

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: <https://icc-es.org/report-listing/esr-4156/>

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

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



ICC-ES Evaluation Report

ESR-4156

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This report is subject to renewal November 2021.

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A Subsidiary of the International Code Council®

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 73.13—Fire-Retardant Wood Treatment

REPORT HOLDER:
TECHNOLOGIES BORALIFE INC.

EVALUATION SUBJECT:
BORAFLAME

1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2018 and 2015 *International Building Code*® (IBC)
- 2018 and 2015 *International Residential Code*® (IRC)

For evaluation for compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see [ESR-1166 LABC and LARC Supplement](#).

Properties evaluated:

- Flame spread
- Structural
- Corrosion
- Hygroscopicity

2.0 USES

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.

3.0 DESCRIPTION
3.1 General:
BORAFLAME fire-retardant-treated lumber is produced using Borafire'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).

3.2 Flame Spread:
BORAFLAME fire-retardant 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.

3.3 Structural Strength and Durability:
BORAFLAME fire-retardant-treated lumber was tested and evaluated in accordance with ASTM D5684 and ASTM D6541 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.

3.4 Corrosion:
The corrosion rate of carbon steel is not increased by the BORAFLAME fire-retardant-treated lumber when used as recommended by the manufacturer.


3.5 Hygroscopicity:
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 UCPA.

4.0 DESIGN AND INSTALLATION
4.1 General:
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.


4.2 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.]

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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 calculations shall be subject to the design value adjustment factors or span ratings shown in Table 1 above.
2. The design value adjustment factors given in this datasheet shall only be used for unincised dimensional lumber of the species noted above.
3. *Boraflame* fire-retardant-treated wood is limited to interior applications.
4. *Boraflame* fire-retardant-treated wood shall not be used in contact with the ground.
5. *Boraflame* fire-retardant-treated lumber shall not be ripped or milled as this will alter the surface-burning characteristics and invalidate the flame-spread classification.
6. Exposure to precipitation during storage or installation shall be avoided. If material does become wet, it shall be replaced.
7. The design value adjustment factors for lumber span in Table 1 above are applicable under elevated temperatures resulting from cyclic climatic conditions. They are not applicable under continuous elevated temperatures resulting from manufacturing or other processes which shall require special consideration in design, which is not in the scope of this technical specification sheet.

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