



To: ICC-ES Evaluation Committee
From: Jeff Filler, P.E. and William Gould, P.E.
Date: October 2, 2020
Subject: Proposed Acceptance Criteria for Factory-Applied Fire-Retardant Penetrant for Wood Structural Panels and Sawn Lumber AC516-1020-R3 (JF/WG)

MEMO

We received nine comment letters on our website posting of the proposed new ICC-ES Acceptance Criteria AC516. We also received a rebuttal letter from the proponent, Fire Retardant Coatings of Texas. Comment letters and the rebuttal letter are posted on our website.

Regarding the comments received and proponent rebuttal, we note the following:

1. Evaluation for exterior use (Section 3.3.2) has been removed from the draft criteria. Staff had added exterior use to the draft criteria posted on August 18, 2020 in an effort to follow the scope and performance requirements of AC66. The original intent of the proponent was for interior use only. The criteria is now clearly scoped for interior use (Section 1.2).
2. The proponent has included details that wood structural panels tested for surface burning characteristics with a 1/8-inch gap, and a 1/8-inch by 1/8-inch groove (Sections 3.2.2 and 3.2.3). The intent of these details is to serve as enhancements to the ASTM E84 tests in order to demonstrate that penetration is sufficient to provide fire retardance despite surface openings on the panels. These details are not proposed for AC66, or any other criteria, and are not prohibited by the code.
3. The jobsite rain wetting test of Section 3.3 remains. This test is not taken from AC66 as AC66 has no evaluation protocol for jobsite weather exposure for interior use product. The test is provided in this criteria to assure reasonable durability against possible rain exposure before covering on the construction site. There has been considerable debate during the proposal process of this criteria for additional jobsite durability tests. To date, however, no suitable protocols have been provided by the industry. Tests from AC479 have been proposed by some public comments; however, AC479 is for a different type of product, specifically an intumescent coating, and not a factory-applied fire-retardant penetrant. No evidence, research studies or data, has been submitted to ICC-ES showing that the durability requirements of AC479 more accurately or realistically model possible jobsite

exposure to weather of interior products intended to be protected in the structure. Further, there are no evaluation reports that have been issued to AC479 and no product has been successfully evaluated to the requirements to date.

4. Section 3.6 on corrosion was modified to exclude obsolete (outdated information) and provide better clarity for corrosion of both fasteners and metals (connectors) in contact with the factory-applied fire-retardant penetrant wood. Reference to AC326 was removed and the intended information from AC326 was included in the proposed criteria. This included the requirement of third-party involvement. Third-party involvement is required in AC66 by reference to AC326, and now directly in AC516. We have found that for the evaluation of corrosion, for both preservative and fire-retardant treated wood, third party involvement is necessary for analysis of corrosion tests.
5. In Section 3.8 we maintain the requirement of involvement of a third party if structural analysis is involved. This is consistent with AC66.
6. The requirement of periodic surface burning tests and tests on the effects on structural properties has been removed from Section 5 the criteria. These ongoing quality control tests were added as enhancements to an earlier draft of AC516 and are not in AC66.
7. To date we have received numerous comments that the subject product should be evaluated under AC66. The proposed AC516 is based substantially on AC66 performance requirements, but with some additional durability requirements specific to the new product. In the interest of the applicant, we are proposing evaluation of the new product under IBC Section 104.11 as an alternate to fire-retardant treated wood.
8. Considerable input and information has been provided both in support of, and opposition to, this proposed criteria. The development of any new ICC-ES acceptance criteria is intended to provide a set of test and evaluation guidelines for a specific new product. The guidelines are developed due to the lack of clear code provisions and absence of applicable standards pertaining to the specific new product. Criteria are revised as products become better understood, applicable code and standards are developed, and as we are asked to evaluate similar products that may fit already existing criteria. Acceptance criteria are not intended to be a comprehensive evaluation standard for a product or class of products. They are intended only for use by ICC-ES staff in the evaluation of a client's product. As we better understand the product to be evaluated under AC516, and if applications are made to ICC-ES to evaluate similar products, we may propose revisions and further enhancements to AC516.

PROPOSED ACCEPTANCE CRITERIA FOR FACTORY APPLIED FIRE-RETARDANT PENETRANT FOR WOOD STRUCTURAL PANELS AND SAWN LUMBER

AC516

Proposed August 2020

PREFACE

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1 **1.0 INTRODUCTION**

2 **1.1 Purpose:** The purpose of this acceptance criteria is to establish requirements
3 for a factory-applied fire-retardant penetrant for wood structural panels and sawn lumber
4 to be recognized in an ICC Evaluation Service, LLC (ICC-ES) evaluation report for use,
5 but not limited to, where fire-retardant-treated wood is required or permitted, in under
6 the 2018, 2015, 2012, and 2009 *International Building Code*[®] (IBC) and 2018, 2015,
7 2012, and 2009 *International Residential Code*[®] (IRC). Bases of evaluation are IBC
8 Section 104.11 and IRC Section R104.11.

