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Fire Retardant Chemical Manufacturer

September 22, 2020

Re: ICC-ES Proposal AC516-1020-R3 "Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber"

FRCT's Reply to the public comments for October 6th and 7th, 2020 ICC-ES Evaluation Committee hearing.

The responsibility of the ICC-ES Evaluation Committee Chairman and the Committee members for decades has been to approve acceptance criteria for new innovative products, new technology, and new materials coming into the building industry. Think of all the AC's that have been approved and have earned their place in the building industry over the years.

This AC516 is presented to the committee for approval, which contains the necessary fire performance and quality control criteria for proven fire-retardant penetrant chemicals. This Acceptance Criteria establishes the foundation for new fire-retardant technologies that will significantly expand the solutions for wood fire protection.

The AC516 criteria has been developed to the performance and quality control guidelines from existing Acceptance Criteria and also from extensive input from experts in this industry. The critical factors as to why this AC516 needs to be approved is because the two primary existing Acceptance Criteria, namely AC66 and AC479, that are the closest in the description, are guidelines for completely different chemical types, application methods, and limitations.

The purpose of AC516 is to give fire-retardant penetrants that do not require the application method of pressure impregnated the same opportunity to prove and be recognized for the same fire protection performance. The AC516 provides a high level of assurance that these products will perform to the expectations and requirements of Section 2303.2 of the IBC regarding fire performance, test requirements, durability, strength adjustment disclosure, labeling, limitations, quality control, etc.

Fire Retardant Treated Wood, as we know it today, has been instrumental in the fire performance requirements for structural wood construction but now has growing limitations in the types of wood that can be treated without impacts to the structural values. This also includes solutions necessary to upgrade existing wood structures to meet the fire performance requirements of the building code. 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.

This Acceptance Criteria provides many benefits and resolutions to current issues of fire protection in the wood construction industry and a great foundation to expand on the fire protection solutions for future wood products.

Acceptance Criteria 516 for a fire-retardant penetrant needs to be approved and allowed to earn its place in the industry. AC516 brings to the industry what current fire-retardants do not, a higher fire performance fire-retardant, less invasive damage to sawn lumber and wood structural panels, and job site durability regarding rain and job site handling. AC516 deserves its place to prove itself in the industry. We have taken all the comments, suggestions, recommendations, positive and negative, and agreed with those compatible with a fire-retardant penetrant. The compatible ones (fire-retardant testing, chemical manufacture quality control, treating facility quality control, etc. all meet or exceed IBC & IRC Codes) have had positive replies (much improved from previous drafts).

Fire-Retardant Penetrant is a new technology of fire-retardant and is very much needed in the industry of fire-retardants. A fire-retardant that "chemically penetrates" the wood structural panels, sawn lumber, and OSB is a unique high-performance fire-retardant. When applied to wood structural panels, sawn lumber, and OSB, it has the required fire-retardant performance of the IBC and IRC codes.

"It's not always about the sale, but rather doing what's right for our valued customers"



Fire Retardant Coatings of Texas®, LLC

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AC516 deserves its place in the industry, an even playing field, recognizing what it is, not what it is not.

When other AC's were proposed to ICC-ES Committee, no one was 100% on board with the creation of a new acceptance criteria. However, New AC's were approved just on the merits of the AC's itself. Not on derogatory comments from competitors in the same industry.

Again, we urge the committee to approve AC516 on its own merits.

Thank You for the opportunity to bring new technology into the industry.

NOTE Specific rebuttal comments to public comments received follow in the line within the comment letters, and are identified by **[David Paulo – Rebuttal for _____ Comment 9-23-2020]** in red font and are indented.

Best Regards

David Paulo, Sr

David Paulo, Sr.

President

Fire Retardant Coatings of Texas, LLC.

“It’s not always about the sale, but rather doing what’s right for our valued customers”



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September 10, 2020

Jeff R. Filler, Ph.D., P.E.
Senior Staff Engineer
ICC Evaluation Service
900 Montclair Road, Ste. A
Birmingham, AL 35213

Subject: Proposed New Acceptance Criteria for Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber, Subject AC516-1020-R3

Dear Dr. Filler and the ICC-ES Evaluation Committee:

I want to thank you, your staff, and the Evaluation Committee for allowing me to comment on this ongoing and evolving acceptance criteria.

I am encouraged by subsequent changes made in the criteria to address significant deficiencies. My comments will primarily address these changes or potential omissions that should be considered as this AC progresses forward.

Acceptance Criteria and Code Equivalence

The preface statement for all ICC-ES Acceptance Criteria repeats and emphasizes the alternate methods and materials provisions of IBC Section 104.11. It demands that an alternate method or material be determined that “for the purpose intended, (is) not less than the equivalent in quality, strength, effectiveness, fire resistance, durability, and safety.”

The specific product use limitations contained in previous versions of AC 516 have been eliminated in this version of AC 516. The AC now allows these alternatively treated products to be used in any application where pressure-impregnated fire-retardant treated wood (FRTW) is allowed by the building code. With these changes, the burden of proof of equivalency is now increased to accommodate all end use applications allowed by the code.

David Paulo – Rebuttal for Building Intuition 9-23-2020

Equivalency means it meets the performance requirements of the building code and has been strength tested in compliance with Section 2303.2 of the IBC. These requirements are covered in the AC516 which are parallel to the requirements in the AC66. End of Comment

Pressure impregnated FRTW has been used in building construction in the United States for nearly a century. Since World War II, it has had extensive and successful use in large wooden buildings. In the 1960's, its proven track record allowed it to be prescriptively placed and utilized in US building codes. Improvements have been made in its performance and its track record has been solid for the past several decades.

David Paulo – Rebuttal for Building Intuition 9-23-2020

FRTW was prescriptively placed and utilized in the US building codes because it was the only solution at the time. The AC516 recognizes that Fire Retardant Chemistry have greatly advanced and do not have the limitations to the types of wood that can be fire treated as well as not impact structural strength values like current FRTW. End of Comment

The proposed AC intends to evaluate a product, produced using a new technology that lacks this historic record or in situ performance. The performance of wood products that are pressure impregnated cannot automatically be ascribed to the performance to a material using a non-pressure penetration process. For that reason, it is essential to test for all aspects of its performance, consider its unique characteristics, and understand and evaluate it for conditions where it will be placed in a building.

David Paulo – Rebuttal for Building Intuition 9-23-2020

There are several products in use today that have long history but are being reevaluated and/or being required to be updated to improve performance, in order to meet the changes in today's construction. End of Comment

This extra testing and performance verification is absolutely essential in order to demonstrate and assert equivalence in “quality, strength, effectiveness, fire resistance, durability, and safety.” Otherwise, the code official cannot approve it as an alternative.

David Paulo – Rebuttal for Building Intuition 9-23-2020

A code official CAN approve a product, provided the product submittal data meets the performance requirements as prescribed in Section 2303.2 of IBC 2018. End of Comment

Minimum Expectations of Penetration

I have previously testified to the need to provide some assurance of an acceptable level of penetration depth into the wood substrate using this non-pressure, penetrant technology. In my opinion, micro-penetration does not have the same inherent durability potential exhibited in pressure-impregnated materials. Pressure impregnation has been shown to provide deep, if not complete penetration of the treated material. The proposed “chemical penetration” depth is vague and uncertain unless a minimum is specified.

David Paulo – Rebuttal for Building Intuition 9-23-2020

The depth of penetration does not determine the performance of a fire-retardant penetrant, it's the fire retardant, whether pressure or non-pressure applied meets the 30-minute flame spread and smoke requirements per 2303.2 of IBC 2018. Again, it is a misperception that penetration depth is the basis of FRTW, when it is not. Like the AC 66, the AC516 does not dictate depth of penetration OR the required retention rate, because just like pressure impregnated applications, it will vary from manufacturer to manufacturer as well as types of wood. End of Comment

As it stands, AC 516 has no minimum expectation of the extent of penetration provided by the chemical treatment process. Many of my comments below relate to this unknown circumstance and must assume the worst case lacking any stipulated minimum embodied in the AC.

David Paulo – Rebuttal for Building Intuition 9-23-2020

This is under the chemical manufacturers application guidelines per passing the performance test as prescribed in 2303.2 of IBC 2018. The required depth of penetration and retention will be different from one chemical to the next. AC516 has guidelines for this reason.

Elimination of Nail Placement in the Extended ASTM E84 Test

David Paulo – Rebuttal for Building Intuition 9-23-2020

The nail placement requirement will be added back into AC516. End of Comment

As AC 516 does not establish an acceptable depth of penetration of the fire-retardant chemical, it is possible that a product may only exhibit shallow or micro-penetration. Pressure impregnated FRTW for which this the product is being evaluated as an equivalent has very deep if not complete penetration.

David Paulo – Rebuttal for Building Intuition 9-23-2020

The depth of penetration does not determine the performance of a fire-retardant penetrant, if the fire retardant meets the 30-minute flame spread and smoke requirements per 2303.2 of IBC 2018. Again, it is a misperception that penetration depth is the basis of FRTW when it is not. Like the AC 66, the AC516 does not dictate depth of penetration OR the required retention rate, because just like pressure impregnated applications, it will vary from manufacturer to manufacturer as well as types of wood.

In addition, the Quality Control Section 5.4 of the AC66 and Section 5.4 of the AC516 state these parameters must be included in the quality documentation and therefore, do not need to be listed within the AC516. Again, answered above. End of Comment

Shallow and micro-penetration has similar concerns as that of coated products. A protective layer at the surface of a material is obviously not inherently protected and available deep within the substrate as found with conventional FRTW.

