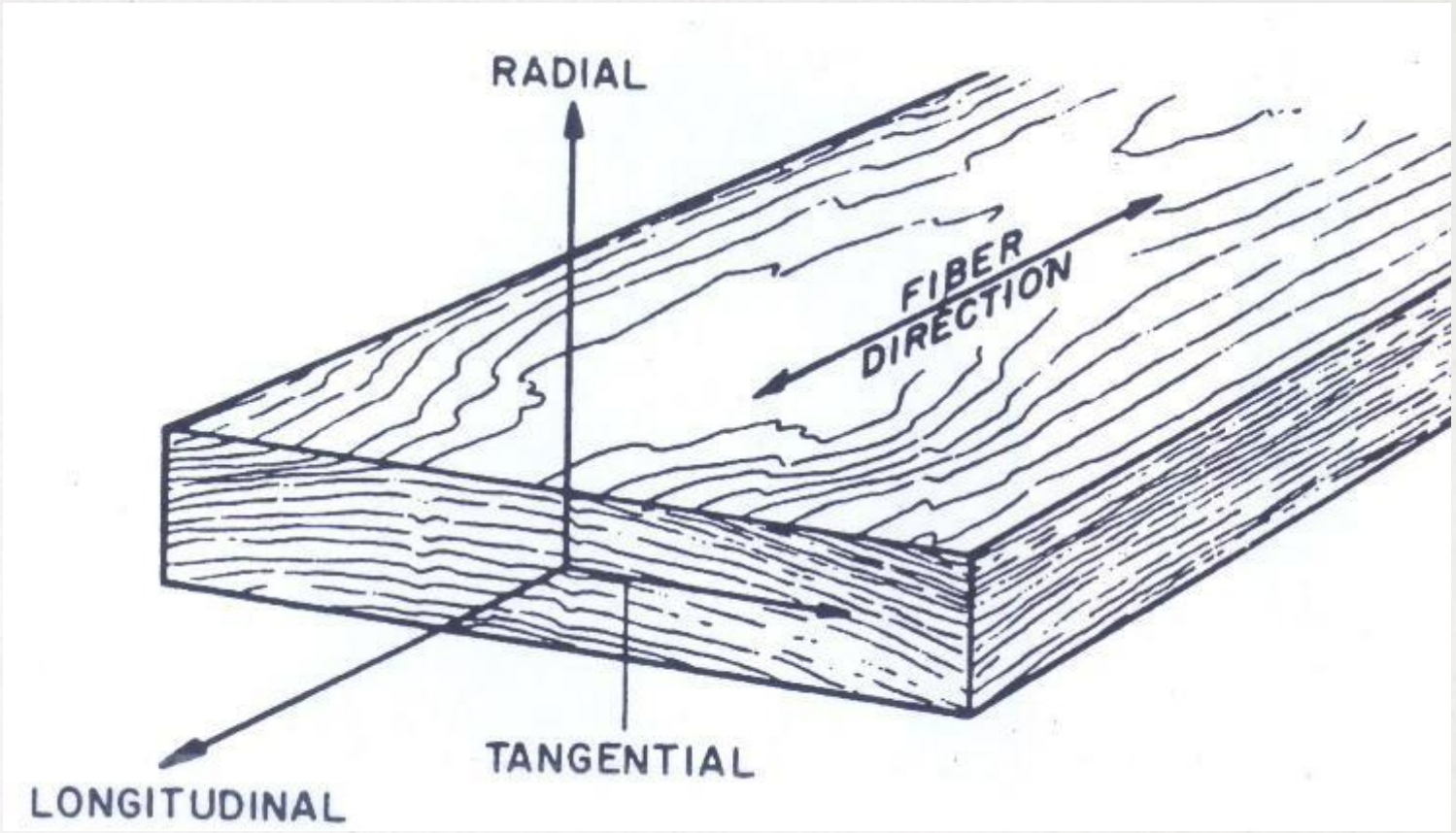


Figure 11 Hem



Fiber Has Different Orientations

Wood is Anisotropic

Variation Within Board or Veneer

Fiber Has Variation with Different Properties

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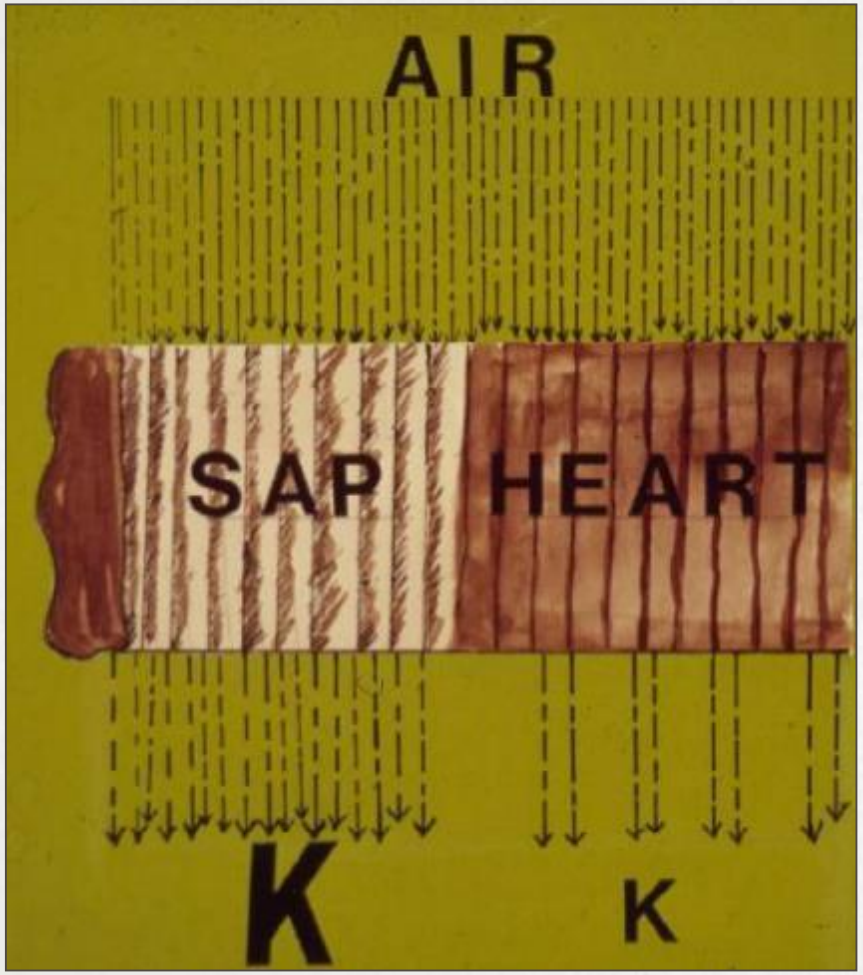
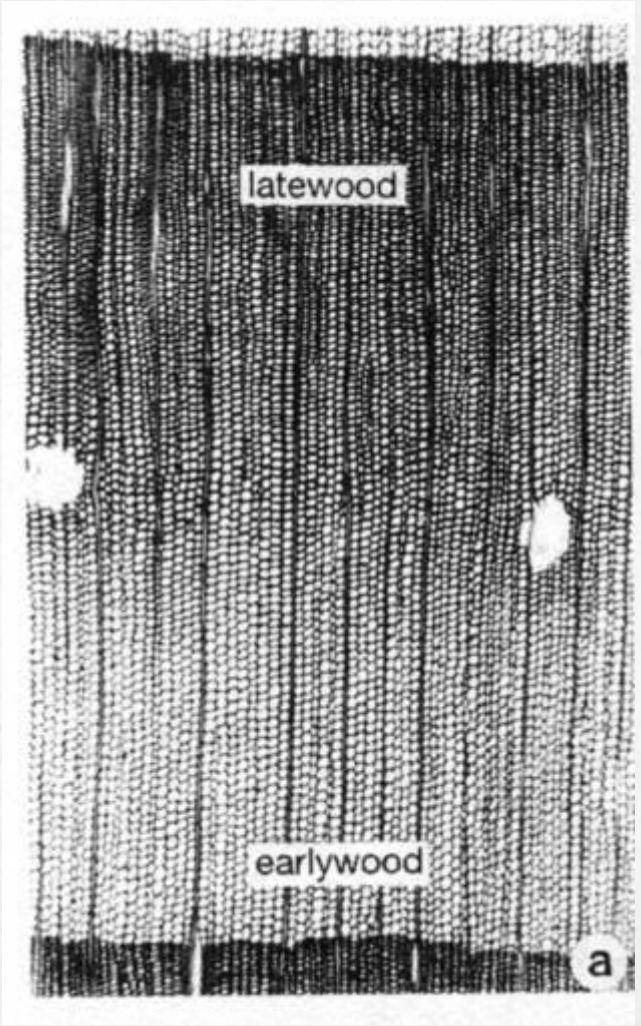
Sapwood is more permeable than Heartwood
Earlywood is more permeable than Latewood