9 **1.2 Scope:** This criteria addresses the fire performance, strength reduction
10 characteristics, hygroscopicity, durability, and corrosion-of-metals properties of wood
11 structural panels and sawn lumber with a factory-applied fire-retardant penetrant for
12 interior use (not weather-exposed). The scope of this criteria does not include
13 evaluation of tests conducted in accordance to NFPA 285 for compliance of IBC Section
14 1402.5.

15 **1.3 Codes and Referenced Standards**

16 **1.3.1 Codes:** Code sections referenced in this criteria for the IBC and
17 IRC are with respect to the 2018 editions. See Table 1 for section editions for earlier
18 code editions.

19 **1.3.1.1** 2018, 2015, 2012 and 2009 *International Building Code*[®]
20 (IBC), International Code Council.

21 **1.3.1.2** 2018, 2015, 2012 and 2009 *International Residential*
22 *Code*[®] (IRC), International Code Council.

23 **1.3.2 Standards:** Sections of standards referenced in this criteria are for
24 the standard editions noted for the 2018 IBC and 2018 IRC in Table 1. See Table 2 for
25 editions of referenced standards applicable to the earlier editions of the IBC and IRC.

26 **1.3.2.1** ANSI/AWC *National Design Specification® for Wood*
27 *Construction* (NDS) and *Supplement*, American Wood Council.

28 **1.3.2.2** ASTM International

29 ~~**1.3.2.2.1** ASTM D2898 Standard Test Methods for~~
30 ~~Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.~~

31 ~~**1.3.2.2.2**~~**1.3.2.2.1** ASTM D2915 Standard Practice for
32 Sampling and Data-analysis for Structural Wood and Wood-Based Products.

33 ~~**1.3.2.2.3**~~**1.3.2.2.2** ASTM D3201 Standard Test Method for
34 Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products.

35 ~~**1.3.2.2.4**~~**1.3.2.2.3** ASTM D5516 Standard Test Method for
36 Evaluating the Flexural Properties of Fire-Retardant-Treated Softwood Plywood
37 Exposed to Elevated Temperatures.

38 ~~**1.3.2.2.5**~~**1.3.2.2.4** ASTM D5664 Standard Test Method for
39 Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on
40 Strength Properties of Fire-Retardant Treated Lumber.

41 ~~**1.3.2.2.6**~~**1.3.2.2.5** ASTM D6305 Standard Practice for
42 Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated
43 Plywood Roof Sheathing.

44 **~~1.3.2.2.7~~1.3.2.2.6** ASTM D6841 Standard Practice for
45 Calculating Design Value Treatment Adjustment Factors for Fire-Retardant-Treated
46 Lumber.

47 **~~1.3.2.2.8~~1.3.2.2.7** ASTM D7857 Standard Test Method for
48 Evaluating the Flexural Properties and Internal Bond Strength of Fire-Retarded Mat-
49 Formed Wood Structural Composite Panels Exposed to Elevated Temperatures.

50 **~~1.3.2.2.9~~1.3.2.2.8** ASTM E84 Standard Test Method for
51 Surface Burning Characteristics of Building Materials.

52 **~~1.3.2.2.10~~1.3.2.2.9** ASTM E119 Standard Test Methods for
53 Fire Tests of Building Construction and Materials.

54 **1.3.2.3** AWWA E12 Standard Method of Determining Corrosion of
55 Metals in Contact with Treated Wood, American Wood Protection -Preservers'
56 Association.

57 **1.3.2.4** NFPA 285 Standard Fire Test Method for the Evaluation of
58 Fire Propagation Characteristics of Exterior Nonload-bearing Wall Assemblies
59 Containing Combustible Components, National Fire Protection Association

60 **~~1.3.2.4~~1.3.2.5** UL LLC:

61 **~~1.3.2.4.1~~1.3.2.5.1** UL 263 Standard for Fire Tests of Building
62 Construction and Materials.

63 **~~1.3.2.4.2~~1.3.2.5.2** UL 723 Standard Test for Surface Burning
64 Characteristics of Building Materials.

65 **~~1.3.2.5~~1.3.2.6** U.S. Department of Commerce:

66 **~~1.3.2.5.1~~1.3.2.6.1** PS 1 Structural Plywood.