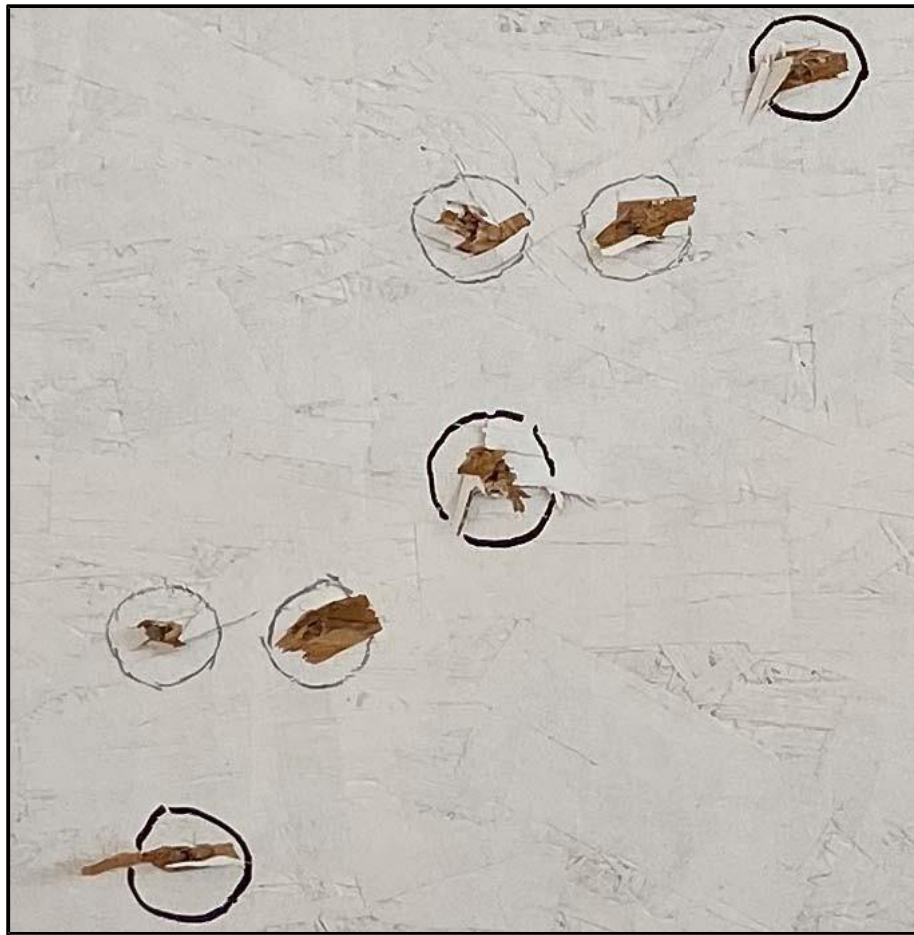
David Paulo – Rebuttal for Building Intuition 9-23-2020

The AC516 criteria clearly identifies the chemical as a fire-retardant penetrant, that is permanent. AC516 has the required testing of wood structural panels be tested with untreated joint and roofing nails placed in the panels after treatment, along with a 1/8-inch saw cut down the length of the panels after treatment. End of Comment

In the case of exterior wall and roof sheathing applications, nails installed nearly always result in some amount of surface delamination. This delamination may remove most, if not all of the protective chemical, leaving untreated wood exposed to heat and flame. This obviously will have some impact on the rate of surface burning propagation and must be evaluated to determine equivalence.

David Paulo – Rebuttal for Building Intuition 9-23-2020

Absolutely correct, however, we are not talking about a coating in AC516. The AC516 criteria clearly identifies the chemical as a fire-retardant penetrant, that is permanent. That does not delaminate or flake off like an intumescent coating (fire-retardant paint). End of Comment



Nail Penetration Delaminated Surface on Oriented Strand Board (OSB)
Pneumatically Placed Roofing Nails at Industry Standard 90psi

The nail placement criteria previously contained in AC 516 Section 3.2 ASTM E-84/UL 723 has been removed in this version. The placement of nails in the Steiner Tunnel test must be restored if an acceptable minimum level of penetration is not mandated by the acceptance criteria. Failure to assess for this phenomenon for materials with minimal surface penetration will most certainly result in substandard surface fire propagation.

David Paulo – Rebuttal for Building Intuition 9-23-2020

The representation in the photo is NOT an example of a fire-retardant application. It is misleading because it is a “coating”. Criteria requirement for intumescent coatings applied to wood can be reviewed in the AC479. In addition, unlike the AC66 or AC479, Section 3.2 of the AC516 addresses any concern by providing requirements for 1/8” sawn gaps and grooves cut after treatment. These gaps are designed to demonstrate adequate surface burning performance with minor surface damage. We will add the nail placement back into AC516. [End of Comment](#)

Allowing this to proceed unaddressed would fail to meet the Section 104.11 evaluation for “fire resistance, effectiveness, and safety”.

David Paulo – Rebuttal for Building Intuition 9-23-2020

Incorrect. See previous response. [End of Comment](#)

AC 516 Section 3.3.1 – Wetting During Construction Test

I am pleased to see the addition of a water exposure test method in this most recent iteration. This is absolutely necessary to address real world exposures that the product will experience on construction sites.

Unfortunately, no definitive description is provided on how the test is to be conducted. As it is currently written, extremely wide latitude in performing the test is inevitable. This will not permit valid repeatability between laboratories charged with performing this test.

At a very minimum, the method used to apply the water must be fully described. Assuming a spray method, this should include as a minimum the intended number/density of nozzles, orifice size, water pressure at the nozzle, volume calibration at each nozzle, distance of the nozzle to the sample, etc.

As the test proposed at Section 3.3.1 is not based on any existing consensus standard, its testing methodology and assumed efficacy must be understood and agreed upon by the Evaluation Committee. As this is intended to represent a rain event, I would expect some form of water droplet spray application equivalent to a normal wind-driven rainstorm event. This is necessary to replicate any detriment that water under normally anticipated force will have on the chemical treatment.

Assuming an appropriately designed and described test, the currently prescribed volume and duration seems reasonable for a site exposed material that will be permanently shielded within the building envelope.

David Paulo – Rebuttal for Building Intuition 9-23-2020

The Durability Test procedure is designed by an Accredited Testing Laboratory and based off existing durability test equipment/procedures that will adequately address the ability to maintain the required fire performances after exposure. This addresses the concerns previously voiced of a fire retardant possibly “washing off”. This step takes fire retardant penetrant to a new level over FRTW because I am sure that you are aware, there is no Durability Test for FRTW. Manufacturers of FRTW state in their Technical Data Sheets to avoid exposure to weather/moisture. [End of Comment](#)

As a caveat, this test may not prove a representative evaluation of long term wetting that may occur within exterior wall assemblies. This phenomenon may require evaluation through another testing means. Testimony from a water testing expert on the appropriateness of the short-duration rain exposure test to these long term conditions would be helpful.

David Paulo – Rebuttal for Building Intuition 9-23-2020

See above comment. [End of Comment](#)

Freeze-Thaw Testing

The current AC has no provision for freeze-thaw testing.

Moisture moves through building envelope cavities and will condense on solid surfaces where dewpoint is reached. This is an undisputed scientific fact. In cold weather climates, this is building interior to outward flow where condensation usually takes place on the interior side face of exterior wall sheathing.

In the majority of Colorado, we typically see a freeze-thaw cycle occur on a daily basis during the winter months. This equates to 90-120 freeze-thaw cycles per year.

Our daytime temperatures and sun exposure will result in liquid moisture condensing on the wall interior side of the sheathing surface. After the sun sets, that same moisture will freeze to the surface. Over time, the freeze-thaw may start to lever, lift, and curl the surface furnish “wafers” of sheathing products. These lifted materials are thin and therefore have more surface area exposed, making them more vulnerable to surface fire spread. This may also reduce the structural load carrying capacity of the material over time. At a minimum, it is necessary to test for freeze-thaw to determine if there is any detriment to the efficacy of the fire-retardant treatment. If long term exposure to freeze-thaw results in substandard fire performance, then the product will not meet the “fire resistance, effectiveness, and safety” equivalency of Section 104.11.

If the chemical treatment has a hygroscopic effect and accelerates the structural degradation of wood materials exposed to wetting and subsequent freeze-thaw, that factor must also be considered, understood, and tested for equivalence. This evaluation would address the “durability and strength” characteristics of Section 104.11.