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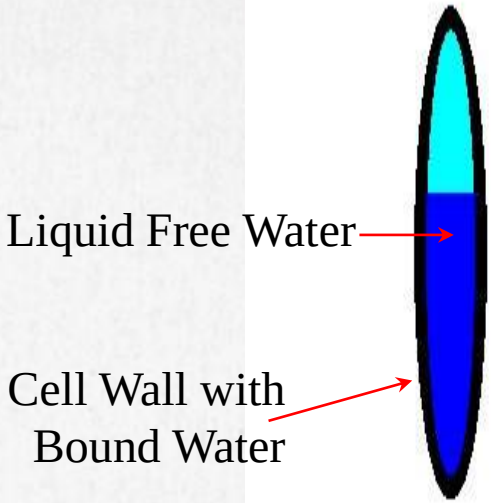
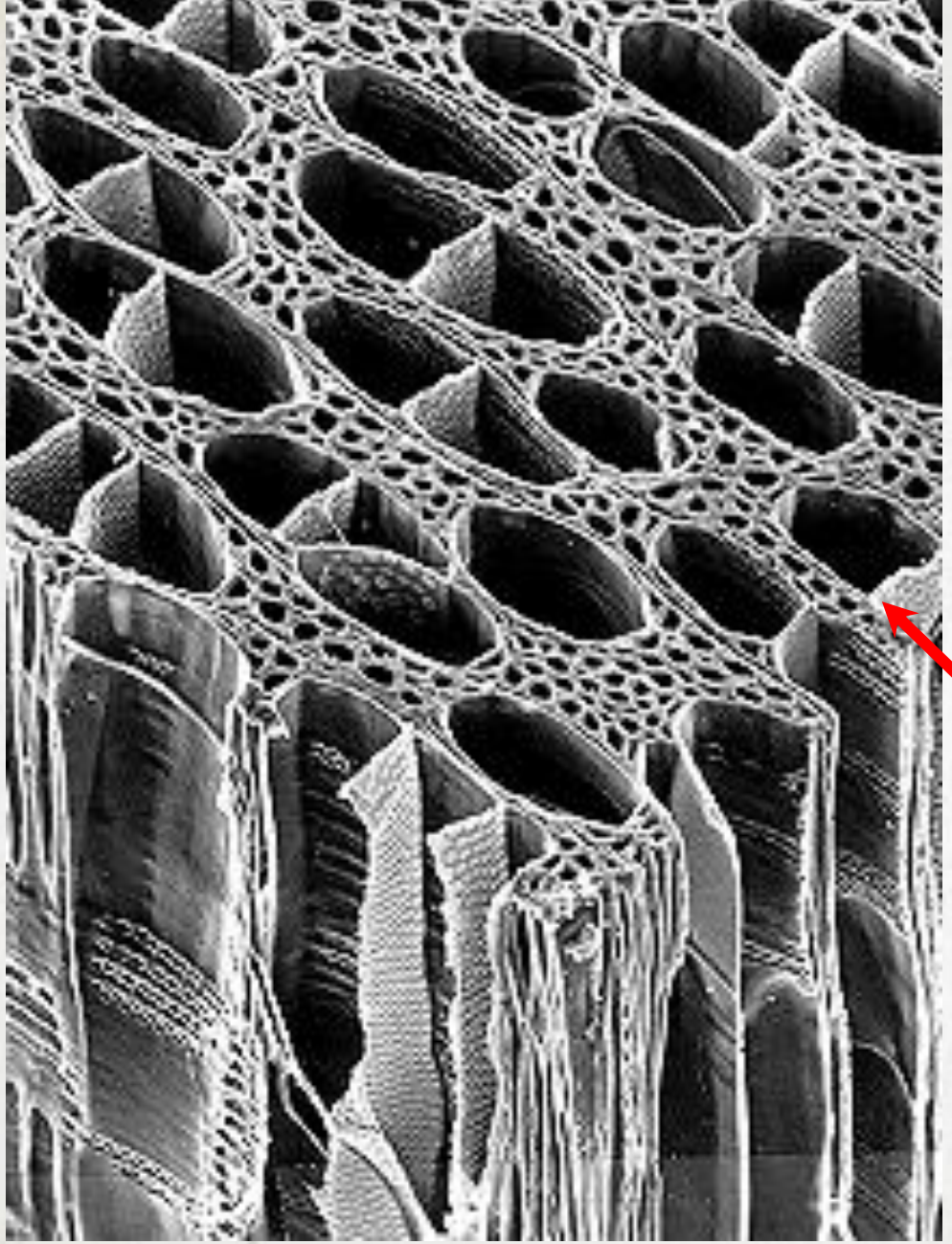
Wood has a lot of variation…
I haven't even talked about water yet