67 ~~1.3.2.5.21.3.2.6.2~~ PS 2 Performance Standard for Wood-
68 based Structural-use Panels.

69 **1.4 Definitions**

70 **1.4.1 Factory Applied Fire-Retardant Penetrant:** The factory applied
71 fire-retardant penetrant is a proprietary formulation that is applied to all sides of the
72 wood structural panels and all faces of sawn lumber that ~~chemically~~ penetrates the
73 wood to impart fire-retarding qualities to the wood substrate.

74 **1.4.2 Retention Rate:** The rate of retention of factory-applied fire-
75 retardant penetrant required in the approved quality documentation necessary to
76 achieve the fire-retardant performance requirements as defined in Section 2303.2 of
77 the IBC and Section R802.1.5 of the IRC and additional requirements detailed in this
78 criteria.

79 **2.0 BASIC INFORMATION**

80 **2.1 General:** The applicant for an evaluation report addressing factory-applied
81 fire-retardant penetrant for wood structural panels and sawn lumber shall submit the
82 following information:

83 **2.1.1 Product Description:** Basic information on the fire-retardant
84 penetrant including, at a minimum, method of retarding fire, pre-conditions of substrate,
85 method of applying penetrant, measure of retention, drying or post-treatment, and product
86 uses.

87 **2.1.2 Quality Control Manual:** Manufacturer's application manual (for
88 treatment plant/applicator factory).

89 **2.1.3 Source of Treatment Chemical:** Identify source of ~~T~~treatment

90 chemical (~~manufactured by listee or report holder~~listee, or by third party).

91 **2.1.4 Installation Instructions and Field Preparation:** Product
92 limitations, recommendations for fasteners and contact metals, limitations on boring,
93 notching, cutting, ripping, and field repair, as applicable.

94 **2.1.5 Packaging and Identification:** Details and method of identification
95 of ~~treated product, wood-based substrate~~wood product, and the ~~sample~~product label shall
96 be submitted. Product identification shall comply with the product identification provisions
97 of the ICC-ES Rules of Procedure for Evaluation Reports and Section 6.14~~2~~ of this
98 criteria, and in accordance with Section 2.1.5 of AC10.

99 **2.2 Testing Laboratories:** Testing laboratories shall comply with Section 2.0 of
100 the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES
101 Rules of Procedure for Evaluation Reports.

102 **2.3 Test Reports:** Test reports shall comply with AC85.

103 **2.4 Product Test Sampling:** Test samples shall be prepared and/or obtained
104 under the supervision of the accredited inspection agency and shall be declared and
105 verified as representative of the standard product. The testing agency shall be provided
106 with the sample preparation and treating methods, solution analysis, and solution
107 retention.

108 **2.5 Qualification Test Plan:** A qualification test plan shall be submitted to and
109 approved by ICC-ES staff prior to any testing being conducted.

110 **3.0 TEST AND PERFORMANCE REQUIREMENTS**

111 **3.1 General:** Reports of the following tests on wood structural panels and/or
112 sawn lumber ~~treated~~ with factory-applied fire-retardant penetrant for which evaluation is

113 sought shall be submitted:

114 **3.2 Surface Burning Characteristics:**

115 **3.2.1** The surface burning characteristics (flame spread and smoke-
116 developed ~~index~~indices) of wood structural panels and sawn lumber with factory-applied
117 fire-retardant penetrant shall be determined in accordance with ASTM E84 or UL 723
118 conducted ~~after~~on material which has undergone the durability requirements of Section
119 3.3.1 ~~(interior use)~~ or 3.3.2 ~~(exterior use)~~ as applicable. The flame spread index shall
120 be 25 or less ~~and there shall be no evidence of significant progressive combustion when~~
121 ~~the test is continued for an additional 20-minute period.~~ Additionally, the ASTM E84 or
122 UL723 test shall be continued for an additional 20-minute period, and the flame front
123 shall not progress more than 10 feet-6 inches (3200 mm) beyond the centerline of the
124 burners at any time during the test. The smoke-developed index shall be 450 or less.

125 **3.2.2** Test specimens for wood structural panels with factory-applied fire-
126 retardant penetrant shall be constructed with a ripped or cut gap (joint) of $\frac{1}{8}$ inch (3.2
127 mm), running the length of the tunnel. The joint shall be made with ripped or cut panel
128 edges exposing edge surfaces ~~not directly treated with~~for which the factory-applied fire-
129 retardant penetrant was not directly applied.

130 **3.2.3** Test specimens for wood structural panels with factory-applied fire-
131 retardant penetrant shall also be constructed with at least one $\frac{1}{8}$ -inch (3.2 mm) wide by
132 $\frac{1}{8}$ -inch (3.2 mm) deep cut (groove) running the length of the tunnel and exposed to the
133 fire. The cut (groove) shall be made in the panel specimens after application of the
134 factory-applied fire-retardant penetrant.