David Paulo – Rebuttal for Building Intuition 9-23-2020

As previously stated, AC516 is not about a coating. As a fire-retardant penetrant, it is embedded in the fibers of the wood. Like the AC66, it is not a required test, but would be if it were an intumescent coating. End of Comment



Significant Moisture Condensation at Inside Surface of Exterior Wall
Sheathing Test Building Interior at 72 ° F and 42% RH, Exterior
38 ° F and 53% RH
Meyers - February 2020 ICC-ES Hearing Testimony

David Paulo – Rebuttal for Building Intuition 9-23-2020

Per review of the above pictures, it appears the weather resistant barrier (WRB) was not properly installed nor professionally installed on the test (structure pictured above). The WRB is not supposed to be tucked around the end of the sheathing when creating an outside corner unless it is sealed with a flashing. It is quite possible that the moisture represented in the picture seeped in through the corner of the structure where it appears

to not be properly sealed. A WRB is designed to be the second layer of moisture protection as part of a wall system behind an exterior cladding like siding or brick, and not function as the siding itself. The WRB shown in the picture above has a perm rating of 56 where the ideal rating for a WRB is between 10 and 20 perms, as proven by Joseph Lstiburek, a moisture intrusion expert and founding principal of the Building Science Corporation. What is a perm rating? A perm rating is a rating given to weather resistant barriers based on their permeability or permeance which is the moisture transmission rate of the WRB. The lower the perm rating, the lower the moisture transmission rate...the higher the perm rating, the higher the moisture transmission. A WRB that meets a rating between 10 and 20 perms, is considered to have a balanced perm rating. This optimal perm rating ensures that while water is prevented from entering the wall cavity, ideal levels of moisture vapor are allowed to escape. If the perm rating is too high, such as the WRB pictured above, it increases the passage of water vapor and also makes the WRB more susceptible to bulk water intrusion. which can ultimately cause excessive moisture to enter the wall cavity, and therefore, the test structure pictured above is not a valid representation of a working wall system.

Additionally, the freeze-thaw test outlined in ASTM D7032 is designed to determine the mechanical property degrade as well as the surface burning characteristics after the freeze-thaw exposure. The results of the test are used to establish a performance rating and the basis for code recognition for materials used to fabricate wood-plastic composite deck boards, guards, and handrails, used in EXTERIOR APPLICATIONS. This test requires the specimen to undergo three cycles of being submerged underwater for 24 hours, frozen for 24 hours, then thawed to normal room temperature for 24 hours. If an OSB specimen, treated with a fire-retardant or not, went through this test, the concern would be its strength properties...not its fire performance. This explains why this test should not be a requirement of the AC516 as well as why it's not a requirement of the existing AC264...the acceptance criteria for Wood Structural Panels Laminated with an Inert, Inorganic Fire Shield...which is designed for the manufacturing of OSB with a fire-retardant layer of magnesium oxide applied to the surface.
End of Comment

NFPA 285

The NFPA 285 test mandated by IBC Section 1402.5 is omitted from the proposed AC. ESR's are considered to be full and complete product approvals for substitution of code prescribed materials. Since this AC now permits any application where FRTW is permitted for use by the code, Section 1405.2 and its NFPA 285 fire test evaluation cannot be ignored.

If NFPA 285 testing is not deemed necessary in the AC516 evaluation, then a caveat stating that "NFPA 285 testing is not a subject of this report" should be included in the Section 6 "Evaluation Report Requirements".

David Paulo – Rebuttal for Building Intuition 9-23-2020

If the ESR's for FRTW manufacturers include the NFPA 285 testing and is included in the AC66, then it would be pertinent to include it in the AC 516 as being an equivalent performing product. End of Comment

I thank you and the ICC ES Evaluation Committee for your time in reviewing this letter and my concerns.

Respectfully,

A handwritten signature in black ink, appearing to read 'T. Meyers', with a long horizontal flourish extending to the right.

Thomas Meyers,
CBO President

David Paulo – Fire Retardant Coatings of Texas

Rebuttal for Hoovers Public Comments

September 23, 2020

For years and to date, fire-retardant penetrant technology has complied with Section 2303.2 of the International Building Code (IBC) regarding fire performance. In recent years, as the technology has grown in popularity, so have the rumors of this technology not complying with the code. However, the focus of non-compliance revolved around it not being impregnated with chemicals by a pressure process...not its fire performance.

During the 2015-2017 Code Development Cycle for the 2018 IBC, there were proposed changes to the 2015 IBC that added a unique filter in the definition of Fire Retardant Treated Wood. The proposed changes targeted the application method and type of product, NOT fire performance. There were several changes proposed under S261-16 Part I and Part II, most notably, the addition of new text as follows: “2303.3 Surface Coatings. Surface coatings shall be in accordance with Chapter 5 of NFPA.” Under S262-16, it was proposed to revise Section 2303.2.2, Other means during manufacture by adding “impregnated with chemicals” and the addition of “The use of paints, coatings, stains or other surface treatment shall not be permitted.”

When voting was complete, S262-16 was approved, and changes were made to Section 2303.2.2 that read the following: “The use of paints, coatings, stains or other surface treatment is not an approved method of protection as required in this section.” As far as the proposed changes under S261-16, prior to being voted on, it was withdrawn by the proponent.

In summary, these recent changes made to Section 2303.2 of the IBC has greatly confused the industry because the building community was very aware of equal tested fire-retardant technologies. Therefore, the proposed AC516 is necessary to separate this technology from Section 2303.2 with regards to the application method referring to impregnated with chemicals by a pressure process. This separation will allow fire-retardant penetrant technology to not be limited to the same constraints and structural design value losses as pressure impregnated.

AC 516 provides a foundation for a much different and needed criteria that reflects new fire retardant penetrant chemical technology that AC66 does not and cannot reference, for example, Difference in fire retardant technology....

- Penetrant: A chemical compound that when applied to a wood substrate, uses a carrier to open the pores allowing the chemicals it is carrying to penetrate the wood.
- Pressure Impregnate: The exertion of force by one body on the surface of another. (Therefore, limiting the species and type of wood it can be applied to, without significant impact to structural design value.)

APA, AWC, AWPA (the recognized experts of the treated wood industry), lumber and plywood manufacturers, and wood treaters are very aware of the impact to wood by pressure impregnation, therefore Quality Control is a great concern and requires additional criteria. Physical and mechanical properties as well as structural performance, is required by the AC66 AND the AC516 to be disclosed in the evaluation report. **End of Comment**

September 10, 2020

Jeff Filler, Ph.D., P.E.
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Birmingham, AL 35213

RE: Proposed New Acceptance Criteria for Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber, Subject AC516-1020-R3

Dear Jeff:

Thank you for the opportunity to comment on *AC516 Proposed New Acceptance Criteria for Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber*. We have the following comments and suggested revisions on the proposed draft AC:

Weather Exposure and Durability Testing

In our public comments to the draft of AC516 that was proposed for the June 2020 Evaluation Committee meeting, we noted that durability testing is needed and the UV-waterspray and freeze-thaw exposures from AC479 should be included. While the draft currently under consideration includes some durability testing provisions, we find the proposed provisions to be inadequate. It is important to note that these “interior use” products, whose primary use is in exterior walls of mid-rise construction, are commonly exposed to weeks or months of weathering during construction. We have the following specific comments regarding the proposed durability provisions:

1. The cover letter indicates that the proposed new waterspray test in Section 3.3.1 would expose specimens to a volume of water representing about 48 inches of direct rainfall. By comparison, the AC479 exposure (based on a shortened version of ASTM D2898, Method C) results in a total of 693 inches of water – 14 times the amount proposed in AC516. It should be noted, however, that the total *amount* of water may not be as important as the *duration* of wetting and number of *cycles* between wetting events. The six wetting cycles specified in AC479 result in a cumulative total of 24 hours of active waterspray, and each cycle is followed by four hours of UV exposure. This cumulative wetting time is four times longer than the single six-hour wetting exposure in the proposed provision, and it includes cycling between wetting and drying periods. The proposed single six-hour wetting period is not enough time and is devoid of the cycling necessary to represent a series of wetting events to which the evaluated product would likely be exposed during construction.

David Paulo – Rebuttal for Joint Comment 9-23-2020

To date there is no ICC-ESR nor any test documents to substantiate the recommendation of following AC479 procedures for any fire-retardant product.

In the contiguous United States, Louisiana has the highest average annual rainfall with 60". The durability test outlined in Section 3.3.1 in the AC516 represents 48" of rain. Based on the highest average annual rainfall of 60", that's equivalent to 292 days or nearly 10 months of rain. Per the APA, Exposure 1 rated sheathing are designed to resist the effects of moisture during normal construction delays but are not suitable for long-term exposure. If roof sheathing is exposed for 10 months or more, it falls outside the context of "normal construction delays", and the warranty is void. Therefore, the interior durability test in Section 3.3.1 of the AC516 is sufficient.

For comparison, if we use the same 60" of annual rainfall, the exposure test in the AC479 is the equivalent of 4,215 days or 11-1/2 years of rainfall. End of Comment

2. ASTM D2898 Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing has four accelerated aging exposures designed specifically to evaluate the leaching of chemicals from fire-retardant-treated wood (FRTW). It is unclear why AC516 proposes a completely different exposure which was adapted from a test that was not designed to evaluate the leaching of chemicals from FRTW. A shortened version of one of the D2898 tests should be used to evaluate the durability of interior use products, because these exposures have been designed specifically to evaluate FRTW.
 - a. The specified angle of 70-80 degrees in Section 3.3.1 is a much steeper slope than those specified in ASTM D2898 and in other ACs for similar products. This nearly vertical orientation would lead to more rapid drainage of water from the surface of the test specimen, resulting in a less severe exposure than the standardized methods. By comparison, the UV-Waterspray Exposure of AC479 Section 4.1.3 references AC107 which specifies a 4:12 slope. Section 3.3.1 of proposed AC516 should be revised to specify a 4:12 slope for consistency with other methods and to be more representative of typical roof slopes.
 - b. The proposed waterspray provisions are lacking specific guidance on variables such as the acceptable temperature range of the water to be used, performance characteristics of the nozzles, restrictions on water recirculation, etc. These factors could lead to a difference in test results and should therefore be specified. As with our other concerns, these concerns can be addressed by maintaining consistency with the provisions of AC479 Section 4.1.3.
3. The proposed waterspray test in Section 3.3.1 is not coupled with any ultraviolet (UV) exposure cycling. Without substantiation through testing under established exposure provisions such as those specified in Section 4.1.3 of AC479, any claims that products evaluated under AC516 are not susceptible to degradation from UV exposure, in combination with repeated wetting, are unsupported. Not only would this loophole create an inconsistency between evaluations of products intended for identical use under AC516 versus AC479; it also represents a serious omission from a thorough evaluation of products which are likely to be exposed to both wetting and sunlight during construction. The result would be a lack of assurance that the product will perform as expected following typical exposure during construction.

