



SHIELD INDUSTRIES, INC.

FORCEFIELD® FIREGUARD E-84® INTUMESCENT COATING

CSI Section:

- 09 96 46 Intumescent Paints
- 09 96 43 Fire-retardant Coatings
- 09 07 13 Steel Coatings
- 09 29 82 Gypsum Fireproofing
- 09 07 23 Fire-resistant Concrete and Masonry Coatings

1.0 RECOGNITION

ForceField® FireGuard E-84® Intumescent Coating has been evaluated for use as a thin film intumescent coating that creates a fire retardant and fire-resistant barrier on a wide range of building surfaces as described in this evaluation report. The intumescent coating has been evaluated for durability and fire performance. Tables 1 and 2 of this report summarize the associated performance data for each application of intumescent coating. ForceField® FireGuard E-84® Intumescent Coating evaluated in this report is a satisfactory alternative to the following codes and regulations:

- 2015, 2012, 2009, and 2006 International Building Code® (IBC)
- 2015, 2012, 2009 and 2006 International Residential Code®(IRC)
- 2015, 2012, 2009 and 2006 International Existing Building Code®(IEBC)

2.0 LIMITATIONS

Use of the ForceField® FireGuard E-84® Intumescent Coating recognized in this report is subject to the following:

2.1 The coating shall be applied in accordance with this report, the manufacturer’s instructions and the applicable code. In the event of a conflict between the manufacturer’s instructions and this report, the more restrictive shall prevail.

2.2 Application is limited to the substrates documented in this report.

2.3 The ForceField® FireGuard E-84® Intumescent Coating shall be applied to areas within the weatherproofing membrane or surfaces not exposed to weather. ForceField® FireGuard E-84® Intumescent Coating shall not be applied to interior steelwork or substrates that will be exposed to freezing and thawing cycling or long-term surface temperatures over 140°F (60°C) in normal use.

2.4 Coatings shall be applied by a trained and qualified applicator in accordance with Section 3.3 of this report.

2.5 For fire resistance, the ForceField® FireGuard E-84® Intumescent Paint qualified applicator shall affix a ForceField® FireGuard E-84® Intumescent Coating issued label to the substrate where the coating has been applied; at a minimum, one ForceField® FireGuard E-84® issued label shall be affixed every 10,000 ft² (929 m²) of surface area (See Figure 1).

3.0 PRODUCT USE

3.1 General: ForceField® FireGuard E-84® Intumescent Coating complies with IBC®, IRC® and IEBC® for use in new and existing buildings. Applied to the substrates listed in Tables 1 and 2 of this report, ForceField® FireGuard E-84® Intumescent Coating provides the following attributes:

1. Fire resistance ratings in accordance with Section 4.2 of this report.
2. Surface burning characteristics in accordance with Section 4.3 of this report.

The water-based intumescent coating is designed for the fire protection on a wide range of building surfaces as described in this evaluation report. The thin film intumescent coating creates a fire retardant and fire resistant barrier when applied over concrete masonry, gypsum/wood/OSB, steel and PVC.

3.2 Design: ForceField® FireGuard E-84® Intumescent Coating shall be applied at coats of up to 25-30 mils (0.64 to 0.76 mm) per coat (wet thickness) in a minimum of two coats at various final thicknesses. The minimum total thickness required for the intumescent coating is shown in Tables 1 and 2 of this report.

3.3 Installation:

3.3.1 General: ForceField® FireGuard E-84® Intumescent Coating has a dry film thickness of 13.5 to 16.2 mils (0.34 to 0.41 mm) per coat and have a solids content of 54 percent.

3.3.2 Substrate Preparation: Prior to application, the substrate surface needs to be cleaned by removing all oil, grease, or any loose particles that may interfere with the bond of ForceField® FireGuard E-84® Intumescent Coating.

Concrete, masonry and steel substrates shall be primed with a compatible primer. Drywall substrates are recommended to be primed. For existing/used wood substrates, old and dried out wood shall be scraped and the surface primed.

3.3.3 Mixing and Thinning: A 0.5-inch (12.7 mm) diameter electric or air driven drill with a slotted paddle mixer (300 rpm under load) is required to mix the ForceField® FireGuard E-84® Intumescent Coating Mix material for a minimum of five minutes to achieve the necessary texture required. These products shall not be thinned or tinted.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.





3.3.4 Airless Spray: ForceField® FireGuard E-84® Intumescent Coating may be airless sprayed onto their approved substrate. A single coat, built up with a number of quick passes, allows greater control over quantities, thickness, and finish. A minimum of two coats shall be applied to achieve the final thickness.