135 **3.2.4** For evaluation as a roof wood structural sheathing or wall sheathing

136 that is used as a nail base, specimens shall be constructed with two rows of fasteners
137 driven through the unexposed face of the wood structural panel with the nail points
138 protruding through the wood structural panel and exposed in the tunnel. The nails shall
139 be driven with a pneumatic fastening tool without the use of pre-drilled pilot holes. The
140 (bottom) face of the wood structural panel shall not be supported at the location of the
141 nails when the nails are driven. The nail tips shall protrude from the surface by a
142 minimum of 1/8 inch (3.2 mm). Nails shall be corrosion-resistant roofing nails, spaced a
143 maximum of 8 inches (203 mm) on center along the length of the tunnel, with rows
144 spaced 8 inches (203 mm) apart. Nails shall be installed after the preconditioning
145 exposures and left in place for the test.

146 **3.3 Durability:** ~~Wood structural panels and sawn lumber with factory-applied~~
147 ~~fire-retardant penetrant treated wood shall be tested for durability according to interior~~
148 ~~or exterior use as follows:~~

149 **3.3.1 Interior Use:** ~~To address wetting during construction, wood structural~~
150 ~~panels and sawn lumber with factory-applied fire-retardant penetrant intended for~~
151 ~~interior use shall be subject to wetting at a rate of 5 gallons per hour per square foot of~~
152 ~~surface continuously for 6 hours with the surface oriented at an angle of 70-80 degrees~~
153 ~~(nearly vertical). Wetted test specimens shall be dried in accordance with the~~
154 ~~conditioning requirements of the ASTM E84 or UL 723 tests. The wetting and drying~~
155 ~~requirements shall be conducted on all interior-use products prior to the surface-burning~~
156 ~~tests required under this criteria.~~

157 **3.3.2 Exterior Use (Optional):** ~~Wood structural panels and sawn lumber with factory-~~
158 ~~applied fire-retardant penetrant intended for use in exterior applications shall be subject~~

159 ~~to the requirements of ASTM D2898 and Section 2303.2.6 IBC or Section R802.1.5.8~~
160 ~~IRC.~~

161 **3.4 Mechanical Properties:** The following tests shall be conducted to
162 determine the effects of factory-applied fire-retardant penetrant on the mechanical
163 properties of wood structural panels and sawn lumber. Results of such tests shall be
164 used to determine adjustments to strength properties and/or re-determination of span
165 ratings in accordance with Sections 4.1.1 and 4.1.2 of this criteria. In no case shall
166 factory-applied fire-retardant penetrant be considered to increase mechanical properties
167 (strength and stiffness properties) of wood structural panels and sawn lumber.

168 **3.4.1 Factory-Applied Fire-Retardant Penetrant for Wood Structural**
169 **Panels:** Wood structural panels with factory-applied fire-retardant penetrant shall be
170 tested ~~separately~~ for effects on strength and stiffness properties in accordance with
171 ASTM D5516 for plywood and effects on strength and stiffness properties and internal
172 bond in accordance with ASTM D7857 for OSB, including effects of temperature and
173 humidity associated with intended use(s) for which evaluation is sought. Data from such
174 tests shall be used to determine adjustment values, or maximum spans and loads, or
175 both, in accordance with ASTM D6305, for non-span-rated plywood, in accordance with
176 Section 4.1.1. For span-rated plywood and OSB, results of tests conducted on plywood
177 and OSB shall be used to determine the need for re-qualification of treated the OSB, in
178 accordance with Section 4.1.2. Tests of wood structural panels shall be conducted on
179 all wood species for which evaluation is sought.

180 **Exception:** The results of tests conducted on Douglas Fir and Southern
181 Pine plywood, an OSB manufactured primarily with Aspen, and an OSB manufactured

182 primarily with Southern Pine shall be considered as being representative for all species
183 of wood structural panels for effects on mechanical properties.

184 **3.4.2 Factory-Applied Fire-Retardant Penetrant for Sawn Lumber:** Sawn
185 lumber with factory-applied fire-retardant penetrant shall be tested for effects on
186 mechanical properties in accordance with ASTM D5664. Data from such tests shall be
187 used to determine modification factors in accordance with ASTM D6841, and shall take
188 into consideration temperature, humidity, climate conditions, and end use. See Section
189 4.2. Strength and stiffness properties tests of sawn lumber shall be conducted on all
190 wood species for which evaluation is sought.

