DrJ™ CERTIFICATION

Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1703-18

MFRT™ Class-A Fire Protected Lumber

M-Fire Holdings LLC

Product:

Lumber treated with AAF21 to create MFRT™ Class-A Fire Protected Lumber

Issue Date:

September 25, 2017

Revision Date:

October 11, 2020

Subject to Renewal:

October 1, 2021

LEGACY

COMPANY INFORMATION:

M-Fire Holdings LLC

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 05 83 - Shop-Applied Wood Coating

SECTION: 06 11 00 - Wood Framing

SECTION: 06 17 00 - Shop-Fabricated Structural Wood

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1 PRODUCT EVALUATED[1]

1.1 Lumber treated with AAF21 to create MFRT™ Class-A Fire Protected Lumber

1.1.1 AAF21 is intended as a treatment for solid sawn lumber in limited interior, dry use conditions (Section 3.1.7). It is a fire retardant coating and is used as an alternative to Fire Retardant Treated Wood (FRTW).

2 APPLICABLE CODES AND STANDARDS[2,3]

2.1 *Codes*

2.1.1 *IBC—12, 15, 18: International Building Code®*

2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.1.3 *IFC— 12, 15, 18: International Fire Code®*

2.2 *Standards and Referenced Documents*

2.2.1 *ANSI/AWC NDS®: National Design Specification (NDS®) for Wood Construction*

2.2.2 *ASTM D143: Standard Test Methods for Small Clear Specimens of Timber*

2.2.3 *ASTM D3201: Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products*

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[1] Building codes require data from valid research reports be obtained from *approved sources*. Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the *building official*. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain product approval in any *jurisdiction* or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "certified once, accepted everywhere."

Building official approval of a licensed *registered design professional* (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant *jurisdiction*. Therefore, the work of licensed RDPs is accepted by *building officials*, except when plan (i.e., peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the *building official* responds in writing stating the reasons for disapproval.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

[2] Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., *ASCE 7, NDS®, ASTM*). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

[3] All terms defined in the applicable building codes are italicized.

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2.2.4 *ASTM D5116: Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products*

2.2.5 *ASTM D5197: Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology)*

2.2.6 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

2.2.7 *AWPA E12: Standard Method of Determining Corrosion of Metal in Contact with Treated Wood*

2.2.8 *AWPA M4: Standard for the Care of Preservative-Treated Wood Products*

2.2.9 *AWPA U1: Use Category System: User Specification for Treated Wood*

2.2.10 *UL 2818: GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings*

2.2.11 *UL 723: Test for Surface Burning Characteristics of Building Materials*

3 Performance Evaluation

3.1 AAF21 has been evaluated to determine its suitability to treat lumber used in above ground applications where it is required by code to provide the following:

3.1.1 Use where treated materials are used as an interior finish in new or existing construction to achieve the reduced flame spread and smoke developed indices required by the code.

3.1.2 Alternative to fire retardant treated wood as required by *IBC* Section 2303.2[4] and *IRC* Section R317.3 and Section R317.4.

3.1.3 Strength adjustment of lumber treated with AAF21 in accordance with *ASTM D143* and *IBC* Section 2303.2.5.

3.1.4 Flame spread index and smoke developed index properties where required by *IBC* Section 2303.2[5] and Section 1402.5[6] and *IRC* Section R302.9 and Section R802.1.5.[7]

3.1.5 Moisture content in accordance with *IBC* Sections 2303.2.7 and Section 2303.2.8.

3.1.6 Corrosion resistance of fasteners in contact with treated wood in accordance with *IBC* Section 2304.10.5 and *IRC* Section R317.3.

