

## ICC Design No. IFRM-1191-04

**ESL-1191**

*Issued November 2019*

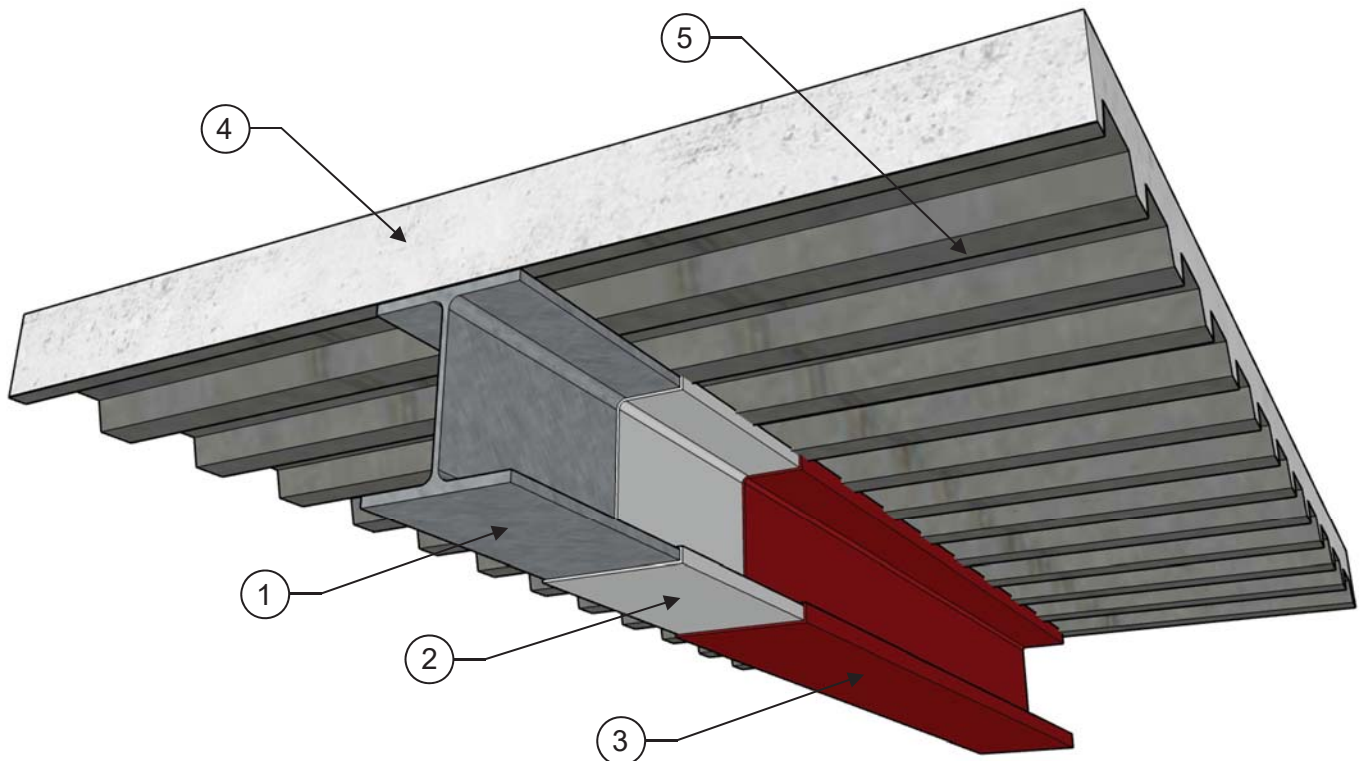
*Revised September 2021*

*This listing is subject to renewal November 2021.*

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**Applicant:** FLAMEOFF COATINGS, INC.  
**Product:** FLAMEOFF® FIRE BARRIER PAINT  
**Standard:** ASTM E119 (UL 263) / CAN/ULC-S101  
**Structural Shape:** W-Shape (H-section or I-section) Beams



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**COMPONENTS OF CONSTRUCTION:**