191 **Exception:** The results of tests conducted on Southern Pine, Douglas Fir,
192 and either White Spruce or a Spruce/Fir mixture are permitted to be used together as
193 being representative of all lumber species. A Spruce/Fir mixture can be obtained by
194 obtaining Canadian Spruce-Pine-Fir and removing the Lodgepole and Jack Pine which
195 can be visually segregated from the remaining Spruces and Firs. Under this exception,
196 the lowest of the property median treatment ratios obtained from the three species in
197 accordance with Section 4.3.1 shall be used with any untested softwood species.

198 **3.5 Hygroscopic Properties:** Wood structural panels (plywood and OSB) and
199 sawn lumber with factory-applied fire-retardant penetrant shall be tested in accordance
200 with ASTM D3201, and be subject to the requirements of Section 2303.2.7 of the IBC
201 or Section R802.1.5.9 of the IRC. Each wood species for which evaluation is sought
202 shall be tested.

203 **EXCEPTION:** Wood structural panels (plywood and OSB) and sawn
204 lumber with factory-applied fire-retardant penetrant sought for evaluation for use only in

205 exterior applications shall not be required to be tested for hygroscopic properties.

206 **3.6 Corrosion of Fasteners and Connectors (Metals)**

207 **3.6.1 Fasteners:** ~~Fasteners used with factory-applied fire-retardant~~
208 ~~penetrant treated wood in exterior applications or wet or damp locations shall be~~
209 ~~corrosion resistant subject to the requirements of Section 2304.10.5.3 and Section~~
210 ~~R317.3.3 of the IRC.~~ Fasteners used with factory-applied fire-retardant penetrant
211 ~~treated wood~~ for interior application shall be subject to the requirements of Section
212 2304.10.5.3 and Section R317.3.3 of the IRC unless recommendations otherwise are
213 provided for the evaluation report by an accredited third-party test laboratory or an
214 independent wood scientist/engineer based on testing in accordance with the ICC-ES
215 Acceptance Criteria for Corrosion-Resistant Fasteners and Evaluation of Corrosion
216 Effects of Wood Treatments, AC257.

217 **3.6.2 Connectors:** ~~Connectors used with factory-applied fire-retardant~~
218 ~~penetrant treated wood in exterior applications or wet or damp locations shall be~~
219 ~~corrosion resistant subject to the requirements of IBC Section 2304.10.5.1 and Section~~
220 ~~R317.3.~~ Corrosion testing of metals in contact with factory-applied fire-retardant
221 penetrant for wood structural panels and sawn lumber used in interior applications shall
222 be conducted in accordance with the procedures in AWWA E12. Metals tested shall
223 represent metals of typical applications and those to be identified in the evaluation
224 report. Tests of benchmark (comparison) products shall be conducted to provide the
225 basis for statements in the evaluation report. A minimum of 10 replicate tests of each
226 metal with each the treated product with factory-applied fire-retardant penetrant and its
227 benchmark is required. Assessments against benchmarks shall be evaluated by

228 comparison of average corrosion rates calculated from weight-loss measurements in
229 accordance with AWWA E12 Section 9. Statements for the evaluation report shall be
230 provided by an accredited third-party test laboratory or an independent wood
231 scientist/engineer based on analysis and conclusions drawn from test data and other
232 relevant documentation and provided for review by ICC-ES.

233 **3.7 Fire-resistance-rated Assemblies (Optional):** When wood structural
234 panels or sawn lumber with factory-applied fire-retardant penetrant for wood structural
235 panels or sawn lumber are used as components of a fire-resistance-rated wall, floor-
236 ceiling, or roof-ceiling assembly; the assembly shall be tested in accordance with ASTM
237 E119 or UL 263. The fire-resistance-rated assembly shall be completely described in
238 the test report specifying the hourly fire-resistance rating.

239 **3.8 Factory-Applied Fire-Retardant Penetrant for Wood Structural Panels**
240 **used in Shear Walls and Horizontal Diaphragms (Optional):** Use of wood structural
241 panels with factory-applied fire-retardant penetrant as a component of a shear wall or
242 horizontal diaphragm shall be documented by either structural analysis or full-scale load
243 testing. ~~Details of the s~~Shear wall and diaphragm assemblies and any allowable load
244 adjustments shall be included in the evaluation report. The structural analysis shall be
245 prepared by an independent third party. Prior to full-scale load testing, a test plan shall
246 be submitted to ICC-ES staff in accordance with Section 2.5 of this criteria.