- Living trees moisture as a percentage of wood substance can range from **30%** to **200%**
- Water occurs in two locations:
  - Within cell lumen
    - Liquid
    - Called free water
  - Within the cell wall
    - Captured in cell wall matrix
    - Called bound water



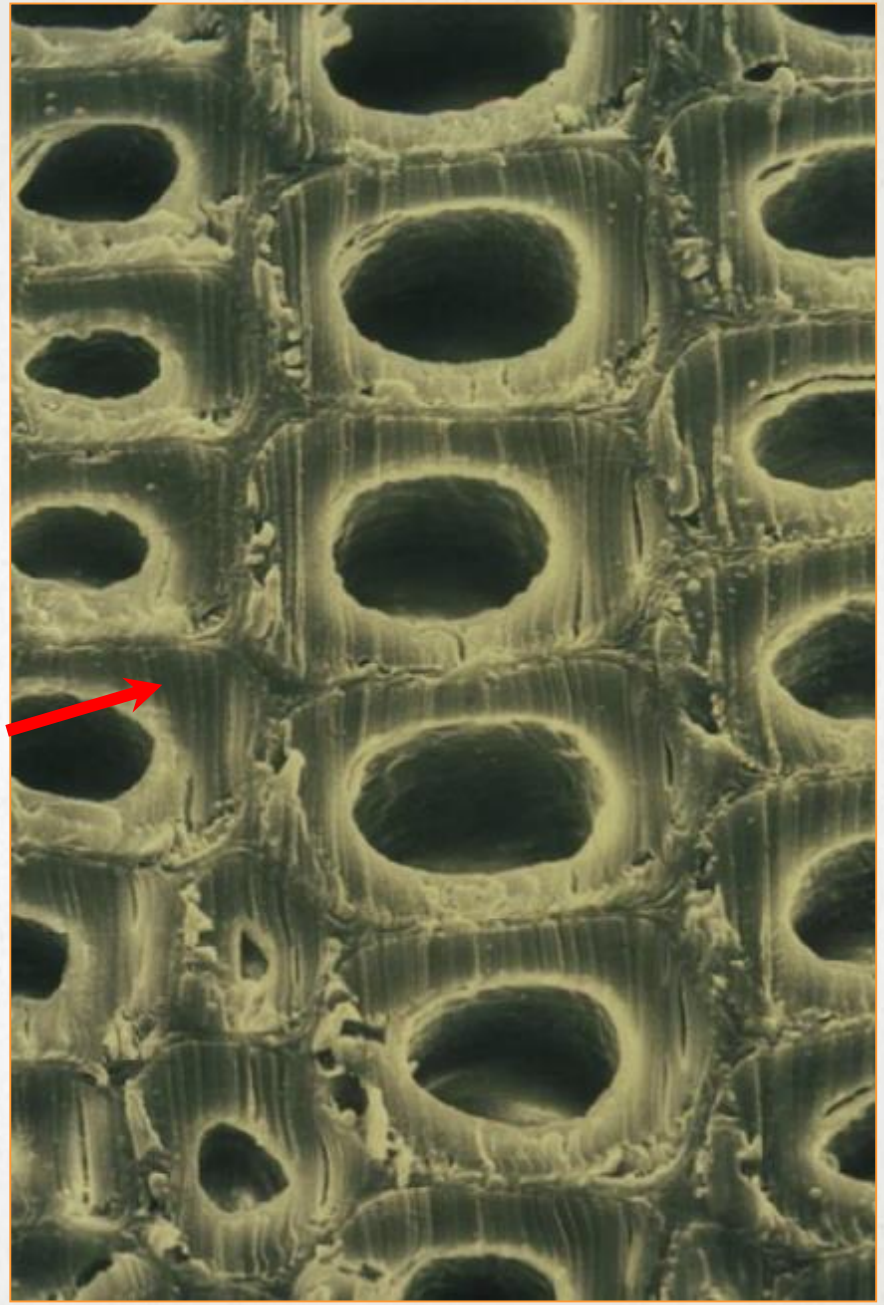
Example of a Wood Cell

Zoom in



Zoom in

Cell Wall with
Bound Water



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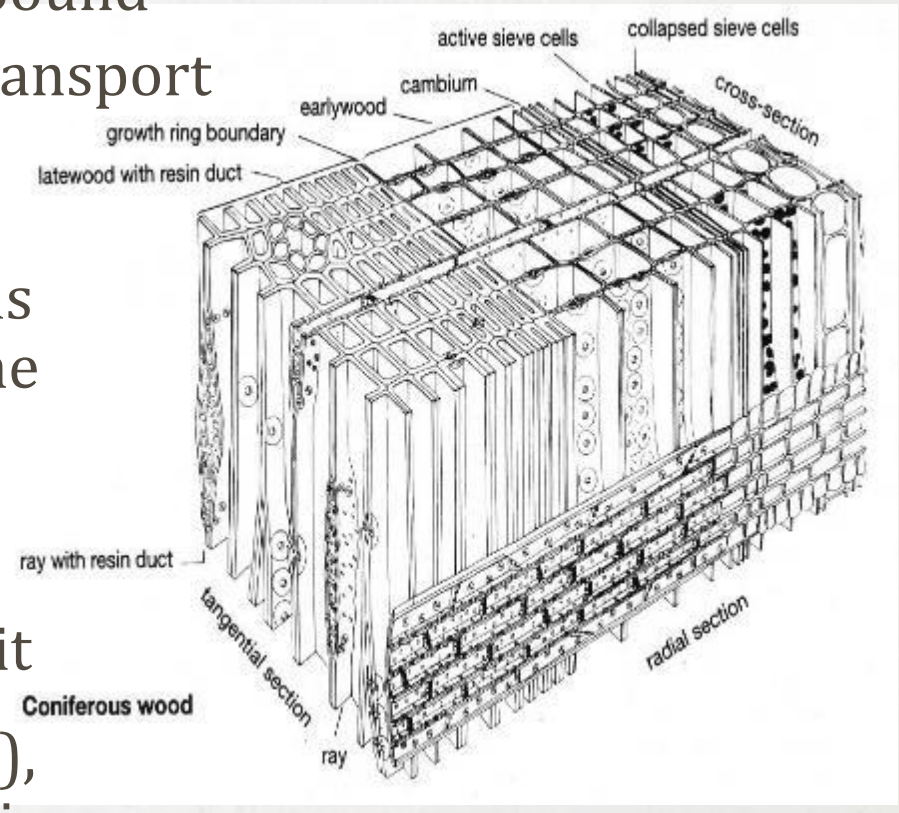
Wood and water

- As wood dries
  - Water leaves the cell lumens (cavities)
    - However, cell walls still have bound water *(Typically 30% MC)*
  - Called Fiber Saturation Point (FSP)
    - However, temperature and humidity continue to influence the water in wood
- Equilibrium Moisture Content (EMC) is where the wood is neither gaining or losing moisture.