1. **Structural Steel Beams** – Wide flange steel beams (H-section or I-section) with  $H_p/A$  or  $W/D$  section factors based on exposure on three sides. Beams shall be free of dirt, loose scale, and oil before application of metal alkyd primer.
2. **Primer Coating** – Structural steel to be primed with a layer of an alkyd metal primer with an average applied dry film thickness of 3.1 mils (0.08 mm). Primed surface shall be cleaned, dried, and free of dirt, loose scale, grease, oil, and any contaminant that would inhibit bonding of the FlameOff® Barrier Paint to the primer.
3. **FlameOff® Fire Barrier Paint** – Coating applied in accordance with manufacturer's instructions to the minimum dry film thicknesses shown in IFRM-1191-04 Tables 1 and 2 based on the beam section factor (exposure on three sides) and fire resistance period. Coating thicknesses may be interpolated between section factors at the same fire resistance period. Extrapolation beyond the minimum and maximum section factors and fire resistance periods is not permitted.
4. **Concrete** – Minimum thickness over the steel deck and form unit crests must be 2½-inch-thick (63.5 mm) and have a minimum 3,000 psi (20.7 MPa) compressive strength and unit weight of  $145 \pm 3$  pcf ( $2323 \pm 48$  kg/m<sup>3</sup>).
5. **Steel Deck or Floor Units** – Minimum 2-inch (50.8 mm) deep galvanized fluted units with a nominal thickness of 0.039-inch (0.99 mm); welded to the structural steel beam.
6. **Shear Stud Connectors (Not Shown)** – (Optional) Headed type or equivalent per AISC Specification. Connectors must be welded to the top flange of the structural steel beam through the steel decking. Studs shall be designed and installed in accordance with AISC guidelines to provide composite action (between structural steel beam and concrete deck), as required.
7. **Mineral Wool Insulation (Not Shown)** – Flute spaces between the structural steel beam and the steel deck shall be completely filled with mineral wool insulation having a minimum density of 6.15 pcf (98.5 kg/m<sup>3</sup>).

**IFRM-1191-04 TABLE 1 – MINIMUM COATING THICKNESS FOR A W-SHAPE (H- OR I-SECTION) BEAM SECTION FACTOR TO ACHIEVE ESTIMATED FIRE RESISTANCE PERIOD (UNRESTRAINED BEAM RATING).**

| Unrestrained Beam Rating   |                  |                              |        |      |         |
|----------------------------|------------------|------------------------------|--------|------|---------|
| Section Factor             |                  | Fire Resistance Period (min) |        |      |         |
| Hp/A<br>(m <sup>-1</sup> ) | W/D<br>(lbs./in) | 60                           |        | 90   |         |
|                            |                  | Thickness in mm (mils)       |        |      |         |
| 70                         | 1.91             | 1.19                         | (46.8) | 1.84 | (72.5)  |
| 80                         | 1.67             | 1.19                         | (46.8) | 1.84 | (72.5)  |
| 90                         | 1.49             | 1.19                         | (46.8) | 1.84 | (72.5)  |
| 100                        | 1.34             | 1.25                         | (49.3) | 1.95 | (76.7)  |
| 110                        | 1.22             | 1.31                         | (51.7) | 2.05 | (80.8)  |
| 120                        | 1.12             | 1.37                         | (54.1) | 2.16 | (84.9)  |
| 130                        | 1.03             | 1.44                         | (56.5) | 2.26 | (89.0)  |
| 140                        | 0.96             | 1.50                         | (58.9) | 2.37 | (93.1)  |
| 150                        | 0.89             | 1.56                         | (61.3) | 2.47 | (97.2)  |
| 160                        | 0.84             | 1.62                         | (63.7) | 2.57 | (101.3) |
| 168                        | 0.80             | 1.67                         | (65.7) | 2.66 | (104.6) |
| 170                        | 0.79             | 1.68                         | (66.2) | 2.68 | (105.5) |
| 180                        | 0.74             | 1.74                         | (68.6) | 2.78 | (109.6) |
| 190                        | 0.71             | 1.80                         | (71.0) | 2.89 | (113.7) |
| 194                        | 0.69             | 1.83                         | (72.0) | 2.93 | (115.3) |
| 200                        | 0.67             | 1.86                         | (73.4) | -    | ( - )   |
| 210                        | 0.64             | 1.93                         | (75.8) | -    | ( - )   |
| 220                        | 0.61             | 1.99                         | (78.2) | -    | ( - )   |
| 230                        | 0.58             | 2.05                         | (80.7) | -    | ( - )   |
| 240                        | 0.56             | 2.11                         | (83.1) | -    | ( - )   |
| 250                        | 0.54             | 2.17                         | (85.5) | -    | ( - )   |