247 **4.0 ANALYSIS**

248 **4.1 Factory-Applied Fire-Retardant Penetrant for Wood Structural Panels:**

249 **4.1.1** Bending strength design value treatment adjustment factors for
250 factory-applied fire-retardant penetrant for non-span-rated plywood structural panels shall

251 be determined in accordance with ASTM D6305 using results from tests specified in
252 Section 3.4.1. Treatment adjustment factors shall be applied cumulatively with other
253 relevant adjustment factors from the NDS, including the NDS temperature factor.
254 Treatment adjustment factors shall consider the wood species and climatological location
255 where wood structural panels with factory-applied fire-retardant penetrant will be used.
256 The initial treatment (IT) effect as determined by ASTM D6305, shall be used as the
257 reduction factor for non-span-rated plywood structural panels not subject to elevated
258 temperature exposures. The total allowable roof sheathing load (live load plus dead load)
259 shall be determined in accordance with ASTM D6305 for each wood species of non-span-
260 rated wood structural panels tested, based on the design value treatment adjustment
261 factors. Recommended uniform live loads for factory-applied fire-retardant penetrant for
262 non-span-rated structural panels used in roofing and subfloor applications shall be
263 provided.

264 **4.1.2** Data from tests of plywood in accordance with ASTM D5516 and
265 OSB in accordance with ASTM D7857 shall be used to determine if the factory-applied
266 fire-retardant penetrant adversely affects span-rated wood structural panels, in
267 accordance with Section 4.1.3. Properties to be considered for plywood shall be bending
268 strength and bending stiffness. Properties to be considered for OSB shall be bending
269 strength, bending stiffness, work-to-maximum load, and internal bond. If the test results
270 determine that the required properties of span-rated wood structural panels are not
271 adversely affected by the factory-applied fire-retardant penetrant, no further testing is
272 required. If the test results determine that any of the properties are adversely affected by
273 the factory-applied fire-retardant penetrant, re-qualification in accordance with DOC PS-

274 2 shall be required. In this case, the original trademark of the wood structural panels shall
275 be obliterated and replaced with the new trademark resulting from the re-qualification in
276 accordance with DOC PS-2 for panels ~~treated~~ with the fire-retardant penetrant.

277 **4.1.3** The evaluation of adverse effects on bending strength, bending
278 stiffness, work-to-maximum load, and internal bond, as required by Section 4.1.2, on
279 span-rated wood structural panels with factory-applied fire-retardant penetrant shall be
280 conducted using data obtained from tests conducted in accordance with ASTM D5516 or
281 ASTM D7857, as applicable. Comparisons of data for ~~treated and untreated panels~~ with
282 and without factory-applied fire-retardant penetrant shall be compared for each ~~the~~
283 temperature and humidity conditions to be included in the evaluation report in accordance
284 with the following:

$$M_m \geq M_c \left(1 - \frac{tV}{\sqrt{N}} \right) \quad (\text{Eq. 1})$$

287 where:

288 M_m = average property of ~~treated~~ penetrant group for a specific
289 temperature and humidity condition in the evaluation report

290 M_c = average property of the control (~~untreated~~ no penetrant) group for the
291 same condition as M_m

292 t = student t statistic with 95 percent confidence; $t = 2.045$ for 30
293 specimens (29 degrees of freedom) (Table 1 of ASTM D2915)

294 V = coefficient of variation for the mechanical property of the control
295 (~~untreated~~no penetrant) group at the same condition as M_m ; $V \leq 0.2$ (when
296 V is greater than 0.2, use 0.2 in the calculation)

297 N = sample size for the control group; $N \geq 30$.

298 **Condition of Acceptance:** For acceptance of no adverse effects of the
299 factory-applied fire-retardant penetrant on the span-rated wood structural panel, Equation
300 (1) must be satisfied for all temperature humidity conditions and stated in the evaluation
301 report.

302 **4.2 Factory- Applied Fire-Retardant Penetrant for Sawn Lumber**

303 **4.2.1** The design value treatment adjustment factors for factory-applied
304 fire-retardant penetrant for sawn lumber shall be determined in accordance with ASTM
305 D6841 using results from tests specified in Section 3.4.2 of this criteria, except as limited
306 in Sections 4.3.2 and 4.2.3. Treatment adjustment factors shall consider the wood species
307 and climatological location where sawn lumber with factory-applied fire-retardant
308 penetrant will be used. The initial treatment (IT) effect as determined by ASTM D6841
309 shall be used as the reduction factor for non-span-rated wood structural panels not
310 subject to elevated temperature exposures.

311 **4.2.2** The adjustment factor for fastener loads for each sawn lumber wood
312 species shall be the lower of the ratio for maximum stress in compression parallel to grain
313 and the ratio for maximum stress in horizontal shear, determined in accordance with
314 ASTM D5664, or 0.90, whichever is lower, unless fastener tests are conducted on sawn
315 lumber with factory-applied fire-retardant penetrant.