EMC of wood at various temperature and humidity values			
Temp. °F	Relative Humidity %		
	30%	60%	90%
30°	**6.3%**	**11.3%**	**21.0%**
70°	**6.2%**	**11.0%**	**20.5%**
90°	**5.9%**	**10.5%**	**19.8%**
130°	**5.2%**	**9.4%**	**18.2%**

Why wood and water matter to AC 516, AC 66, AC 479

- If wood is dried to 12-18% EMC all water in the wood is bound
  - If a chemical is applied to the surface, water will not transport the chemical deeper into the wood without assistance
    - Typical ways of assisting chemicals into the wood is through pressure, heat, moisture and exposure time
- Natural wood structure limits ability of chemical to penetrate radially or tangentially into the wood
- Wood drying can change the wood cell structure, harden it
- Machining of the wood, such as planning the surface (S4S), creates a smooth surface that also limits surface penetration



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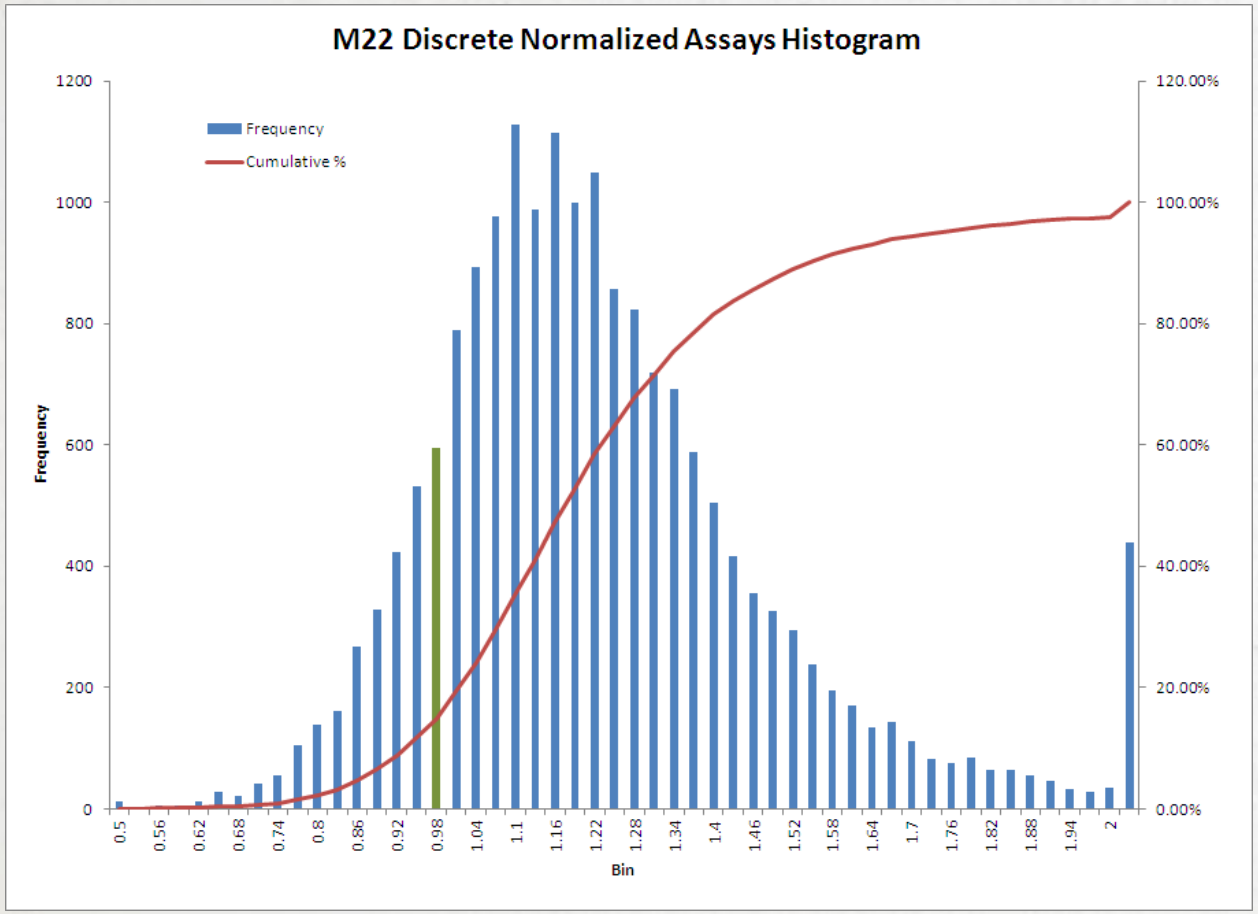
Results of putting chemicals into wood

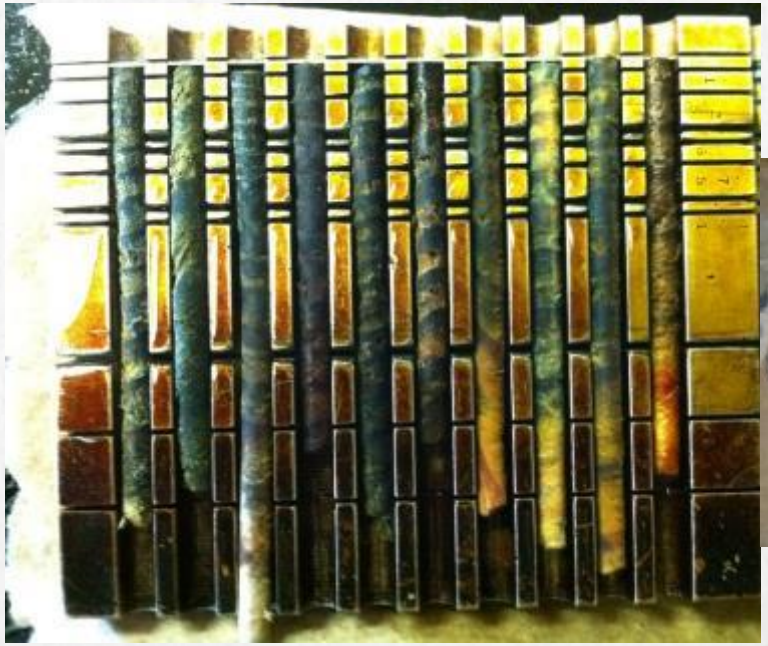
Lots of variation

Penetration is limited

Water diffusing chemicals can penetrate farther if MC above 40%, around FSP, they will not penetrate below 15%.