David Paulo – Rebuttal for Joint Comment 9-23-2020

The purpose of AC516 is to provide the guidelines for a factory-applied fire-retardant penetrant to be recognized in the industry as a code approved product that meets all of the requirements prescribed in Section 2303.2 of the IBC with regards to fire performance, test requirements, durability, strength adjustment disclosure, labeling, limitations, quality control, and it's intended use. The purpose of AC516 is also to provide the industry with a high level of assurance that these products will meet and exceed the requirements of Section 2303.2 of the IBC. End of Comment

4. Section 3.3.2 references ASTM D2898 as the standard to which the durability exposure is to be conducted on products intended for exterior use; however, it does not specify which method is to be followed. ASTM D2898 has four different exposure methods, so this needs to be specified. As stated in Section 4.3 of D2898, Method A is the method normally specified for regulatory purposes when testing products that are intended for exterior applications. Thus, Section 3.3.2 of AC516 should specify Method A of D2898.

Mechanical Properties

5. The mechanical properties testing and evaluation provisions of Sections 3.4, 4.1 and 4.2 are improved over previous drafts of AC516; however, the adjustment factors derived in accordance with these provisions are not effectively conveyed and implemented in a mandatory sense within Section 6.0 (Evaluation Report Requirements) and Section 2.1.5 (Packaging and Identification).

For example, there is no explicit requirement in Section 6.2, stating that the evaluation report is required to report the treatment adjustment factors. This raises concerns that product users and report users will not be adequately informed of applicable adjustment factors and how to apply them.

David Paulo – Rebuttal for Joint Comment 9-23-2020

Agree and suggest the following changes under Section 6.0:

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 non-treated wood structural panels and sawn lumber of the species noted in this report. End of Comment

6. The first sentence of Section 3.4.1 requires wood structural panels to be tested “separately” for effects on strength and stiffness properties. The word “separately” can be misinterpreted to mean that the performed to determine strength must be separate from the tests performed to determine stiffness. The word “separately” should be deleted.

David Paulo – Rebuttal for Joint Comment 9-23-2020

The word “separately” was meant to be directed at the testing of plywood separately from OSB. However, I do agree it can easily be misinterpreted and it should be removed. End of Comment

Qualification for use in Shear Walls and Diaphragms

7. In previous drafts, section 3.8 applied to wood structural panels used in either shear walls or diaphragms. The provisions regarding usage in diaphragms should be added back to this section.

David Paulo – Rebuttal for Joint Comment 9-23-2020

Section 3.8 needs to be modified to include diaphragms:

3.8 Factory Applied Fire-Retardant Penetrant for Wood Structural Panels used in Shear Walls and Horizontal Diaphragms (Optional): Use of wood structural panels with factory applied fire-retardant penetrant as a component of a shear wall or horizontal diaphragm shall be documented by either structural analysis or full-scale load testing. Shear wall or diaphragm assemblies and any allowable load adjustments shall be included in the evaluation report. The structural analysis shall be prepared by an independent third party. Prior to full-scale load testing, a test plan shall be submitted to ICC-ES staff in accordance with Section 2.5 of this criteria. End of Comment

8. Although titles are typically considered non-mandatory, the title of Section 3.8 implies that the shear wall qualification provisions of that section are “optional.” If these provisions are considered optional, Section 6.0 should include a requirement that panels for which this testing and analysis is not performed, and the corresponding evaluation reports for those products, should be identified as “not evaluated for shear walls or diaphragms.” Without this information, designers, builders, and inspectors will assume that the panels are suitable for shear walls and diaphragms. This could be of particular concern where Section 4.1.3 indicates a reduction in mechanical properties. If the treatment causes a reduction in mechanical properties, panels for use in shear walls should be qualified in accordance with AC 269.1 and 269.2, and panels for use in diaphragms should be similarly qualified by testing.

David Paulo – Rebuttal for Joint Comment 9-23-2020

The reference made in Section 3.8 to “Optional” means the manufacturer of a fire-retardant penetrant seeking an evaluation report in accordance with AC516, has the option to be evaluated for shear walls or diaphragms. Furthermore, Section 3.8 requires the details of shear wall or horizontal diaphragm assemblies to be included in the final

evaluation report. It is the intention of AC516 to remain consistent with existing acceptance criteria, and therefore, Section 6.0 does not need to include a requirement stating that panels for which this analysis and/or testing is not performed, those products should be identified as "not evaluated for shear walls or horizontal diaphragms". If a section of an acceptance criteria is labeled as "Optional", and this section requires the details to be included in the evaluation report, it would be redundant to include a provision in Section 6.0 stating what the fire-retardant penetrant "is not" or "has not" been evaluated to. End of Comment

9. The third sentence of Section 3.8 requires the structural analysis of shear wall assemblies to be prepared by an independent third party. There is no need for this to be prepared by an independent third party. ICC-ES staff provides independent review. However, it is necessary for the structural analysis to be performed by an engineer. If a manufacturer has engineers on staff, they should be able to prepare the analysis. This sentence should be revised to read "The structural analysis shall be prepared by a licensed engineer experienced in shear wall design an independent third party."

David Paulo – Rebuttal for Joint Comment 9-23-2020

It is the intention of AC516 to remain consistent with existing acceptance criteria regarding the use of "third-party" and "independent", and therefore, should not be removed from this, or any section, of AC516. End of Comment

ASTM E84 Flame Spread Testing

10. In the second sentence of Section 3.2, the phrase "significant progressive combustion" should be removed because it is an undefined term which is no longer used in the building code (as of the 2021 I-codes) or applicable referenced standards. Also, it is technically incorrect to require that the FSI be determined "...when the test is continued for an additional 20-minute period." The FSI is determined during the first 10 minutes of the test, which is the standard duration of an ASTM E84 test. The additional 20-minute period is performed for the sole purpose of establishing whether the flame front progresses more than 10-1/2 feet beyond the centerline of the burners. This has been corrected in the 2021 IBC. To correct these problems in the proposed text, please consider making the following revisions, which are similar to the corrections that were made to the 2021 IBC:

3.2 Surface Burning Characteristics: The surface burning characteristics (flame spread and smoke-developed index) of wood structural panels and sawn lumber with factory- applied fire-retardant penetrant shall be determined in accordance with ASTM E84 or UL 723 conducted after the durability requirements of Section 3.3.1 (interior use) or 3.3.2 (exterior use) as applicable. The flame spread index shall be 25 or less. ~~and there shall be no evidence of significant progressive combustion when the test is continued for an additional 20-minute period.~~ Additionally, the ASTM E84 or UL 723 test shall be continued for an additional 20-minute period, and the flame front shall not progress more than 10 feet-6 inches (3200 mm) beyond the centerline of the burners at any time during the test. The smoke-developed index shall be 450 or less.

David Paulo – Rebuttal for Joint Comment 9-23-2020

Agree with slight modification. This was approved at the 2019 Code Development Cycle (ref. S166-19) for the 2021 IBC.

3.2 Surface Burning Characteristics: The surface burning characteristics (flame spread and smoke-developed index) of wood structural panels and sawn lumber with factory- applied fire-retardant penetrant, when tested in accordance with ASTM E84 or UL 723 after the durability requirements of Section 3.3.1 (interior use) and/or 3.3.2 (exterior use), shall have a listed flame spread index of 25 or less. Additionally, the ASTM E84 or UL 723 test shall be continued for an additional 20-minute period and the

flame front shall not progress more than 10-1/2 feet (3200 mm) beyond the centerline of the burners at any time during the test. The smoke-developed index shall be 450 or less. End of Comment

11. The proposed requirement in the third paragraph of Section 3.2 to include a 1/8-inch cut (groove) running the length of the tunnel is not necessary, as there is no code provision or referenced standard provision requiring this in the I-code versions referenced in Section 1.3.1 of this proposed AC. It is also cause for concern because it differs from provisions that are currently being developed within ASTM E2579, which is a secondary reference standard, for compliance with provisions that are new to the 2021 IBC. The third paragraph of Section 3.2 should be deleted.

David Paulo – Rebuttal for Joint Comment 9-23-2020

As a result of the 2019 Code Development Cycle, S167-19 was approved for the 2021 IBC regarding the addition of the 1/8" gap, and therefore, is necessary to remain in AC516. End of Comment

Requirements for “Independent” and/or “Third-Party” Evaluation.

12. Lines 189, 190, 205, 206 and 218: The words “third-party” and “independent” should be stricken here because ICC-ES has provisions for allowing testing at the manufacturer's accredited testing laboratory. Also, ICC-ES provides the independent review. There is no justification for precluding a manufacturer's engineers and scientists from doing the evaluations and providing the statements for independent review by ICC-ES.