316 **4.2.3** The adjustment factor for compression perpendicular to grain design
317 values shall be 0.95 unless compression perpendicular to grain tests are conducted on
318 sawn lumber with factory-applied fire-retardant penetrant.

319 **5.0 QUALITY CONTROL**

320 **5.1 Factory-Applied Fire-Retardant Penetrant (Chemical):** Factory-applied
321 fire-retardant penetrant (chemical) shall be manufactured under an approved quality
322 control program with inspections by ICC-ES or by a properly accredited inspection agency
323 that has a contractual relationship with ICC-ES. When the factory-applied fire-retardant
324 penetrant (chemical) is manufactured by a party other than listee or report holder,
325 documentation in accordance with the ICC-ES Acceptance Criteria for Quality
326 Documentation (AC10), Section 1.4.4.4. shall be required.

327 **5.2 Treatment Plant / Applicator Factory:** Factory-applied fire-retardant
328 penetrants shall be applied to wood structural panels and sawn lumber at treatment plants
329 / applicator factories under an approved quality assurance program, with inspections
330 conducted by ICC-ES or an approved agency having a contractual relationship with ICC-
331 ES. Inspections and inspection agencies shall comply with the ICC-ES Acceptance
332 Criteria for Inspections and Third-party Inspection Agencies (AC304). Ongoing follow-up
333 inspections by ICC-ES or an approved agency having a contractual relationship with ICC-
334 ES are required under this criteria for each treatment facility / applicator factory.

335 **5.3 Third-Party Inspection Agency:** An accredited third-party inspection
336 agency shall be employed by the listee or report holder to conduct inspections on a
337 monthly or more frequent basis. Reports of such inspections shall be audited by ICC-ES

338 or an approved agency having a contractual relationship with ICC-ES on a quarterly basis
339 as part of the ongoing inspection program under this criteria.

340 **5.4 Quality Control Program:** A Quality Control Program shall be developed
341 by the report holder or listee in coordination with the independent accredited third-party
342 inspection agency. The Quality Control Program shall relate treatment formulation,
343 method of treatment, application and retention rates at qualification to ongoing quality
344 control monitoring. Ongoing quality control shall include, at a minimum, chemical
345 formulation verification, retention rate, ~~bench fire tests,~~ and necessary record-keeping,
346 ~~and periodic third-party testing to verify the surface-burning characteristics (ASTM E84 or~~
347 ~~UL 723) and verification of the effects on mechanical properties, as detailed in the~~
348 ~~approved Quality Control Documentation.~~ Each treatment facility / applicator factory shall
349 be subject to a Quality Control Program. The Quality Control Program shall be submitted
350 to and subject to review by ICC-ES as a part of evaluation process.

351 **6.0 EVALUATION REPORT REQUIREMENTS**

352 The following are the conditions of use for wood structural panels and sawn lumber with
353 a factory-applied fire-retardant penetrant addressed by this acceptance criteria:

354 **6.1** Span-rated wood structural panels with a factory-applied fire-retardant
355 penetrant must be subject to the ~~use and~~ modified loads and span information determined
356 from Section 4.1.2 and applicable only to the wood structural panels identified in the
357 evaluation report.

358 **6.2** The use and design of non-span-rated wood structural panels and sawn
359 lumber with a factory-applied fire-retardant penetrant must be subject to the design value

360 adjustment factors determined in accordance with Sections 4.1.1 and 4.2 of this criteria
361 and limited to the species evaluated.

362 ~~6.3~~ The exposure limitations of the wood structural panels and sawn lumber with
363 a factory-applied fire-retardant penetrant shall be defined in the evaluation report, either
364 interior or exterior.

365 6.46.3 The evaluation report shall detail requirements for fasteners and
366 connectors used with wood structural panels and sawn lumber ~~the~~with factory-applied
367 fire-retardant penetrant-treated wood, based on Section 3.6 of this criteria.

368 6.56.4 The use of wood structural panels and sawn lumber with factory-applied
369 fire-retardant penetrant in contact with the ground has not been evaluated and is outside
370 the scope of the evaluation report.

371 6.66.5 The evaluation report shall note that sawn lumber with a factory-applied
372 fire-retardant penetrant must not be ripped along the face or milled as this may create an
373 exposed ~~untreated~~ face to which penetrant was not directly applied and alter the surface-
374 burning characteristics.

375 6.76.6 The evaluation report shall note that exposure to precipitation during
376 storage or installation shall be avoided. If material does become wet, it must be dried to
377 a moisture content of not greater than 16 percent for wood structural panels and 19
378 percent for sawn lumber, prior to covering or enclosure by wallboard or other construction
379 materials.