Quality Control: penetration and retention





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Factory Applied Fire-Retardant Penetrant …

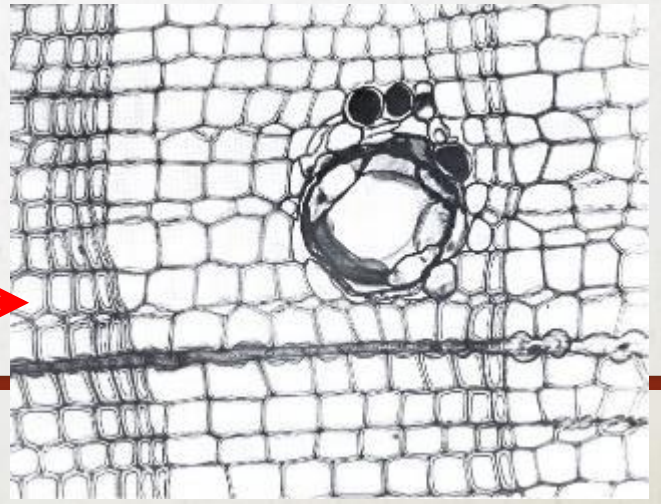
- Chemicals applied to wood penetrate the surface to form interlocking bonds or they would fall off *(Valence forces are the exception)*
- How far they penetrate is the difference.
  - Pressure treating results in penetration from 0.4 inches up, which is verified by testing.
  - Intumescent coatings penetrate the surface superficially and hence have stability testing
- Proprietary systems in ICC-ES all avoid stating a depth of penetration or testing to prove it in the AC.

Factory Applied Fire-Retardant Penetrant …

- AC479 defines a FR coating as “factory-applied fire-retardant coating has been coated to one or both faces.”
  - No requirements, tests, measurements or assurance of penetration
- AC516 claims penetration through the surface
- AC 66 has an unspoken claim of deeper penetration through the surface

Remember:

Penetration is not along the wood fiber it is through the side.



Diffusion: fine line between on the surface and penetrating

- If a chemical is applied to lumber above 40% MC, the movement of water particles in the wood allow the diffusion of the chemical as the wood dries to EMC over time, however this is cut off if kiln dried after application.
- If the chemical is applied to lumber with a moisture content below 15% then the coating is not able to penetrate very far as it does not have bound water movement or free water to diffuse through, made even more difficult by cell degradation from drying.
- Therefore the condition of the wood prior to application, during application and after application is critical to the diffusion of the chemical.
- Wood Handbook: “The amount of [penetrant/coating/adhesive] needed will depend on the wood species, moisture content, type of [penetrant/coating/adhesive], temperature and humidity of the air, assembly time, and whether [penetrant/coating/adhesive] will be applied to one or both surfaces.”

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Published Examples of Borate Diffusion at 10-30% MC

THE INTERNATIONAL RESEARCH GROUP ON WOOD PRESERVATION

Section 3 WOOD PROTECTING CHEMICALS

Movement of borates in a range of timber species at various moisture contents

M W Schoeman*, J D Lloyd* & M J Manning**

Wrapped 25% MC

Humid 100% RH

Outside 10% MC

Fig. 1 - Penetration of DOT into Douglas Fir

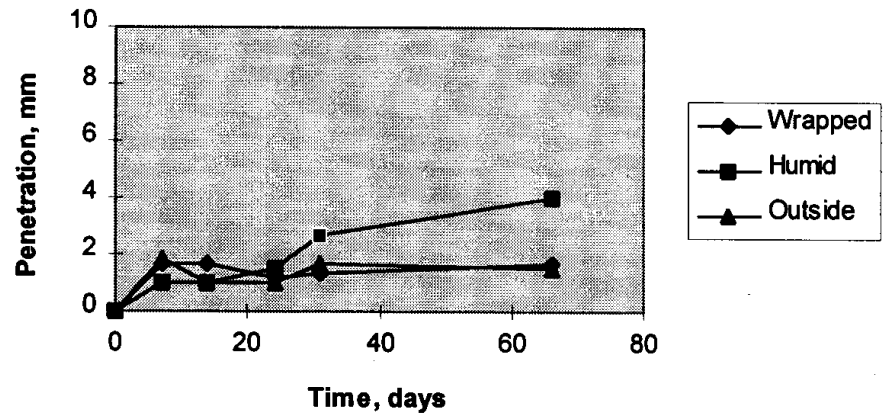
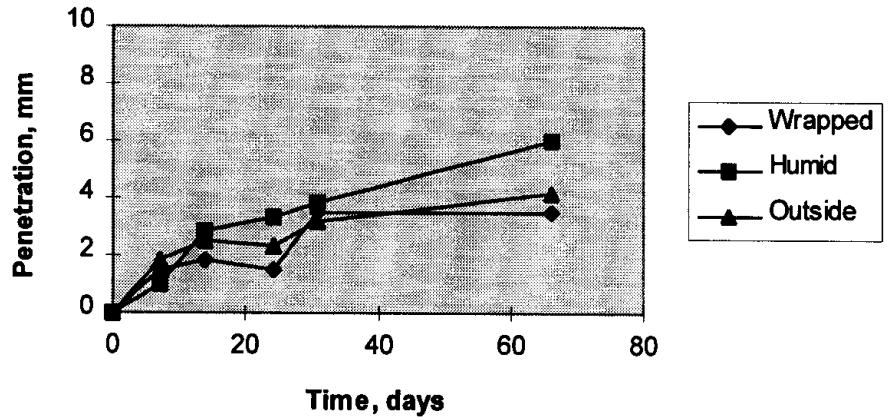


Fig. 3 - Penetration of DOT into Southern Yellow Pine



Conclusion

From the data presented, it is confirmed that moisture content of the wood is of over-riding importance to borate movement in wood. Differences in wood species do occur

Testing for previous diffusion before product sampling

- Boron is colorless, so are Hydrogen Peroxide, phosphates and other fire retardant ingredients.
- AC 516 Section 2.4 does not verify that there has been no previous diffusion of Fire-Retardants into the wood before sample preparations.
- The inspection agency must use a boron indicator on the material before application of the fire-retardant penetrant.
- If boron is not used in the product, then a phosphorus indicator should be used as well.
- A boron indicator prior to application of the penetrant will remove any concerns of manipulation and ensure proper sample performance. This could also be considered for AC 66 and AC 479.