3.1.7 The following uses are outside the scope of this evaluation:

3.1.7.1 Use as a treatment for wood structural panels (i.e., OSB and plywood)

3.1.7.2 Use in unconditioned attics and roofing applications

3.1.7.3 Use as a treatment for lumber grades other than those listed in Section 4.2

3.1.7.4 Renewal or maintenance requirements for the treated products

3.1.7.5 Performance of this product with an over coating such as paints, stains, or other coatings

3.2 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

3.3 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 Product Description and Materials

[4] 2012 *IBC* Section 2303.1.8

[5] 2012 *IBC* Section 2303.1.8

[6] 2015 *IBC* Section 1403.5

[7] 2012 *IRC* Section R802.1.3

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4.1 AAF21 (FT) is a non-halogenated factory-applied wood protection coating that uses ammonium phosphate, diammonium phosphate, ammonium bromide, and other proprietary fire-retardant additives to coat wood members by means of a dipping process.

4.2 The lumber covered in this TER include:

4.2.1 Spruce Pine Fir (SPF)

4.2.2 Douglas Fir (DF)

4.3 AAF21 (FT) protected lumber is acceptable for use in the following *AWPA*[8] Use Categories:

4.3.1 UC1 – Interior construction – millwork and finishing

4.3.2 UC2 – Interior construction – interior beams, timbers, flooring, framing, millwork, and sill plates

4.4 Minimum coverage rate is 500 square feet per gallon.

5 APPLICATIONS

5.1 AAF21 (FT) is a protective coating for solid sawn SPF and DF lumber used in floor and wall framing.

5.1.1 Applications include but are not limited to fire inhibition treatment for beams, columns, headers, joists, and wall studs.

5.2 AAF21 (FT) protected wood lumber is suitable for above ground applications not subject to contact with liquid water.

5.3 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.4 *Design*

5.4.1 Allowable design stresses for AAF21 (FT) protected lumber for dry conditions of use are the same as the wood product before treatment in accordance with *ASTM D143*.

5.4.2 Since AAF21 (FT) is a topically applied coating treatment, not a pressure treatment, the wood is not incised. Therefore, the Incising Factor (*NDS*® Section 4.3.8) is not applicable.

5.4.3 Maximum duration of load design stress increase shall not exceed 1.6. Duration of load design stress increase equal to or less than 1.6 shall be in accordance with *NDS*® Section 2.3.4.

5.4.4 The design provisions for wood construction noted in *IBC* Section 2302.1[9] and *IRC* Section R301.1.3 apply to AAF21 (FT) protected lumber unless otherwise noted in this TER.

5.4.5 Field cuts, notches, or bored holes do not need to be site treated.

5.4.6 *Connections:*

5.4.6.1 Lateral loads for nails, screws, bolts, and withdrawal loads for nails and screws, installed in AAF21 (FT) protected lumber shall be in accordance with *NDS*® using the species specific gravity.

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[8] These are *AWPA* designated wood preservation systems and retentions (pressure impregnation processes only) which have been determined to be effective in protecting wood products under specified exposure conditions. The use of AAF21 protective wood coatings, while purposely not included in the *AWPA*'s specification, satisfies and complies with the intent of the building code and is an equivalent treated material in quality, strength, effectiveness, durability, and safety. Therefore, M-Fire Holdings LLC protective wood coatings treated articles are deemed to be Non-*AWPA* Standardized; however, the intent of the building code has been satisfied and is adequately supported by third-party verified data and accredited testing protocols. See *IBC* Section 104.11 for methods of obtaining "Alternative Materials Approval" via Building Official Authority.

[9] 2015 *IBC* Section 2301.2

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5.5 *Fire Resistance Properties*

5.5.1 Lumber protected by AAF21 (FT) meet the requirements where surface burning and smoke developed index values are required to be tested by *IBC* Section 2303.2[10] and *IRC* Section R302.9 and Section R802.1.5[11] in accordance with *ASTM E84* extended 20 minutes (Table 1).

TABLE 1. SURFACE BURN CHARACTERISTICS

Wood Species	Flame Spread	Smoke Developed
SPF	≤ 25	≤ 450
DF	≤ 25	≤ 450

1. Tested in accordance with *ASTM E84* and *UL 723*
2. Additionally, the flame front did not progress more than 10.5 feet beyond the centerline of the burners at any time during the test.