380 ~~6.86.7~~ The evaluation report shall note that the design value adjustment factors
381 for sawn lumber and wood structural panel spans in the evaluation report are applicable
382 under elevated temperatures resulting from cyclic climatic conditions; design value

383 adjustment factors are not applicable under continuous elevated temperatures resulting
384 from manufacturing or other processes, which require special consideration in design,
385 and are not within the scope of the evaluation report.

386 **6.96.8** The evaluation report shall note that the design value adjustment factors
387 are to be applied cumulatively with all other applicable adjustment factors from the NDS,
388 including the NDS temperature factor.

389 **6.106.9** Fire-resistance-rated assemblies qualified in accordance with Section
390 3.7 of this criteria must be fully described in the evaluation report.

391 **6.10** Wood structural panels that have not been tested in accordance with
392 Section 3.2.4 shall contain a statement that the wood structural panels must not be used
393 as roof sheathing or as a nail base in wall applications.

394 **6.11** Wood structural panels that have not been evaluated in accordance with
395 Section 3.7 shall contain a statement that they have not been evaluated for use in shear
396 walls or diaphragms.

397 **6.116.12** Identification of wood structural panels and sawn lumber with factory-
398 applied fire-retardant penetrant shall be as follows. An ink stamp marking shall identify
399 factory-applied fire-retardant penetrant wood. The ink stamp shall be a legible marking.
400 At least one mark shall be applied to every piece of lumber or wood structural panel
401 except for sawn lumber with cross-sectional dimensions less than 1 by 2 inches (25.4 by
402 50.8 mm), where one mark may be applied to a bundle of not more than 20 board feet
403 (0.37 m³). The marking shall be issued by a properly accredited inspection agency having
404 a contractual relationship with ICC-ES.

405 The marking shall contain the information required by Section 2303.2.4 of the
406 IBC or Section IRC R802.1.5.4, and shall include the following additional information:

- 407 1. ICC-ES evaluation report number.
- 408 2. ASTM E84 or UL 723 10-minute test indices (flame spread and smoke
409 developed), and statement indicating no evidence of significant progressive
410 combustion when the test is extended to 30 minutes.
- 411 3. Name or identification number and location of factory-applied fire-retardant
412 penetrant treater / applicator factory.
- 413 4. A code or means of enabling traceability of manufacturing required by the
414 approved quality control program.

415 **6.13** The evaluation report shall include a statement that NFPA 285 testing is
416 not a subject of this report.■

**PROPOSED ACCEPTANCE CRITERIA FOR FACTORY-APPLIED
FIRE- RETARDANT PENETRANT FOR WOOD STRUCTURAL
PANELS AND SAWN LUMBER (AC516)**

TABLE 1 - REFERENCED CODE SECTIONS BY CODE EDITION

| CODE EDITION | | | |
|--------------|----------|----------|----------|
| IBC SECTIONS | | | |
| 2018 | 2015 | 2012 | 2009 |
| 2303.2 | 2303.2 | 2303.2 | 2303.2 |
| 2304.10 | 2304.10 | 2304.9 | 2304.9 |
| IRC SECTIONS | | | |
| R317.3 | R317.3 | R317.3 | R319.3 |
| R802.1.5 | R802.1.5 | R802.1.3 | R802.1.3 |

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TABLE 2 – STANDARDS EDITIONS BY CODE EDITION

| STANDARD | CODE | | | |
|-----------------|--|---|--|----------------|
| | 2018 IBC & IRC | 2015 IBC & IRC | 2012 IBC & IRC | 2009 IBC & IRC |
| ANSI/AWC NDS | 2018 | 2015 | 2012 | 2005 |
| ASTM D3201 | -13 | | -08a | -07 |
| ASTM D5516 | -09 | | | -03 |
| ASTM D5664 | -10 | | -08 | -02 |
| ASTM D6305 | -08(2015) ^{e1} | | -08 | -02e1 |
| ASTM D6841 | | -08 | | -03 |
| ASTM D7857 | | | -16 | |
| ASTM E84 | -16 | -13a | -09 | -07 |
| ASTM E119 | -16 | -12a | -08a | -07 |
| AWPA E12 | | | -15 | |
| DOC PS 1 | | -09 | | -07 |
| DOC PS 2 | | -10 | | -04 |
| UL 263 | -11 with revisions through June 2015 | -11 | -03 with revisions up through October 2007 | -03 |
| UL 723 | -08 with revisions through August 2013 | -08 with revisions through September 2010 | -08 | -03 |

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Note: where a single year edition is shown it shall be considered applicable to all code editions listed.