For SI: 1 inch = 25.4 mm, 1 inch = 1000 mils

**IFRM-1191-04 TABLE 2 – MINIMUM COATING THICKNESS FOR A W-SHAPE (H- OR I-SECTION) BEAM SECTION FACTOR TO ACHIEVE ESTIMATED FIRE RESISTANCE PERIOD (RESTRAINED BEAM RATING).**

|                            |                  | Restrained Beam Rating       |        |      |        |      |         |
|----------------------------|------------------|------------------------------|--------|------|--------|------|---------|
| Section Factor             |                  | Fire Resistance Period (min) |        |      |        |      |         |
| Hp/A<br>(m <sup>-1</sup> ) | W/D<br>(lbs./in) | 60                           |        | 90   |        | 120  |         |
|                            |                  | Thickness in mm (mils)       |        |      |        |      |         |
| 70                         | 1.91             | 0.97                         | (38.2) | 1.36 | (53.6) | 2.32 | (91.2)  |
| 80                         | 1.67             | 0.97                         | (38.2) | 1.36 | (53.6) | 2.32 | (91.2)  |
| 90                         | 1.49             | 0.97                         | (38.2) | 1.36 | (53.6) | 2.32 | (91.2)  |
| 100                        | 1.34             | 1.03                         | (40.6) | 1.42 | (56.0) | 2.38 | (93.6)  |
| 110                        | 1.22             | 1.09                         | (43.0) | 1.48 | (58.5) | 2.44 | (96.0)  |
| 120                        | 1.12             | 1.15                         | (45.5) | 1.55 | (60.9) | 2.50 | (98.4)  |
| 130                        | 1.03             | 1.22                         | (47.9) | 1.61 | (63.3) | 2.56 | (100.8) |
| 140                        | 0.96             | 1.28                         | (50.3) | 1.67 | (65.7) | 2.62 | (103.2) |
| 150                        | 0.89             | 1.34                         | (52.7) | 1.73 | (68.1) | 2.68 | (105.7) |
| 160                        | 0.84             | 1.40                         | (55.1) | 1.79 | (70.5) | 2.74 | (108.1) |
| 168                        | 0.80             | 1.45                         | (57.1) | 1.84 | (72.5) | 2.79 | (110.0) |
| 170                        | 0.79             | 1.46                         | (57.5) | 1.85 | (72.9) | -    | ( - )   |
| 180                        | 0.74             | 1.52                         | (60.0) | 1.91 | (75.4) | -    | ( - )   |
| 190                        | 0.71             | 1.58                         | (62.4) | 1.98 | (77.8) | -    | ( - )   |
| 194                        | 0.69             | 1.61                         | (63.3) | 2.00 | (78.7) | -    | ( - )   |
| 200                        | 0.67             | 1.65                         | (64.8) | -    | ( - )  | -    | ( - )   |
| 210                        | 0.64             | 1.71                         | (67.2) | -    | ( - )  | -    | ( - )   |
| 220                        | 0.61             | 1.77                         | (69.6) | -    | ( - )  | -    | ( - )   |
| 230                        | 0.58             | 1.83                         | (72.0) | -    | ( - )  | -    | ( - )   |
| 240                        | 0.56             | 1.89                         | (74.4) | -    | ( - )  | -    | ( - )   |
| 250                        | 0.54             | 1.95                         | (76.9) | -    | ( - )  | -    | ( - )   |

For SI: 1 inch = 25.4 mm, 1 inch = 1000 mils

Footnote: Empty cells (" - ") indicate unknown performance of coating thickness.