Wetting During Construction in Proposed AC516

125 **3.3.1 Interior Use:** To address wetting during construction, wood
126 structural panels and sawn lumber with factory-applied fire-retardant penetrant intended
127 for interior use shall be subject to wetting at a rate of 5 gallons per hour per square foot
128 of surface continuously for 6 hours with the surface oriented at an angle of 70-80
129 degrees (nearly vertical). Wetted test specimens shall be dried in accordance with the
130 conditioning requirements of the ASTM E84 or UL 723 tests. The wetting and drying
131 requirements shall be conducted on all interior-use products prior to the surface-burning
132 tests required under this criteria.

- No testing has been done to confirm the testing described above actually works to replicate fire retardants used on exterior walls or roof that are subjected to rain and snow during installation.
- This is a project ICC-ES, AWPA, ASTM and industry needs to address.

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Factory Applied Fire-Retardant Penetrant…

- AC 516, AC 66 and AC 479 all allow exposure of “interior applications” to exterior elements during construction: UV light, rain, snow, wind, and temperature.
  - Examples of interior applications include: exterior walls and roofs, clearly these are exposed to the elements from days to months during construction.
  - As such, some testing of the ability to hold retention of the fire-retardant penetrant in the wood with artificial wetting would be advised for all products

Definition in Proposed AC516

60 **1.4 Definitions**

61 **1.4.1 Factory Applied Fire-Retardant Penetrant:** The factory applied

62 fire-retardant penetrant is a proprietary formulation that is applied to all sides of the

63 wood structural panels and all faces of sawn lumber that chemically penetrates the

64 wood to impart fire-retarding qualities to the wood substrate.

- All pressure treated fire-retardants would fit under this definition and could move from AC 66 to AC516.

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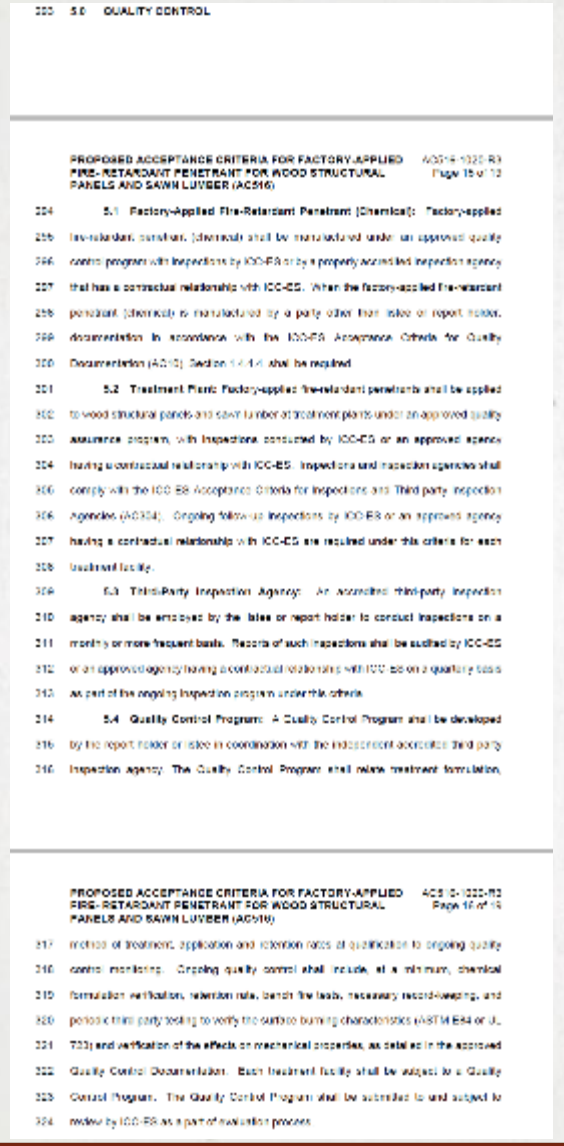
Quality Control

AC 516



5.0 QUALITY CONTROL

PROPOSED ACCEPTANCE CRITERIA FOR FACTORY-APPLIED FIRE- RETARDANT PENETRANT FOR WOOD STRUCTURAL PANELS AND SAWN LUMBER (AC516) — Page 15 of 19

5.1 Factory-Applied Fire-Retardant Penetrant (Chemical): Factory-applied fire-retardant, pressure, (chemicals shall be manufactured under an approved quality control program with inspections by ICC-ES or by a properly accredited inspection agency that has a contractual relationship with ICC-ES. When the factory-applied fire-retardant penetrant chemicals are manufactured by a party other than labor or report holder, documentation in accordance with the ICC-ES Acceptance Criteria for Quality Documentation (AC10), Section 3.1.4.4 shall be required.

5.2 Treatment Plant: Factory-applied fire-retardant penetrants shall be applied to wood structural panels and sawn lumber at treatment plants under an approved quality assurance program, with inspections conducted by ICC-ES or an approved agency having a contractual relationship with ICC-ES. Inspections and inspection agencies shall comply with the ICC-ES Acceptance Criteria for Inspections and Third-party Inspection Agencies (AC304). Ongoing follow-up inspections by ICC-ES or an approved agency having a contractual relationship with ICC-ES are required under this criteria for each treatment facility.

5.3 Third-Party Inspection Agency: An accredited third-party inspection agency shall be employed by the labor or report holder to conduct inspections on a monthly or more frequent basis. Reports of such inspections shall be audited by ICC-ES or an approved agency having a contractual relationship with ICC-ES on a quarterly basis as part of the ongoing inspection program under this criteria.

5.4 Quality Control Program: A Quality Control Program shall be developed by the report holder or labor in coordination with the independent accredited third party inspection agency. The Quality Control Program shall relate treatment formulation,

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method of treatment, application and retention rates of qualification to ongoing quality control monitoring. Ongoing quality control shall include, at a minimum, chemical formulation verification, retention rate, bench fire tests, necessary record-keeping, and periodic third party testing to verify fire surface burning characteristics (ASTM E84 or U... 723) and verification of the effects on mechanical properties, as detailed in the approved Quality Control Documentation. Each treatment facility shall be subject to a Quality Control Program. The Quality Control Program shall be submitted to and subject to review by ICC-ES as a part of evaluation process.

