

Treatment process

BORAFLAME Fire-Retardant-Treated lumber is produced using Boralife's high temperature dip-diffusion impregnation process of a concentrated aqueous solution of sodium borate, a recognized and effective wood preservative having a very low toxicity.

Sodium borate diffuses naturally through wood using water found in wood cells at various moisture contents. Our process takes full advantage of this behavior, minimizing the absorption of more external water that would then need to be evaporated by kiln drying the final product.

Graded kiln dried lumber is used as input for our process.

Fire-Retardant-Treated (FRT) lumber for interior use

Technologies Boralife Inc. has received confirmation from ICC Evaluation Service, LLC (ICC-ES), that its BORAFLAME Fire-Retardant-Treated lumber complies with the provisions of the codes listed below.

This confirmation, as evidence in ICC-ES evaluation report ESR-4156, provides guidance to code officials faced with approving the use of BORAFLAME under these codes. The evaluation report is available online at: [ESR-4156 - ICC Evaluation Service, LLC \(ICC-ES\)](#)

BORAFLAME complies with the provisions of the following codes:

- 2018 and 2015 International Building Code® (IBC)
- 2018 and 2015 International Residential Code® (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LSRC)
- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)
- 2020 and 2017 Florida Building Code – Building
- 2020 and 2017 Florida Building Code – Residential



EPD #9002-0081

BORAFLAME surface burning characteristics comply with:

- ASTM E84: Standard Test Method for surface burning Characteristics of Building Materials. Flame Spread Index: 25 or less. Smoke Index: 450 or less.
- ASTM E2768: Standard Test method for Extended Duration Surface Burning Characteristics of Building Materials. Showing no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. The flame front does not progress more than 10½ feet (3200 mm) beyond the centerline of the burners at any time during the test.

Species

Spruce-Pine-Fir species combination (NLGA S-P-F).



ICC Evaluation Service, LLC

icc-es.org

ICC-ES Evaluation Report: ESR-4156



The screenshot shows the cover and first page of the ICC-ES Evaluation Report ESR-4156. The report is titled "ICC-ES Evaluation Report ESR-4156" and is reissued November 2022. It is a subsidiary of the International Code Council. The report is subject to renewal November 2023. The report is for Division 06 05 00—WOOD, PLASTICS AND COMPOSITES, Section 06 05 73.13—Fire-Retardant Wood Treatment. The report holder is TECHNOLOGIES BORALIFE INC. The evaluation subject is BORAFLAME. The report is for compliance with the following codes: 2018 and 2015 International Building Code® (IBC), 2018 and 2015 International Residential Code® (IRC). The report is for evaluation for compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see ESR-4156 LABC and LARC Supplement. The properties evaluated are: Flame spread, Structural, Corrosion, and Hygroscopicity. The uses are: BORAFLAME fire-retardant-treated lumber is used in interior applications that are not exposed to the weather or wetting where the code permits the use of wood or fire-retardant-treated wood. The description is: BORAFLAME fire-retardant-treated lumber is produced using Borallife's high temperature dip diffusion impregnation process of a concentrated aqueous solution of sodium borate. BORAFLAME Fire-Retardant-Treated lumber is produced from Spruce-Pine-Fir species combination (NLGA SPF). The flame spread is: BORAFLAME fire-retardant-treated lumber has a flame spread index of 25 or less and smoke developed index of 450 or less, when subjected to ASTM E84 tests, and shows no evidence of significant progressive combustion when the tests are continued for an additional 20-minute period, nor does the flame front progress more than 10½ feet (3200 mm) beyond the centerline of the burners at any time during the tests. The structural strength and durability is: BORAFLAME fire-retardant-treated lumber was tested and evaluated in accordance with ASTM D5654 and ASTM D5641 for determination of the treated wood adjustment factors shown in Table 1. The factors in Table 1 are applicable for service temperatures up to 150°F (66°C). These adjustment factors are used in conjunction with, and are applied cumulatively to, the applicable design value adjustments required by the National Design Specification® for Wood Construction (NDS). Design values for SPF lumber are provided in the current NDS Supplement. The corrosion is: The corrosion rate of carbon steel is not increased by the BORAFLAME fire-retardant-treated lumber when used as recommended by the manufacturer. The hygroscopicity is: BORAFLAME fire-retardant-treated lumber qualifies as Interior Type A High Temperature (HT) fire-retardant-treated lumber under the American Wood Protection Association (AWPA) U1, Commodity Specification H, Use Category UCFA. The design and installation is: Structural systems that include BORAFLAME fire-retardant-treated lumber must be designed and installed in accordance with the design value adjustment factors from Table 1 of this report and the design values and applicable adjustment values required by the applicable code. Ventilation must be provided in accordance with the applicable codes. Elevated Temperature: BORAFLAME fire-retardant-treated lumber must only be used in areas (including attic spaces) where the lumber is exposed to temperatures of 150°F (66°C) or less. The design value adjustment factors provided in Table 1 are applicable under elevated temperature resulting from cyclic climatic conditions.