3.3.5 Brushed or Rolled: ForceField® FireGuard E-84® Intumescent Coating may be brushed or rolled on their approved substrate. Brushing and rolling generally create an 11 to 12 mil wet application. Multiple coats will be required to meet specifications to the job requirements. Each coat shall cure for the required minimum cure time of 24 hours before applying the next coat.

3.3.6 Application Rates: Table 3 of this report lists application rates of each paint.

3.3.7 Wet Film Thickness: Table 3 of this report lists wet thicknesses for each application rate. Frequent thickness measurements with a wet film gauge are recommended during the application process to ensure uniform thickness.

3.3.8 Dry Film Thickness: Tables 1 and 2 of this report lists the dry film thicknesses for each use and Table 3 of this report provides dry film thickness measurement procedures.

3.3.9 Equipment Guidelines: Listed below are the general equipment guidelines for the application of this product when spray applied:

| | |
|----------------------|---|
| Airless Spray | Airlessco LP540 or equivalent |
| Spray Gun | Standard airless spray gun |
| Spray Tips | 0.019-0.021 in. |
| Fan Size | 4-10 in. (depending on section being sprayed) |
| Hose Length | 150 ft (45 m) |
| Material Hose | 3/8 in. (9.25 mm) I.D. minimum |
| Whip Hose (optional) | 1/4 in. (6.35 mm) I.D. minimum |

3.3.10 Primer: Table 2 of this report summarizes the primer requirements.

3.3.11 Application Conditions: During application, the coating shall be a minimum of 70°F (21°C) and a maximum of 100°F (38°C), the substrate surface shall be a minimum of 50°F (10°C) and a maximum of 125°F (52°C), and the ambient temperature shall be a minimum of 50°F (10°C) and a maximum of 110°F (43°C). Also, the substrate surface temperature should be a minimum of 5°F (3°C) above the dew point. The ambient humidity shall be a minimum of 0 percent and a maximum of 85 percent. ForceField® FireGuard E-84® Intumescent Coating shall be protected from exposure to weather and protected from freezing.

3.3.12 Curing Schedule: For surface temperatures of 77°F (25°C) at 50 percent relative humidity, the minimum drying time before recoating is 24 hours. It is recommended to apply one coat per day. Drying time will vary with temperature.

Thinner coats as well as air movement will reduce drying times. Another coat of ForceField® FireGuard E-84® Intumescent Coating may be applied when the previous coat has a Shore D hardness of 50 measured at 70°F (2°C). The paint may be top coated when a hardness of 60 is achieved after 4 to 5-day cure time.

3.4 Inspections: Under the IRC, other inspections may be required when determined to be necessary by the code official in accordance with Section R109.1.5 of the 2015, 2012, 2009 and 2006 IRC®.

Under the IBC, special inspection shall be required when determined to be necessary by the code official in accordance with Section 1705.1.1 of the 2015 and 2012 IBC® or Section 1704.15 of the 2009 IBC® or 1704.13 of the 2006 IBC®. A statement of special inspection in accordance with Section 1704.2.3 of the 2015 and 2012 IBC® or 1705 of the 2009 or 2006 IBC® shall be submitted.

4.0 PRODUCT DESCRIPTION

4.1 Product information

4.1.1 General: ForceField® FireGuard E-84® Intumescent Coating is a water-based liquid, packaged in 5-gallon (18.9 L) pails, 55-gallon (208 L) drums, and totes. The coating has a shelf life of 14 months from the time of purchase when stored in unopened original containers between 33°F and 100°F (1°C and 38°C). Shipping weight is approximately 12 lbs. per gallon (1.44 kg/l).

The coating is white in color. The finish (depending on substrate conditions); is smooth and flat (except on gypsum/wood/OSB substrate).

4.1.2 Storage and Handling: The materials shall remain in the original unopened containers and packaging until installation. The materials shall be stored indoors out of direct sunlight in a clean and dry location at temperatures between 33°F and 100°F (1°C and 38°C).

4.2 Fire Resistance: As listed in Table 2 of this report, ForceField® FireGuard E-84® Intumescent Coating provides fire resistance ratings to the substrate at the thickness specified, when tested in accordance with ASTM E119, NFPA 251, UL 263, ULC-101, as well as ASTM E2226 for concrete masonry.

4.3 Surface Burning Characteristics: As listed in Table 1 of this report, ForceField® FireGuard E-84® Intumescent Coating provides Class A interior finish in accordance with Section 803.1 of the IBC when applied to the substrate at the thickness specified when tested in accordance with ASTM E84.