David Paulo – Rebuttal for Joint Comment 9-23-2020

It is the intention of AC516 to remain consistent with existing acceptance criteria regarding the use of “third-party” and “independent”, and therefore, should not be removed from any section of AC516. End of Comment

Editorial and/or Minor Clarifications

13. We recommend adding the following language in Section 1.1 to clarify that the purpose of the AC is to recognize products for use where fire retardant treated wood is required or permitted in the code:

- 1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for a factory-applied fire-retardant penetrant for wood structural panels and sawn lumber to be recognized in an ICC Evaluation Service, LLC (ICC-ES) evaluation report for use, but not limited to, where fire retardant treated wood is required or permitted, in under the 2018, 2015, 2012, and 2009 International Building Code® (IBC) and 2018, 2015, 2012, and 2009 International Residential Code® (IRC). Bases of evaluation are IBC Section 104.11 and IRC Section R104.11.


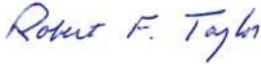
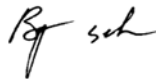


14. In the first sentence of Section 3.6.2, the acronym “IRC” needs to be added before the reference to “Section R317.3.”
15. Editorial revision on Line 256: The word “the” should be deleted before the word “temperature,” and “conditions” should be changed to “condition.”
16. Line 195: The wrong IBC section is referenced here. IBC Section 2304.10.5.1, as currently referenced, applies to fasteners for preservative-treated wood. The appropriate section references are 2304.10.5.3 and 2304.10.5.4, which apply to fasteners for exterior FRTW and interior FRTW, respectively.

Dr. Jeff Filler September 10, 2020
Page 1 of 5

David Paulo – Rebuttal for Joint Comment 9-23-2020
Agree with the editorials with slight modification to 1.1. – Add “, but not limited to,”
after “for use” on the 4th line. End of Comment

Thank you for the opportunity to comment.

Sincerely,

 <p>Jeff Linville, P.E. Senior Engineer Weyerhaeuser Company</p>	
 <p>John Haluska Field Marketing Manager Norbord Inc.</p>	
 <p>Philip Vacca, PE, SE Sr. Engineer OSB/EWP Louisiana-Pacific Corp.</p>	
 <p>Robert Taylor, P.E., S.E Product Acceptance Manager Boise Cascade EWP</p>	
 <p>Borjen ("B.J.") Yeh, Ph.D., P.E. Director, Technical Services Division APA – The Engineered Wood Association</p>	
 <p>Linda Brown Engineer Southern Pine Inspection Bureau</p>	
 <p>Jeff Stefani, P.E. Midwest Regional Sales Manager Canfor Southern Pine</p>	
 <p>Jason Smart, P.E. Manager, Engineering Technology AWC</p>	

David Paulo – Fire Retardant Coatings of Texas

Rebuttal for Koppers Public Comments

September 23, 2020

The purpose of AC516 is to provide the guidelines for a factory-applied fire-retardant penetrant to be recognized in the industry as a code approved product that meets all of the requirements prescribed in Section 2303.2 of the IBC with regards to fire performance, test requirements, durability, strength adjustment disclosure, labeling, limitations, quality control, and it's intended use. The purpose of AC516 is also to provide the industry with a high level of assurance that these products will meet and exceed the requirements of Section 2303.2 of the IBC.

In regard to exposure to rain, all interior FRTW manufacturers recommend protection against moisture and no exposure to rain, because no durability test have been performed on FRTW. Fire Retardant Penetrant is a new level and not the same, therefore the AC516 has included a Durability Test for rain exposure during construction. [End of Comment]

Dr. Jeff R. Filler, P.E.

9 September 2020

Senior Staff Engineer

ICC Evaluation Service

900 Montclair Road, Suite A,

Montgomery, AL 35213

RE: AC 516-1020-R3 (MO/JF)

Mr. Chairman, Members of the Committee and Staff,

It is with continued regret that the company applying for this AC continues to waste valuable Committee time and Staff resources on this effort.

David Paulo – Fire Retardant Coatings of Texas
Rebuttal for Kris Owens Public Comments
September 23, 2020

At first thought with your opening comment, one would take the professional high road.... But it is the requirement to respond, so it is with further regret that after the first paragraph, the committee has to take the time to read the remainder of your comments. End of Comment

If the product is intended to identify as or be considered as an “equal to” product to FRTW then it must be tested and listed under AC 66.

David Paulo – Rebuttal for Kris Owens

As a consultant, you should know from reading the AC516 that the Fire Retardant Penetrant is tested to the same performance requirements listed in the AC66 and since it is NOT pressure impregnated and NOT limited to certain species of wood, it should NOT be listed under AC66. End of Comment

“Fire Retardant Treated” means pressure treated, not a surface coating. See Definition in IBC 2021. However, to attempt to meet these criteria, the tests suggested for the product are for “Fire Retardant Treated” or per AC 66.

David Paulo – Rebuttal for Kris Owens

Again, when one reads AC516, the title states, “Fire Retardant Penetrant”, which is a Fire-Retardant Permanent Treatment, not surface coating. [End of Comment](#)

A prime example of what is missing from AC 516 is the need for a rigorous Q.C. program, like AC 66. Generally, not found in industrial coating system facilities, a professional Q.C. program is mandatory in producing a life safety product like FRTW.

David Paulo – Rebuttal for Kris Owens

The AC516 does have a rigorous QC program and fortunately because the Fire Retardant Penetrant do not impact the structural design values, nor limited to species of wood, nor Engineered Wood Products, it does not require the same QC as pressure impregnated. [End of Comment](#)

To exhibit the lack of understanding of the company proposing this AC, please see Line 50. The proper name of the AWPA was changed almost 20 years ago to American Wood Protection Association. This is not a typo on their part, it is a lack of knowledge.

David Paulo – Rebuttal for Kris Owens

Unfortunately, this was a cut and paste from AC66 and thanks to your expert review, it will be corrected. Since this was taken directly from the AC66, it would be prudent for you to propose this AC66 modification at the next hearing. [End of Comment](#)

There is no definition for “penetrant” in the IBC, the IRC or the IFC, nor in this AC. What is it? The AHJ will likely want to know.

David Paulo – Rebuttal for Kris Owens

Your knowledge of the IBC, IRC and IFC is on point, but not with the AC516. Per Line 61, the definition for Factory Applied Fire Retardant Penetrant IS included. We appreciate your understanding of why it is important to approve the AC516, so the definitions can be proposed at the next hearing. [End of Comment](#)

We do not know what the “penetrant” contains, nor if the “penetrant” is simply the carrier (i.e. water) for an active material.

David Paulo – Rebuttal for Kris Owens

The Safety Data Sheet is available per the manufacturer’s website. The proprietary information is just that, proprietary. The results from the performance test is what is most important. [End of Comment](#)

Line 76: what is “post-treatment”?

David Paulo – Rebuttal for Kris Owens

Treatment carried out after some earlier action or process has been completed. [End of Comment](#)

Line 79: “treatment plant” – does this mean flow coater, spray system of rollers?

David Paulo – Rebuttal for Kris Owens

It will vary, treatment plant, treating facility, etc. Based on the Fire-Retardant Penetrant manufacturer’s instructions. This will be included in the Quality Control Documentation per the ICC ESR. [End of Comment](#)

Note that it not until Line 123 that this “factory applied fire retardant “penetrant” treated wood” is even mentioned. It is not in the title, nor anywhere else and that again was deliberate, not an error. This what the AC is being developed for.

David Paulo – Rebuttal for Kris Owens

Tough grammar here, but I’ll mangle. In the simplest terms, understand that AC516 is to differentiate a Fire Retardant “Penetrant” and application method. It is not about an “end Treated product” AC66, AC479 and AC516 all have different chemicals and different applications methods but are intended to result in a product that meets the code prescribed fire performance. But thank you for your observation, we will recommend that the words “Treated Wood” be removed to keep consistent with the title. [End of Comment](#)

I shall repeat: if this AC 516 is meant to qualify this product as an “or equal” to FRTW, then it must be qualified within the guidelines of AC 66.

David Paulo – Rebuttal for Kris Owens

We greatly appreciate your thorough review of the AC516 and valued opinion. [End of Comment](#)

Respectfully,

Kris Owen

Consultant

Preservative and Fire Retardant Treated Wood

Westfield, IN

Kowen4568@gmail. Com

219-405-8809



Manny Mũniz Consulting, LLC
Fire Protection Codes & Standards Consultants

September 10, 2020

Sent Via Email

<https://es@icc-es.org>

Jeff R. Filler, Ph.D., P.E.
Senior Staff Engineer ICC Evaluation Service 900 Montclair Road, Ste. A
Birmingham, AL 35213

Subject: Proposed New Acceptance Criteria for Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber, Subject AC516-1020- R3

Dear Dr. Filler and members of the ICC-ES Evaluation Committee:

Thank you for the opportunity to submit public comments to the proposal from Fire-Retardant Coatings of Texas to create a new acceptance criterion for Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber, Subject AC516- 1020- R3.

I am a retired Building Official and so my comments will be based on my training and experience as a code enforcement official.

No longer limited to “Interior Applications”

The original proposed version of AC516 was titled “Proposed Acceptance Criteria for Factory Applied Fire-Retardant through the surface by a Non-Pressure Impregnated Process for Wood Structural Panels and Sawn Lumber Used for Interior Applications. Subject AC516-0220-R1 (MPO/JF).”