Mechanical Properties

Boraflame lumber is mostly composed of Balsam Fir and Eastern Spruce lumber all graded under *NLGA Standard Grade Rules for Canadian Lumber* meeting the provisions of PS20 and/or CSA O141, commonly referred to as ALS and/or CLS lumber. Balsam fir and Eastern spruce are produced and distributed under the NLGA Spruce-Pine-Fir species combination (S-P-F).

Design values for the SPF species combination and appropriate grade are available for use in Canada in the current edition *CSA O86 Engineering Design in Wood*. Design values are available for use in the USA in the current edition of the *National Design Specification® for Wood Construction*. Design values are available for use in the EU in the current edition of *EN 1912 Structural Timber Strength Classes- Assignment of visual grades and species*.

As required by the various design standards, *Boraflame* lumber was evaluated under the following to confirm the treated wood factors.

ASTM D5664-17 – Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperature on Strength Properties of Fire-Retardant Treated Lumber

ASTM D6841-16- Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-Retardant-Treated Lumber

Table 1 – *Boraflame* Design Value Adjustment Factors for temperature up to 150°F (66°C) Spruce-Pine-Fir

	Zone 1a	Zone 1b	Zone 2
Bending F_b	0,94	0,94	0,94
Bending MOE	0,98	0,98	0,98
Tension Parallel to grain F_t	0,78	0,89	0,98
Compression Parallel to grain $F_{c }$	0,78	0,89	0,98
Shear parallel to grain F_v	0,78	0,89	0,92
Compression Perpendicular to grain $F_{c\perp}$	0,95	0,95	0,95
Fastener/Connector	0,78	0,89	0,90

Zone 1: Where minimum roof live load or maximum ground snow load ≤ 20 psf (960 Pa).

Zone 1A: Southwest Arizona and Southeast Nevada (Area bound by Las Vegas, Yuma, Phoenix, and Tucson).

Zone 1B: All other qualifying areas.

Zone 2: Where maximum ground snow load > 20 psf (960 Pa).

Hygroscopic properties

Test procedure: ASTM D3201

Hygroscopic properties are in accordance with AWPA U1-19 Criteria (Interior Type A High Temperature (HT) products). Moisture Content equilibrium $\leq 28\%$

Moisture Content

Moisture content of the final product is less than 19% (wt).

Corrosivity

Non-corrosive. Can be assembled with standard hardware.

Packaging

Bundles wrapped in waterproof canvas.

Marking

Typical marking printed on each board:



Conditions of use

1. All strength and stiffness calculations must be subject to the treatment design value adjustment factors shown in Table 1 of this technical specifications sheet.
2. The treatment design value adjustment factors of Table 1 are to be applied cumulatively with all other applicable adjustment factors from the NDS, including the NDS temperature factor.
3. The design value adjustment factors in this specifications sheet must only be used for unincised dimension lumber of the species noted above.
4. BORAFLAME fire-retardant-treated lumber must not be installed where it will be permanently exposed to precipitation, direct wetting or regular condensation.
5. BORAFLAME fire-retardant-treated lumber must not be used in contact with the ground.
6. BORAFLAME fire-retardant-treated lumber must not be ripped or milled as this will alter the surface-burning characteristics and invalidate the flame spread classification. Framing end cuts, holes, joints such as tongue and groove, bevel scarf and lap may be used.
7. BORAFLAME fire-retardant-treated lumber must only be used in areas (including attic spaces) where the lumber is exposed to temperatures of 150°F (66°C) or less.
8. The treatment design value adjustment factors noted in Table 1 are applicable under elevated temperature resulting from cyclic climatic conditions and are not applicable for continuous elevated temperatures resulting from manufacturing or other processes. Such conditions are outside the scope of this specifications sheet.
9. BORAFLAME fire-retardant-treated lumber must be kept dry during storage. Exposure to precipitation must be avoided. Bundles must stay covered, and the material must be elevated to prevent ground contact.
10. Exposure to precipitation during installation must be avoided as much as practically possible. BORAFLAME fire-retardant-treated lumber must be covered and protected from rainfall as soon as possible. Limited exposure while unprotected during construction can be tolerated, but if the material becomes wet, it must be replaced, or allowed to dry to a 19 percent moisture content or less, prior to covering or enclosure by wallboard or other construction materials. The treatment is permanent for the life of the structure as long as the wood is used in dry conditions.

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Canadian Patent: CA 2 948 194

U.S. Patent: 10,933,555