AC 66

5.5 Plant Quality Control:

5.5.1 Program Requirements:

5.5.1.1 Each plant is to maintain a quality control program. The plant shall appoint a quality control supervisor who will be responsible for the quality control program and will have the authority to take action as required to ensure compliance of all material produced at the plant. The plant quality control supervisor will serve as the primary contact for the quality control inspection agency.

5.5.1.2 The plant shall be equipped with the process equipment, measuring instruments, records, and laboratory equipment necessary to accurately monitor the treating, drying and testing procedures conducted at the plant. The equipment shall be properly calibrated and maintained in good working order and personnel shall be properly trained in the use thereof.

5.5.1.3 The fire-retardant treatment solution shall be controlled so that the solution used for treatment contains is of the same composition, within qualified tolerances, as the solution used for the treatment of qualification test specimens.

5.5.2 Treatment Solutions: A representative sample of the treating solution shall be drawn from the working solution batch, for verification testing by the in-plant quality control inspector, at the start of each day, before treatment; whenever any adjustments are made to the solution, and after every third charge.

The verification test of the working solution shall include a determination of the specific gravity and temperature of the treating solution, and shall be within the qualified tolerances of the solution used for the treatment of qualification test specimens.

5.5.3 Treatment Process Control:

5.5.3.1 General: Critical operating parameters for the treatment process shall be continuously monitored by means of automatic chart recorders. These critical parameters include, but are not limited to, pressure, vacuum and time. Temperature and other parameters may be deemed critical, depending upon the process used.

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The limiting tolerances of these critical parameters shall be as noted in the quality documentation.

5.5.3.2 Treating: Each treatment load shall be documented as follows: A charge report that describes the species and volume of material treated, the date, the charge number and the treating cycle parameters.

5.5.3.3 Moisture Content (MC): The fire-retardant-treated lumber or plywood shall be dried after treatment. Fire-retardant-treated lumber shall be dried to a moisture content of 19 percent or less and fire retardant-treated plywood shall be dried to a moisture content of 15 percent or less. The moisture content may be measured using a calibrated moisture meter, oven-dry methods, or a combination of the two. The use of a moisture meter requires demonstration that the values correlate to the oven-dry method and are documented in the quality documentation. During drying, the temperature shall not exceed the maximum temperature used in preparation of the strength test specimens (reference Sections 3.1 and 3.2 or ASTM D5516 / D6841).

5.5.3.4 Kiln Drying: For kiln-dried processes, a kiln record shall be kept that describes the species, the size and volume of material dried, the kiln controller settings (wet bulb and dry bulb temperatures), the time and the final moisture content readings. A kiln recorder chart, showing actual environmental conditions during the entire drying period, shall be kept with the kiln record.

5.5.3.5 Air Drying: For air-drying processes, the ambient environmental conditions, the length of time of air drying, and the final moisture content readings shall be recorded and maintained in a permanent log.

5.5.3.6 Storage: All treated wood shall be stored in weather-protected locations or shall be protected by waterproof wrapping. All fire-retardant-treated wood shall be stored off of the ground.

5.5.3.7 Records: Permanent records shall be kept for a minimum of two years, to document that all treated materials meet the quality control agency requirements and that in-house quality control procedures have been properly conducted.

5.5.4 Chemical Verification: In all cases, chemical verification shall conform to requirements outlined in the approved quality documentation. Verification shall be by means of the tube tests or an assay of boilings by chemical analysis, using nationally recognized test methods or other methods that have been validated to relate to results of the tests conducted in accordance with Sections 3.1.4 and 3.2.4 of this criteria. Three five-tube tests (ASTM E 84, Procedure B) shall be conducted on specimens processed with each charge treated in lieu of the actual species treated, a standard lumber species, such as Douglas fir, may be used for the tube testing on each charge. The average final percentage weight loss of the treated wood samples, after flaming and glowing have ceased, and the maximum temperature, shall be equal to or less than that obtained on the qualification-test specimens. The final percentage weight loss of any individual specimen shall not exceed the qualification value by more than five percentage points. Alternately, an assay of boilings, by chemical analysis, may be used to verify the treatment process. This analysis shall be conducted on a composite of 20 boilings per species per charge, on a representative sampling of the treated

plants processing fire-retardant-treated lumber and plywood at least once a month. More frequent inspections may be necessary for plants operating more than one shift per day, or operating more than five days per week. The visits shall not be made on a regular schedule, but shall be coordinated with the plant quality control supervisor so that materials will be available for testing during the inspection. The inspector shall review plant records recorded since the last inspection to verify that the required records are being maintained in a complete and accurate fashion, and that all treated materials have been properly tested and have complied with the established quality control requirements. While at the plant, the inspector shall witness the tube tests, take borings for moisture tests of at least one charge, or verify compliance with other validated methods specified in the approved quality documentation; check the moisture content of material that has been kiln- or air-dried; and check the solution concentration by hydrometer. The inspector shall keep a report of his findings and copies of records of all witnessed tests.

5.6.2 The inspection agency shall sample the fire-retardant solution from each plant quarterly. The sample shall be obtained from the treating cylinder or storage tank at the time of the inspection. The sample shall be labeled and sent to the inspection agency or designated independent laboratory to confirm proper chemical composition and concentration. Additionally, the agency shall verify plant records of plant testing of the treating solution.

5.6.3 The agency shall examine production records to ensure proper accounting of production. In this regard, reference is made to Sections 3.1.4 and 3.1.5 of the Acceptance Criteria for Quality Documentation (AC10), which require that the agency have some method of the identification methods. A system of traceability of finished product to treatment, drying and quality control records must be provided.

5.6.4 The inspection agency shall verify ongoing compliance with the surface burning characteristics and strength properties.

5.7 Reassertion of Nonconformance:

5.7.1 If a plant fails to maintain all required records in a complete and accurate manner, the inspection agency shall give the plant a written warning, including details of the deficiencies. Three consecutive monthly warnings, or four warnings in a six-month period, shall result in

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suspension of the plant's marking privileges and removal of all stamps and labels from the plant, until such time as the requirements are met to the satisfaction of the quality control agency.

5.7.2 If the agency discovers nonconformance with the requirements of this criteria, the quality control procedures or the approved quality documentation, the agency shall initiate double-frequency inspections until two consecutive inspections show full conformance. If three consecutive inspections show nonconformance, or if four inspections in a six-month period show nonconformance, the plant's marking privileges shall be suspended and all stamps and labels removed from the plant until such time as all requirements are met to the satisfaction of the inspection agency and ICC-ES.