David Paulo – Rebuttal for Muniz 9-23-2020

The AC516 is being developed to provide guidelines in accordance with the performance requirements of 2303.2 of 2018 IBC for manufacturers seeking an evaluation report for a factory applied fire-retardant penetrant. To provide one acceptance criteria for fire-retardant penetrants that doesn't limit its uses, it was in the best interest of the AC516 to include an optional test standard for products seeking recognition for exterior applications. End of Comment

Evidently this product and process have undergone a tremendous leap forward in the last few months because it is no longer limited to “Interior Applications”. As such, I believe that this wood product and process are already addressed in IBC Section 2303.2 and AC66 Acceptance Criteria for Fire-Retardant-Treated Wood.

Chemical Penetration of the Wood

The proposed definition “Factory Applied Fire-Retardant Penetrant” in proposed Section 1.4.1 on Page 4 describes “...applying the proprietary formulation that is applied to all sides of the wood structural panels and all faces of sawn lumber that chemically penetrates the wood to impart fire-retarding qualities to the wood substrate.

Isn't “chemical penetration” another way of saying “impregnation with chemicals”?

David Paulo – Rebuttal for Muniz 9-23-2020

“Chemical penetration” or “penetrant” is a chemical compound that when applied to a wood substrate, uses a carrier to open the pores allowing the chemicals to penetrate the wood. The depth of penetration is not what determines its fire performance...it is the retention rate of the fire-retardant.

“Impregnation 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.

During the 2015-2017 Code Development Cycle, there were changes proposed to Section 2303.2 “Other means during manufacture” of the 2015 IBC, with the intent to exclude fire-retardant penetrants from this section of the IBC. These proposed changes restricted the allowable application methods and required all products to be “impregnated with chemicals”, which were then approved and adopted into the 2018 IBC. Therefore, the proposed AC516 is necessary to differentiate fire-retardant penetrant technology from existing acceptance criteria. End of Comment

Fire-retardant treated wood is defined in IBC Chapter 2 (The definition is under **TREATED WOOD**.)

“[BS] **TREATED WOOD**. Wood products that are conditioned to enhance fire-retardant or preservative properties.

Fire-retardant-treated wood. Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface-burning characteristics and resist propagation of fire.”

Note that wood products impregnated with chemicals can be achieved by “...other means during manufacture”. It does not have to be a pressure process.

David Paulo – Rebuttal for Muniz 9-23-2020

Agreed. Additionally, there are existing fire-retardant technologies that do not need to be “impregnated with chemicals” to meet the requirements of Sections 2303.2 and 104.11. End of Comment

Minimum Depth of Chemical Penetration is Conspicuously Absent What is the minimum depth of chemical penetration that must be achieved in order to be equivalent to FRTW in “quality, strength, effectiveness, fire resistance, durability, and safety” as required by IBC Section 104.11? How can the building official feel comfortable that this wood product and process is truly equivalent to FRTW if no minimum level of penetration is specified?

David Paulo – Rebuttal for Muniz 9-23-2020

Section 104.11 of the IBC does not require a fire-retardant to specify a minimum depth of chemical penetration required to be equivalent to FRTW. Per Section 104.11, a product can be approved provided it meets the requirements of the building code with regards to quality, strength, effectiveness, fire resistance, durability, and safety requirements prescribed in the code. It is the intention of the AC516 to remain consistent with existing acceptance criteria by requiring the disclosure of information, including chemical retention, to be included in the quality control documentation and not an evaluation report. End of Comment

By comparison, FRTW is specifically regulated as to the depth of impregnation through the pressure process.

David Paulo – Rebuttal for Muniz 9-23-2020

FRTW that is impregnated with chemicals by a pressure process is regulated by the depth of penetration as well as chemical retention as per Section 5.4 of AC66. End of Comment

“2303.2.1 Pressure process. For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (345 kPa).”

David Paulo – Rebuttal for Muniz 9-23-2020

A key difference to note between a fire-retardant penetrant and wood impregnated with chemicals are the requirements necessary to meet a specified fire performance. The fire performance of wood impregnated with chemicals is determined based on a required penetration depth AND the chemical retention rate that is verified through testing. The fire performance of a fire-retardant penetrant is determined based on the required chemical retention rate that is verified through testing. End of Comment

Alternate Materials Equivalency

This wood product and process is being proposed as being not less than the equivalent of that prescribed in this code for fire-retardant-treated wood in quality, strength, effectiveness, *fire resistance*, durability and safety per IBC Section 104.11. This is a tremendous change from the original scope of proposed AC516.

“A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.”

It is important to note that six distinct performances must be shown to be not less than the performance of FRTW in each and every application where FRTW is referenced in the IBC and IRC.

David Paulo – Rebuttal for Muniz 9-23-2020

It is important to note in Section 104.11 of the IBC, that the six distinct equivalency requirements are all based on performance, and not the application method. End of Comment

It appears to me that the true intent of creating AC516 is to avoid being regulated by IBC 2303.2 or by AC66

September 10, 2020

David Paulo – Rebuttal for Muniz 9-23-2020

The true intent of AC516 is to differentiate itself from existing criteria and 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 with regard to fire performance, test requirements, durability, strength adjustment disclosure, labeling, limitations, quality control, etc. End of Comment

I, therefore, request that ICC-ES not proceed with the development of AC516.

Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script, appearing to read "Manny Muniz". The signature is written in dark ink and is positioned below the word "Sincerely,".

Manny Muniz



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September 3, 2020

Jeff Filler, Ph.D., P.E.
Senior Staff Engineer
ICC Evaluation Services, LLC
900 Montclair Road, Suite A
Birmingham, AL 35213
Via email es@icc-es.org

Re: ICC-ES Proposal AC516-1020-R3 "Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber"

Ref: AC 66

Dear ICC-ES staff, Proponent and Committee Members:

UFP Retail owns and operated pressure treating plants in the US producing both preservative treated and fire-retardant treated wood products. We are a subsidiary of UFP Industries with business that are directly involved in commercial construction. With respect to AC 516 and the broader topic of fire-retardant Acceptance Criteria, we are both a manufacturer and a user.

We urge ICC-ES to reject the proposed AC 516. We have tried to stay engaged on this topic and have provided input to staff and the committee on previous versions of this proposed AC. This document is much better than previous versions and while we will describe our significant concerns with the current proposal, it is important to acknowledge the progress being made.

Fundamental Misunderstanding

Pressure-treated wood products are great! It is a highly efficient way to produce a terrific and reliable building material suitable for a wide range of structural and aesthetic applications. (And yes, I am a pressure-treater!) But it is not a cure-all/panacea any more than dip or spray application is an Achilles' Heel. This is especially true of interior fire-retardants where penetration is not even necessarily an advantage. I suspect that staff and committee members will hear references to "complete penetration" or "uniform treatment" as an accolade attached to pressure-treating and as a justification for testing requirements not found in AC 66. That is simply wrong. I say that based on a lifetime career in pressure-treating with a great focus in the last fifteen years on quality control of (preservative) pressure-treated

products. I say that as participant in the AWPAs technical committees for more than three decades. I say that as the Past President of AWPAs. I say that as the Vice President of Wood Preservation for a large pressure-treater for twenty years.

Primary Concerns

1. Periodic surface-burning test requirement cannot be applied unless comparable language is first applied to AC 66. ICC-ES simply cannot argue this is somehow appropriate and necessary for a "penetrant" and not for a "pressure-treated" product. This is an industry changing requirement that has major implication for all current ICC-ES ESR fire-retardants. It requires major industry, agency and ICC-ES staff input to work through such a change. This was contemplated several years ago but dropped mysteriously by ICC-ES. We should resume that hard work and delay consideration of this AC or remove the requirement from this AC.
2. Gap and groove requirements for panels are not consistent with AC 66 and are based on a false impression of the difference in penetration required by AC 66. The penetration requirements for pressure-treated products are often minimal (e.g., 0.125 inches) and always allow for a significant portion of the QC test sample to have NO PENETRATION whatsoever. The proposed "groove test" for panels is especially puzzling. There is no basis for this distinction between the requirements of AC 66 and those of the proposed AC 516. The language in AC 516 should be amended to match AC 66.

David Paulo – Rebuttal for UFP Comment 9-23-2020

The purpose of AC516 is to provide the guidelines for a factory-applied fire-retardant penetrant to be recognized in the industry as a code approved product that meets all of the requirements prescribed in Section 2303.2 of the IBC with regards to fire performance test requirements, durability, strength adjustment disclosure, labeling, limitations, quality control, and its intended use. The purpose of AC516 is also to provide the industry with a high level of assurance that these products will meet and exceed the requirements of Section 2303.2 of the IBC. End of Comment

Specific Comments

Section 1.4.1, line 63. Strike the work "chemically". Penetration may be achieved through a variety of mechanisms which could not be considered chemical in nature. In reality, ICC-ES staff will not have the ability to determine if penetration was achieved through chemical means or some other means. Ultimately, this is a result of failing to address these products via modification to AC 66. ICC-ES staff is making a false distinction between two different application methods. Reviewing previous versions of AC 516 as well as the current one demonstrates the incredible acrobatics being performed to maintain this false narrative. Relatively minor changes could be made to AC 66 (primarily the title) to handle these products in a consistent way with the existing AC 66 products including possible improvements to those currently commercialized, code-accepted products.

David Paulo – Rebuttal for UFP Comment 9-23-2020

AC 516 provides a foundation for a much different criteria that reflects new fire retardant penetrant chemical technology methods that the AC66 does not and cannot reference, for example,

Difference in fire retardant technology....