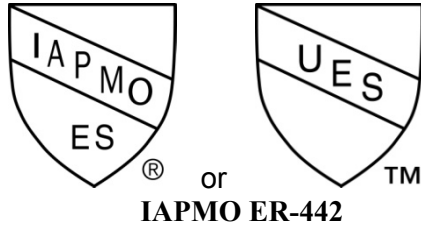


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5.0 IDENTIFICATION

ForceField® FireGuard E-84® Intumescent Coating identified by the Shield Industries, Inc. name and trademark, product name, and evaluation report number (ER-442). The identification shall also include the IAPMO Uniform Evaluation Service Mark of Conformity. Either Mark of Conformity may be used as shown below:



8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on ForceField® FireGuard E-84® Intumescent Coating to assess their conformance to the codes shown in Section 1.0 of this report and documents the product’s certification.

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6.0 SUBSTANTIATING DATA

6.1 Manufacturer’s descriptive literature and installation instructions. Test results are from laboratories in compliance with ISO/IEC 17025.

6.2 Report of Fire Propagation Characteristics testing and analysis in accordance with ASTM E-119, NFPA 251, UL 263, ULC-101, and ASTM E2226.

6.3 Report of testing for Surface Burning Characteristics in accordance with ASTM E84.

6.4 IAPMO UES EC017, Evaluation Criteria for Field-Applied Fire Protective Coatings.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

7.0 CONTACT INFORMATION

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Table 1 - Class A Interior Finish

Shield Industries, Inc. - FireGuard E-84 Intumescent Coating

| Substrate | Material Application Thickness (Mils) | | Coverage Rate (ft ² /gal) | Rating |
|------------------------|---------------------------------------|-----|--------------------------------------|---------|
| | Dry | Wet | | |
| S. Yellow Pine Plywood | 15 | 28 | 57.73 | Class A |
| Oriented Strand Board | 24 | 45 | 36.08 | Class A |
| PVC | 15 | 28 | 57.73 | Class A |
| PVC | 30 | 56 | 28.86 | Class A |

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.093 m², 1 gallon = 3.78 liters



Table 2 – Fire Resistance Ratings

Shield Industries, Inc. - FireGuard E-84 Intumescent Coating

Gypsum Wall (Wood / Steel Stud)- Non-Top Coated (Non-Loadbearing)

| Assembly Type (See Note 1) | Material Application Thickness (mils) | | Coverage Rate (ft ² /gal) | Rating (Hours) |
|-------------------------------|--|-----|---|-------------------|
| | Dry | Wet | | |
| ½ inch Gypsum | 11 | 21 | 78.72 | 2 |
| 5/8 inch Gypsum | 11 | 21 | 78.72 | 2 |
| 5/8 inch Type X | 11 | 21 | 78.72 | 2 |
| ½ inch Gypsum | 10 | 19 | 86.6 | 1 |
| 5/8 inch Gypsum | 10 | 19 | 86.6 | 1 |
| 5/8 inch Type X | 10 | 19 | 86.6 | 1 |

Gypsum Wall (Wood / Steel Stud)- Top Coated (Non-Loadbearing)

| Assembly Type (See Note 2) | Material Application Thickness (mils) | | Coverage Rate (ft ² /gal) | Rating (Hours) |
|-------------------------------|--|-----|---|-------------------|
| | Dry | Wet | | |
| ½ inch Gypsum | 25 | 47 | 34.64 | 2 |
| 5/8 inch Gypsum | 25 | 47 | 34.64 | 2 |
| 5/8 inch Type X | 25 | 47 | 34.64 | 2 |
| ½ inch Gypsum | 19 | 36 | 45.57 | 1 |
| 5/8 inch Gypsum | 19 | 36 | 45.57 | 1 |
| 5/8 inch Type X | 19 | 36 | 45.57 | 1 |

Plywood Wall (Wood Stud) - Non-Top Coated (Non-loadbearing)

| Assembly Type (See Note 3) | Material Application Thickness(mils) | | Coverage Rate | Rating (Hours) |
|-------------------------------|---|-----|---------------|-------------------|
| | Dry | Wet | | |
| ¾ inch Plywood | 25 | 47 | 34.64 | 2 |

Enclosed Floor / Ceiling

| Assembly Type (See Note 4) | Material Application Thickness(mils) | | Coverage Rate (ft ² /gal) | Rating (Hours) |
|-------------------------------|---|-----|---|-------------------|
| | Dry | Wet | | |
| ½ inch Gypsum | 25 | 47 | 34.64 | 1 |
| 5/8 inch Gypsum | 25 | 47 | 34.64 | 1 |
| 5/8 inch Type X | 25 | 47 | 34.64 | 1 |

Combination Floor / Ceiling

| Assembly Type | Material Application Thickness(mils) | | Coverage Rate (ft ² /gal) | Rating (Hours) |
|---------------|---|-----|---|-------------------|
| | Dry | Wet | | |
| See Note 5 | 30 | 56 | 28.86 | 1 |