5.6 *Moisture Resistance Properties*

5.6.1 The moisture content of AAF21 (FT) treated lumber is under 28% when tested in accordance with *ASTM D3201* procedures at 92% relative humidity (at 80°F) and meets the requirements of *IBC* Section 2303.2.7 and *IRC* Section R802.1.5.9.

5.6.2 Testing has not been provided for elevated temperature and humidity in accordance with *IBC* Section 2303.2.5.2 or *IRC* Section R802.1.5.7, so use in roofs/attics of structures is not approved.

5.7 *Fastener Corrosion*

5.7.1 Fasteners used with AAF21 (FT) protected lumber shall be in accordance with *IBC* Section 2304.10.5[12] and *IRC* Section R317.3.

5.7.2 Common steel, red brass and aluminum fasteners are approved for use in lumber protected by AAF21 (FT) in accordance with *AWPA E12*.

6 INSTALLATION

6.1 Lumber treated with AAF21 (FT) shall be installed in accordance with the applicable code, the approved construction documents, this TER, the manufacturer's instructions, and standard framing practice as applied to solid-sawn SPF and DF lumber as delineated by the QAI listing, as applicable.

6.1.1 In the event of a conflict between any of the above and this TER, the more restrictive shall govern.

6.2 AAF21 (FT) shall be applied at a minimum coverage rate of 500 square feet per gallon. Heavier coating rates are permitted.

6.3 The applicator shall supply documentation to the building official showing the minimum coverage rate has been obtained.

6.4 The surface of the substrate shall be free of dirt, dust, oil, paint, stain, or other materials that may prevent the coating from adhering to the substrate.

6.5 This product is not intended for use on surfaces that are subject to washing or where sustained humidity of 80 percent or more is expected.

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[10] 2012 *IBC* Section 2303.1.8

[11] 2012 *IRC* Section R802.1.3

[12] 2012 *IBC* Section 2304.9.5

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7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 Flexure (MOR/MOE) of LVL/EWP in accordance with *ASTM D143* by Wood Durability Lab (SDL) at the LSU Agricultural Center

7.2 Flame spread index and smoke developed index in accordance with *ASTM E84*, *UL 723*, *NFPA 255*, *UBC 8-1*, or *ASTM E2768* by QAI Laboratories

7.3 Hygroscopic properties in accordance with *ASTM D3201* by QAI Laboratories

7.4 Reaction with metals in accordance with *AWPA E12* by QAI Laboratories

7.5 Greenguard Certification Test – Fire Retardant Wood Treatments, Report #90886-02 in accordance with *ASTM D5116* and *ASTM D5197* by Underwriters Laboratory Environment

7.6 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC* Section 1703 and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.

7.7 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC, IRC, NDS®,* and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8 FINDINGS

8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:

8.1.1 AAF21 (FT) protection does not affect the allowable design stresses allowed for untreated lumber as applied to solid sawn SPF and DF lumber.

8.1.2 SPF and DF lumber protected with AAF21 (FT) meet the requirements where surface burning characteristics are required to be tested by *IBC* Section 2303.2[13] and *IRC* Section R302.9 and Section R802.1.5[14] in accordance with *ASTM E84* extended 20 minutes, *UL 723* extended 20 minutes, *NFPA 255* extended 20 minutes, UBC 8-1 extended 20 minutes, and *ASTM E2768*.

8.1.3 AAF21 (FT) protected lumber meets the required moisture resistance properties in accordance *IBC* Section 2303.2.7 and *IRC* Section R802.1.5.9.

8.1.4 The corrosion rate of steel, red brass and aluminum fasteners is not increased by the use of AAF21 (FT) treated lumber and use of other fasteners is in accordance with *IBC* Section 2304.10.5[15] and *IRC* Section R317.3.