- Penetrant: A chemical compound that when applied to a wood substrate, uses a carrier to open the pores allowing the chemical it is carrying to penetrate into the wood.
- Pressure Impregnate: The exertion of force by one body on the surface of another. (Therefore, limiting the species and type of wood it can be applied to, without significant impact to structural design value.) End of Comment

Section 3.2, line 106. (sentence clarity) Replace "after the durability" with "on material which has undergone the durability".

David Paulo – Rebuttal for UFP Comment 9-23-2020

OK. ---- End of Comment

Section 3.2, lines 113-116. (primary concern) Panels are typically loaded in 2' x 8' sections into the Steiner Tunnel for E84 testing. Presumably, this requirement stems from the misunderstanding that pressure-treated products are treated "through and through" so there is never untreated edge exposed. This is simply wrong. To make this point for the committee, I ask that ICC-ES to provide a summary of current ESR's for AC66 products and the exact penetration requirements per species. ICC-ES staff should be able to find a way to present this information without violating the confidentiality requirements it maintains with report holders and manufactures. If this is truly needed to ensure that we have the right performance from these building materials, surely the next critical step is to address the millions on board feet of material being installed EVERY DAY rather than messing around with an AC which might result in limited product entering the market over the next couple years. In short, if this needs to be in here, by definition, ICC-ES staff is failing to address a critical issue with products in the market today. Either remove this requirement from AC 516 or put AC516 on hold and go address the real issue which are the AC 66 products in the market today. Our position is this is not needed and should simply be dropped from the proposed AC 516.

Section 3.2, line 117-121. (primary concern) All of the points made above to the gap apply even more readily to the proposed groove. Additionally, it is not clear why this would only be required of panels and not lumber.

David Paulo – Rebuttal for UFP Comment 9-23-2020

To address the concerns regarding Section 3.2. As a result of the 2019 Code Development Cycle, S167 -19 was approved for the 2021IBC regarding the addition of the 1/8" gap, and therefore, is necessary to remain in AC516. End of Comment

Section 3.3.1. lines 125-132. (general comment) Having a mechanism to assess wetting during construction makes sense. There are two problems with what is proposed. First, once again, there is no basis for requiring this in AC 516 while ignoring it in AC 66. And it is NOT appropriate to address it herein

just because while ignoring for the millions of board feet of product being installed EVERY DAY. The second problem is this is an entirely made up test. It is not well defined and there is no ability to assess how successfully it addresses the concern. ICC-ES staff should provide results of this testing with E84 results before and after this leaching procedure on at least five major AC 66 products in the market today to allow the committee to fully understand what it is voting on. Bottom line is this *may be* a great first step at addressing this legitimate concern around interior fire-retardants but there is no way to determine that at this time; it is pre-mature and must be removed from the proposed AC 516.

David Paulo – Rebuttal for UFP Comment 9-23-2020
Is addressed by the water exposure in AC516. End of Comment

Section 3.3.2, line 133. (section clarity) Strike the work "Optional" from the title. It is not optional; it is required for exterior applications. Placing optional in the header means that everything that come in this section is optional. Therefore, the application ASTM D2898 for exterior products is *optional* even for exterior products. That is clearly not staff's intent.

David Paulo – Rebuttal for UFP Comment 9-23-2020
It is the intention of AC516 to remain consistent with existing acceptance criteria with regard to recognition for exterior use as an option, therefore, the word "Optional" must remain. End of Comment

Section 3.3.2, line 136. (section clarity) Add a sentence at the end comparable to the 3.3.1 making it clear that E84 is conducted on this material post D2898.

David Paulo – Rebuttal for UFP Comment 9-23-2020
OK. ---- End of Comment

Section 3.7, line 208. (section clarity) Strike the work "Optional" from the title. See previous logic.

David Paulo – Rebuttal for UFP Comment 9-23-2020
It is the intention of AC516 to remain consistent with existing acceptance criteria with regard to fire rated assemblies use as an option, therefore, the word "Optional" must remain. End of Comment

Section 3.8, line 214. (section clarity) Strike the work "Optional" from the title. See previous logic.

David Paulo – Rebuttal for UFP Comment 9-23-2020
It is the intention of AC516 to remain consistent with existing acceptance criteria with regard to shear walls as an option, therefore, the word "Optional" must remain. End of Comment

Section 5.4, lines 318-322. (primary concern) The need for "periodic third-party testing to verify the surface burning characteristics" is a really, really big deal. It is an especially important topic. It is clearly a much more important topic for the products being installed EVERY DAY in new construction across the United States, being produced in high volume every day under existing AC 66 based ICC-ES ESR's. Placing this requirement in AC 516 is both an acknowledgement that it is needed and an acknowledgement of ICC-ES's failing to address a huge issue. You cannot have it both ways. Either remove it from the proposed AC or set the proposed AC aside and address the issue under AC 66.

David Paulo – Rebuttal for UFP Comment 9-23-2020
We agree that the intent of 5.4 should be revised and lines 320-321 should be removed. End of Comment

Section 5.4, line 320. (general comment) Strike "bench fire tests" as this is not a fundamental requirement and, I would argue has both limited value and limited applicability. It may fit in some QC programs, but it is certainly not ubiquitous.

David Paulo – Rebuttal for UFP Comment 9-23-2020

Suggest a more applicable test or we can remove it from AC516. End of Comment

Summary

We appreciate the progress being made by ICC-ES staff on this AC. The proposed AC 516 should be rejected. Instead, two things should happen under AC66.

1. Address the legitimate weaknesses in AC 66 which are on display in the proposed AC, particularly the interior durability leach test and periodic E84 fire performance testing. This must be done in with significant industry input and a plan for retroactively applying to existing products.
2. Make simple changes to AC 66 (like the title) to allow non-pressure products to be addressed appropriately and consistently with their pressure-treated brethren.

Sincerely,



Scott W. Conklin
Vice President Wood Preservation
UFP Retail Solutions



Sept. 10, 2020

ICC Evaluation Services, LLC
900 Montclair Road, Suite A
Birmingham, AL 35213

Re: ICC-ES Proposal AC516-1020-R3 “Factory Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber”

The Western Wood Preservers Institute would like you to consider our comments as outlined below.

Section 1.4.1

Line 62- The term “proprietary” is used in the definition. Does that exclude future non-proprietary formulations? We suggest deleting this term.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

It is the intention of AC516 to remain consistent with existing acceptance criteria with regard to the use of “proprietary”, and therefore, should not be removed from this, or any section, of AC516. End of Comment

Line 63 – Revise “lumber that chemically penetrates the wood” to “lumber that penetrates into the wood”. While there may be some chemical-induced penetration, most penetration is simply mechanical impregnation of water and fire retardant through the pits in cell walls. **NOTE: As defined in Section 1.4.1, all pressure treated fire-retardants would fit under this definition and could move from AC 66 to AC516.**

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Agree with the “Line 63” comment but not the “NOTE” comment. This AC focuses on penetrants...not pressure treated fire-retardants. End of Comment

Section 1.4.2

Line 65 – Change the word defined from “Retention Rate” to “Retention by Assay” to match the AWPAs definition of retention by assay. This is because the retention in AC66 can be by assay borings or a gauge retention can be used. But gauge can only be used in a batch process by analyzing how much fire retardant went into the retort compared to how much came out. That cannot be done on an inline system.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Section 5.4 of the AC66 does refer to “assay of borings” but it also states that retention rates may be measured by “other validated methods as delineated in the approved quality documentation”. That said, this needs to be generalized as the method for measuring retention rates may vary from manufacturer to manufacturer. End of Comment

Change Line 65-68 – The definition should be: “The determination of fire-retardant retention in a specified zone of wood by extraction or analysis of specified samples by increment borer cores.”

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Section 5.4 of the AC66 does refer to “assay of borings” but it also states that retention rates may be measured by “other validated methods as delineated in the approved quality documentation”. That said, this needs to be generalized as the method for measuring retention rates may vary from manufacturer to manufacturer. Furthermore, “borer cores” are required for fire-retardant-treated wood impregnated with chemicals to measure chemical retention AND depth of penetration as required in Section 5.4 of AC66. The fire performance of a fire-retardant penetrant is determined solely on the required chemical retention rate that is measured through testing. End of Comment

Section 2.1.2

Line 79 - The term “factory” has been changed to “applicator.” This could cause confusion with field applicators and should be revised to: “treatment plant/applicator factory”. **NOTE: Again, as stated in Section 2.1.2 all pressure treated fire-retardants would fit under this term “treatment plant” and could move from AC 66 to AC516.**

Section 2.1.3

Line 80 – Source of Treatment Chemical. This is confusing as it is asking for the name of the chemical, not who is manufacturing the chemical used.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

This section is asking for the manufacturer of the “Treatment chemical manufactured by listee or report holder”.
End of Comment

Section 2.1.5

Line 86 – Again, confusing. Are the treated product and wood-based substrate different? We suggest revising “treated product, wood-based substrate” to “wood products”.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Agreed ---- End of Comment

Line 88 – To be consistent with AC 66, add to end “and in accordance with Section 2.1.5 of AC10”.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Yes. Ideally, it should be added to the end of the 1st paragraph in section 6.11 End of Comment

Section 2.4

Note: We ask the following language be inserted to ensure samples have not previously been tampered with by dual treatments: The inspection agency shall use of a boron indicator on the test samples before application of the fire-retardant penetrant. The agency shall also take a sample for use with a phosphorus indicator. Any trace of boron or phosphorus before samples have fire-retardant penetrant applied shall negate all further testing results of those samples.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