5.7.3 When conducting the ASTM E84 fire tube test on samples from a load of treated lumber (i.e., the charge), the charge is acceptable if the first three samples tested meet the quality control requirements. If one of the first three samples fails, an additional three samples may be tested. If all of the three additional samples meet the requirements, the charge is acceptable. If the charge is not acceptable, it shall be retreated and retested.

5.7.4 The solution concentration shall be within the range specified in the quality documentation. If the solution concentration is low, the charge shall be retreated with the proper solution.

5.7.5 The analysis of solution sampled by the inspection agency shall confirm proper chemical composition and concentration. If nonconforming, appropriate action shall be taken by the plant to adjust the solution. Additional samples shall then be analyzed on a weekly basis until conformance has been demonstrated in two consecutive samples. All lumber and plywood found to have been treated with a nonconforming solution shall be segregated and labeled as nonconforming. A representative sampling of the nonconforming lumber and plywood selected by the inspection agency shall be tested, and shall meet the flame spread and strength requirements of the code before it may be released.

5.7.6 The charge retention shall be within the specified range of gage retention of fire-retardant chemical, as determined during qualification testing for the applicable material and species. If retention is below the minimum, the charge shall be retreated so that the total retention is within the minimum and maximum qualified values. If retention is above the maximum allowed, the lumber or plywood in the charge shall not be stamped.

6.0 EVALUATION REPORT RECOGNITION

The following are conditions of use for fire-retardant-treated wood products covered by this acceptance criteria.

6.1 All strength calculations shall be subject to the design value adjustment factors or span ratings shown in Tables [insert table numbers] of this report.

6.2 The design value adjustment factors and span ratings given in this report shall only be used for unit-sized dimensional lumber and plywood of the species noted in this report.

6.3 The exposure limitations of the fire-retardant-treated wood shall be defined in the evaluation report, either exterior or interior.

6.4 The fire-retardant-treated wood shall not be used in contact with the ground.

Exception: Fire-retardant-treated wood of naturally durable species, which is identified as "Suitable" in accordance with Section 2303.2.6 of the 2018, 2015, 2012 and 2009 IBC or Section 2303.2.3 of the 2006 IBC or as Section R802.1.8.5 of the 2018 and 2015 IRC or Section R802.1.3.6 of the 2012 and 2009 IRC, and Section R802.1.3.5 of the 2006 IRC and which is evaluated for ground-contact use.

6.5 The fire-retardant-treated lumber shall not be sawed or milled as this will alter the surface-burning characteristics and invalidate the flame-spread classification.

6.6 Exposure to precipitation during storage or installation shall be avoided. If material does become wet, it shall be replaced or permitted to dry (maximum 19 percent moisture content for lumber and 15 percent moisture content for plywood) prior to covering or enclosure by wallboard or other construction materials (except for protection during construction).

6.7 The design value adjustment factors for lumber and plywood specified in Tables [insert table numbers] of this report are applicable under elevated temperatures resulting from cyclic climatic conditions. They are not applicable under continuous elevated temperatures resulting from manufacturing or other processes which shall require special consideration in design, which is not within the scope of this report.

6.8 Fire-resistance-rated assemblies qualified in accordance with Section 3.4 of this criteria must be described in the evaluation report.■

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Quality Control Manual in Proposed AC516

78 **2.1.2 Quality Control Manual:** Manufacturer's application manual (for

79 treatment plant/applicator).

- All pressure treated fire-retardants would fit under this term "treatment plant" and could move from AC 66 to AC516.

Quality Control in Proposed AC516

301 **5.2 Treatment Plant:** Factory-applied fire-retardant penetrants shall be applied
302 to wood structural panels and sawn lumber at treatment plants under an approved quality
303 assurance program, with inspections conducted by ICC-ES or an approved agency
304 having a contractual relationship with ICC-ES. Inspections and inspection agencies shall
305 comply with the ICC-ES Acceptance Criteria for Inspections and Third-party Inspection
306 Agencies (AC304). Ongoing follow-up inspections by ICC-ES or an approved agency
307 having a contractual relationship with ICC-ES are required under this criteria for each
308 treatment facility.

- All pressure treated fire-retardants would fit under this term “treatment plant” or “treatment facility” and could move from AC 66 to AC516.

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Quality Control in Proposed AC516

314 **5.4 Quality Control Program:** A Quality Control Program shall be developed
315 by the report holder or listee in coordination with the independent accredited third-party
316 inspection agency. The Quality Control Program shall relate treatment formulation,
317 method of treatment, application and retention rates at qualification to ongoing quality
318 control monitoring. Ongoing quality control shall include, at a minimum, chemical
319 formulation verification, retention rate, bench fire tests, necessary record-keeping, and
320 periodic third-party testing to verify the surface-burning characteristics (ASTM E84 or UL
321 723) and verification of the effects on mechanical properties, as detailed in the approved
322 Quality Control Documentation. Each treatment facility shall be subject to a Quality
323 Control Program. The Quality Control Program shall be submitted to and subject to
324 review by ICC-ES as a part of evaluation process.

- All pressure treated fire-retardants would fit under this term “treatment facility” and could move from AC 66 to AC516.
- Additionally it would require each facility to test their product to E-84 periodically.

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Labeling in Proposed AC516

371 The marking shall contain the information required by Section 2303.2.4 of the
372 IBC or Section R802.1.5.4 IRC, and shall include the following additional information:
373 1. ICC-ES evaluation report number.
374 2. ASTM E84 or UL 723 10-minute test indices (flame spread and smoke
375 developed), and statement indicating no evidence of significant progressive
376 combustion when the test is extended to 30 minutes.
377 3. Name or identification number and location of factory-applied fire-retardant
378 penetrant treater.
379 4. A code or means of enabling traceability of manufacturing required by the
380 approved quality control program. ■

- Section 3.
- All pressure treated fire-retardants would fit under this term “penetrant treater” and could move from AC 66 to AC516.
- Additionally it should require a statement to clarify that is it “By non-Pressure process.

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Conclusion

- The most common answer when dealing with wood is “It Depends”.
- All three Acceptance Criteria AC 479, AC 66 and AC 264 along with proposed AC 516 should be reviewed for equivalency and consistency.
- All of them should include: Pretest verification of no boron/phosphate, research of wetting effects, adjustment factors, details of wood MC, chemical and process parameters to ensure penetration, with clear quality control guidelines.

Clarification needs to be made if ICC-ES staff or the committee want for FRTW to move to AC 516 or not.

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