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[13] 2012 *IBC* Section 2303.1.8

[14] 2012 *IRC* Section R802.1.3

[15] 2012 *IBC* Section 2304.9.5

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8.2 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.9 are similar) states:

> **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…Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

8.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this TER, they are listed here.

8.3.1 No known variations

9 Conditions of Use

9.1 For field-applied applications, the applicator shall provide documentation that the application rate does not exceed 500 square feet per gallon.

9.2 Application is limited to SPF and DF lumber substrates.

9.3 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

9.4 Lumber treated with AAF21 (FT) shall be installed in accordance with the applicable code, the approved construction documents, this TER, and the manufacturer's installation instructions. If there is a conflict between this report and the manufacturer's instructions, the more restrictive shall govern.

9.5 AAF21 (FT) is a water-soluble product. This product shall not be used in locations subject to washing or wetting. Lumber bundles shall be protected from wetting during shipment, storage, and installation.

9.6 Where required by the *building official*, proof of application shall be provided. Proof of application can be shown by subjecting treated and untreated samples to a small fire source such as a propane torch for approximately 20 seconds and comparing the results. The treated sample will exhibit a visible black char layer.

9.7 AAF21 (FT) complies with, or is a suitable alternative to, the treatment required for SPF and DF lumber as permitted by the codes listed in Section 2, subject to the following conditions:

9.7.1 AAF21 (FT) protected lumber are suitable for above ground applications not subject to continuous contact with liquid water.

9.7.2 Fastener design values shall be determined using the specific gravity of the lumber species used in the coated product.

9.7.3 Cutting and notching of AAF21 (FT) coated lumber is permitted where allowed by the applicable building code, the manufacturer's recommendations, this TER, or where the effects of such alterations are specifically considered in the design of the member by a *registered design professional*.

9.7.3.1 Field cuts, notches, or bored holes must be site treated in accordance with the manufacturer's instructions and AWPA M4 in accordance with *IRC* Section R317.1.1 and Section R318.1.2.

9.7.4 Duration of load increases shall be in accordance with the limitations of the applicable building code for sawn lumber, but not greater than 1.6.

9.8 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of *permit* application.

9.9 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.10 Design loads shall be determined in accordance with the building code adopted by the *jurisdiction* in which the project is to be constructed and/or by the Building Designer (e.g., *owner* or *registered design professional*).

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9.11 At a minimum, this product shall be installed per Section 6 of this TER.

9.12 This product is manufactured under a third-party quality control program in accordance with *IBC* Section 104.4 and 110.4 and *IRC* Section R104.4 and R109.2.

9.13 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the *owner* or the owner's authorized agent. Therefore, the TER shall be reviewed for code compliance by the *building official* for acceptance.

9.14 The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the *building official's* inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

10.1 AAF21 (FT) wood protection coating described in this TER is identified by a label on the containers bearing the manufacturer's name, product name, date of manufacture, shelf life, and TER number.

10.2 Lumber factory treated with MFRT™ Class-A Fire Protected Lumber shall be labelled with the following information:

10.2.1 Identification mark of an approved agency

10.2.2 Name of the fire retardant treatment (AAF21)

10.2.3 Name of the treating facility

10.2.4 Species of wood treated

10.2.5 Flame spread and smoke developed indices

10.3 An example of an acceptable product label is shown in Figure 1.

M-Fire Holdings – MFRT Stockton, CA. Treating facility Douglas Fir, ADAT DrJ TER 1703-18, LARR# 26112	QAI Laboratories Inc. listing # B1106 Flame Spread (under 25) Smoke Developed (under 450) ASTM E84 30-minute extended test

FIGURE 1. EXAMPLE OF LABEL FOR MFRT™ CLASS A FIRE PROTECTED LUMBER

10.4 Additional technical information can be found at mightyfirebreaker.com.

11 REVIEW SCHEDULE

11.1 This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjcertification.org.

11.2 For information on the current status of this TER, contact DrJ Certification.

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