This needs to be a requirement of the ASTM E84 extended 20-minute test. If it works at time of testing, it'll work when applied at the treatment plants. End of Comment

Section 3.0

If this is proposed as an alternative to AC 66, it should match exactly as possible to AC 66. At present, OSB is not covered under AC 66. It could be broken out in a separate section, as outlined below:

3.1 Lumber

3.1.1 Strength and Stiffness Properties

3.1.2 Hygroscopic properties

3.1.3 Durability

3.1.4 Surface Burning Characteristics

3.2 Plywood Panels

3.2.1 Flexural Strength and Stiffness Properties

3.2.2 Hygroscopic properties

3.2.3 Durability

3.2.4 Surface Burning Characteristics

3.3 OSB Panels

3.3.1 Flexural Strength and Stiffness Properties

3.3.2 Hygroscopic properties

3.3.3 Durability

3.3.4 Surface Burning Characteristics

David Paulo – Rebuttal for WWPI Comment 9-23-2020

The only difference in the testing of plywood vs OSB is the ASTM D5516 vs ASTM D7857, and it is consistently defined as such within the AC516. However, either way should be ok. End of Comment

Section 3.3.1

Note that no testing has been done to confirm the testing described below actually works to replicate fire retardants used on exterior walls that are subjected to rain and snow during installation:

“3.3.1 Interior Use: To address possible wetting during construction, wood structural panels and sawn lumber with factory-applied fire-retardant penetrant intended for interior use shall be subject to wetting at a rate of 5 gallons per hour per square foot of surface continually for 6 hours with the surface oriented at an angle of 70-80 degrees (nearly vertical).”

David Paulo – Rebuttal for WWPI Comment 9-23-2020

The durability test proposed in the AC516 is the foundation for the durability test that will be part of the AC516.

End of Comment

Standard test methods such as ASTM G7, E661 and D7032 have been considered but none have proven effective. This is a project ICC-ES, AWWA, ASTM and industry needs to address. It is critical to develop the correct test requirements. As such, we continue to recommend the testing defined in AC 479, Sections 4.1.2 and 4.1.3 until such time as a proper test is developed for AC 66 and AC 516.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

This should address the concern with regard to the volume of water in Section 3.3.1:

In the contiguous United States, Louisiana has the highest average annual rainfall with 60". The durability test outlined in Section 3.3.1 in the AC516 represents 48" of rain. Based on the highest average annual rainfall of 60", that's equivalent to 292 days or nearly 10 months of rain. Per the APA, Exposure 1 rated sheathing are designed to resist the effects of moisture during normal construction delays but are not suitable for long-term exposure. If roof sheathing is exposed for 10 months or more, it falls outside the context of "normal construction delays", and the warranty is void. Therefore, the interior durability test in Section 3.3.1 of the AC516 is sufficient.

For comparison, if we use the same 60" of annual rainfall, the exposure test in the AC479 is the equivalent of 4,215 days or 11-1/2 years of rainfall. End of Comment

Section 3.3.2

Line 133 – This section is optional, but if an exterior test is conducted, the requirements are not optional. Since interior use is separated from exterior use, the word optional is not needed and should be deleted. For clarification, add the term "requirements" after each subsection in 3.3.1 Interior Use Requirements and 3.3.2 Exterior Use Requirements.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

The word "Optional" was added to Section 3.3.2 to ensure that it is not required...similar to Sections 3.7 Fire-resistance-rated Assemblies and 3.8 Shear Walls. It is the intention of the AC516 to remain consistent with existing acceptance with regard to sections that are labeled "Optional". For consistency, "Optional" should be added to Section 3.2.3 Durability in the AC66. End of Comment

Section 5.2

Line 301 – The term used in 2.1.2 is treatment plant/applicator. The title here should be consistent with the other sections by adding "/applicator factory"

Line 302 – For consistency, add "/applicator factory" after treatment plants.

Line 308 – For consistency, add "/applicator factory" after treatment facility

NOTE: As previously noted, all pressure treated fire-retardants would fit under this term “treatment plant” and could move from AC 66 to AC516.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Agreed. ---- [End of Comment](#)

Section 5.3

There is no reference to AC 304 and there are no defined requirements for frequency of inspections. This should match AC 66.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

AC304 is mentioned in Section 5.2 of AC516 and the frequency of inspections is defined in Section 5.6.1 of AC66.

[End of Comment](#)

Section 5.4

The “Quality Control Program” and “Quality Control Documentation” defined here seems to be a big departure from the AC 66 quality assurance program. It is lacking in the detail found in AC 66, but does have new ongoing quality control third-party periodic testing of E84 surface-burning characteristics for treatment facilities QCP. We support this, but again it needs more detail so that it is applied consistently across ESRs and, if changed, across ACs.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

The intention of AC516 is to remain consistent with existing acceptance criteria with regard to quality control, and therefore, “periodic third-party testing to verify the surface-burning characteristics (ASTM E84 or UL 723) and verification of the effects on mechanical properties” on lines 320 and 321. End of Comment

Line 319 – Retention rate should be revised to “Retention by Assay” and expressed as: “The amount of fire retardant, in pcf or kg/m³”, as this is used in AC 326 when expressing an assay retention.

Line322- be consistent and add “/applicator factory” after treatment facility

NOTE: Again, as previously noted, in section 5.4 all pressure treated fire-retardants would fit under this term “treatment facility” and could move from AC 66 to AC516.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

Section 5.4 of the AC66 does refer to “assay of borings” but it also states that retention rates may be measured by “other validated methods as delineated in the approved quality documentation”. That said, this needs to be generalized as the method for measuring retention rates may vary from manufacturer to manufacturer.

Furthermore, “borer cores” are required for fire-retardant-treated wood impregnated with chemicals to measure chemical retention AND depth of penetration as required in Section 5.4 of AC66. The fire performance of a fire-retardant penetrant is determined solely on the required chemical retention rate that is measured through testing.

Agree to the change to line 322. [End of Comment](#)

Section 5.5 and all subsections.

We disagree with the removal of this section. Stains, glues, coatings, penetrants and pressure treatments used on wood are impacted by two main properties of the wood: moisture content and surface structure. If the wood is too dry, the penetrant cannot move into the wood as there is no moisture to carry it in. Additionally, if the wood is case hardened from drying, then the cell pits aspirate preventing penetration. If the wood has been through a planer then the surface will be smoothed and hardened from the blade making it more resistant to penetration.

Proper penetration into wood fiber is an art as much as it is a science and this should be highlighted in the quality control section to ensure the coverage rate usage achieves the desired penetration and retention.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

By definition, a “penetrant” a chemical compound that when applied to a wood substrate, uses a carrier to open the pores allowing the chemicals it is carrying to penetrate into the wood. [End of Comment](#)

Section 6.7

Note: This is where the durability testing is a concern. A proper test method must be developed to determine how wet the wood can get before it must be replaced. See comments for Section 3.3.1

David Paulo – Rebuttal for WWPI Comment 9-23-2020

See my comments to Section 3.3.1 as well. [End of Comment](#)

Section 6.11

Line 377 and 378 – Modify “3. Name or identification number and location of factory-applied fire-retardant penetrant treater” to include the following: “3. Name or identification number and location of factory-applied fire-retardant penetrant treater” Also add the statement: “By non-Pressure Process” if applied by a factory applicator.

NOTE: Again, as stated before, in section 6.11 all pressure treated fire-retardants would fit under this term “penetrant treater” and could move from AC 66 to AC516.

David Paulo – Rebuttal for WWPI Comment 9-23-2020

The 2018 IBC does not require fire-retardant-treated wood to be manufactured by a pressure process Per Section 2303.2.3. Therefore, this addition to “3” is not required.

Below are definitions that should help address the concerns of “pressure treated fire-retardants” falling under AC516:

- Penetrant: A chemical compound that when applied to the surface of a wood substrate, uses a carrier to open the pores allowing the chemicals it’s carrying to penetrate into the wood.
- Impregnate: To fill throughout, soak, saturate, drench, steep, permeate.

AC516 uses the term “penetrant” which defines the type of chemical used and allows the manufacturer to define the details of the application method used in the to achieve the performance requirements of Section 2303.2 of the building code. AC66 uses the terms “pressure process” and “impregnated with chemicals” which defines the application methods used and allows the manufacturer to define the details of the chemical used to achieve the performance requirements of Section 2303.2 of the building code. [End of Comment](#)

Line 379 – Add back item 4 from ACC 66 line 2.1.3 “4. When testing has been conducted at 80°F only, (4.1.3) labels shall state that the products shall not be used in roofing applications.”

David Paulo – Rebuttal for WWPI Comment 9-23-2020

In an effort to avoid the possibility of limiting usages, the application restrictions do not need to be defined in the AC516. However, in an effort to stay consistent with the AC66 as well as improving upon all AC’s, I do think it needs some verbiage stating that there may be some usage restrictions. The details of the usage restrictions will be defined in the quality control program and must be stated on the product labels. [End of Comment](#)

WWPI’s position is that AC66, AC479 and the proposed AC516 should all be harmonized and we look forward to staff addressing this issue.

Should you have any questions, please contact me at (360) 693-9958 or dallin@wwpi.org.

Sincerely,



Dallin Brooks

Executive Director

Western Wood Preservers Institute