Open Floor / Ceiling

| Assembly Type (See Note 5) | Material Application Thickness | | Coverage Rate (ft ² /gal) | Rating (Hours) |
|-------------------------------|-----------------------------------|-----|---|-------------------|
| | Dry | Wet | | |
| See Note 5 | 30 | 56 | 28.86 | 1 |

| | | | | |
|--|----|----|-------|-----------------------------|
| 2015 IRC R301.13 Exception 4 / 2012 IRC® R5013.3 Exception 4 | 25 | 47 | 34.64 | Equivalent to ½-inch Gypsum |
|--|----|----|-------|-----------------------------|



Table 2 – Fire Resistance Ratings (cont.)

| Structural Steel - Members | | | | |
|---|--|------------|---|---------------------------|
| Assembly Type (Note 6) | Material Application Thickness (mils) | | Coverage Rate (ft²/gal) | Rating (Hours) |
| | Dry | Wet | | |
| Heavy Weight Steel Columns > 25 LBS / LFT | 60 | 112 | 14.43 | 2 |
| Heavy Weight Steel Beams > 25 LBS / LFT | 60 | 112 | 14.43 | 2 |
| Medium Weight Steel Columns 10-25 LBS / LFT | 60 | 112 | 14.43 | 2 |
| Medium Weight Steel Beams 10-25 LBS / LFT | 60 | 112 | 14.43 | 2 |
| Light Weight Steel Columns <10 LBS / LFT | 60 | 112 | 14.43 | 1.5 |
| Light Weight Steel Beams <10 LBS / LFT | 60 | 112 | 14.43 | 1.5 |
| Heavy Weight Steel Columns > 25 LBS / LFT | 35 | 65 | 24.74 | 1 |
| Heavy Weight Steel Beams > 25 LBS / LFT | 30 | 56 | 28.86 | 1 |
| Medium Weight Steel Columns 10-25 LBS / LFT | 40 | 75 | 21.65 | 1 |
| Medium Weight Steel Beams 10-25 LBS / LFT | 30 | 56 | 28.86 | 1 |
| Structural Steel – Floor / Ceiling / Roof | | | | |
| Assembly Type | Material Application Thickness (mils) | | Coverage Rate (ft²/gal) | Rating (Hours) |
| | Dry | Wet | | |
| No. 22 Ga. 1.5-inch Steel Deck - Minimum 10-inch Steel Joist ⁷ | 45 on deck and joist | 84 | 19.24 | 1 |
| No. 22 Ga. 1.5-inch Steel Deck - HW Beam | 30- Beam | 56 | 28.86 | 1 |
| | 45- Deck | 84 | 19.24 | |
| No. 22 Ga. 1.5-inch Steel Deck - MW Beam | 30- Beam | 56 | 28.86 | 1 |
| | 45-Deck | 84 | 19.24 | |
| No. 22 Ga. 1.5-inch Steel Deck - MW Beam | 30 - Beam | 56 | 28.86 | 1 |
| | 45-Deck | 84 | 19.24 | |
| No. 22 Ga. 1.5-inch Steel Deck - LW Beam | 60- Beam | 112 | 14.43 | 1 |
| | 45-Deck | 84 | 19.24 | |
| No. 22 Ga. 1.5-inch Steel Deck w/ min. 2" Concrete Slab – Bar Joist ⁷ | 45- Bar Joist | 84 | 19.24 | 1 |
| No. 22 Ga. 1.5-inch Steel Deck w/ min. 2" Concrete Slab – HW Beam | 30 - Beam | 56 | 28.86 | 1 |
| No. 20 Ga. 3/4-inch Steel Deck w/ min. 2.5" Concrete Slab and minimum 8k Bar Joists | 45- Bar joist | 84 | 19.24 | 1 |
| | 10-Deck | 19 | 86.6 | |
| No. 20 Ga. 3/4-inch Steel Deck w/ min. 2.5-inch Concrete Slab – HW Beam | 30-Beam | 56 | 28.86 | 1 |
| | 10-Deck | 19 | 86.6 | |



Table 2 – Fire Resistance Ratings (cont.)

| Structural Steel – Floor / Ceiling / Roof (cont.) | | | | |
|---|---------------------------------------|-----|--------------------------------------|----------------|
| Assembly Type | Material Application Thickness (mils) | | Coverage Rate (ft ² /gal) | Rating (Hours) |
| | Dry | Wet | | |
| No. 22 Ga. 1.5-inch Steel Deck w/ min. 2" Concrete Slab – Beam | 60- Beam | 112 | 14.43 | 2 |
| | 45-deck | 84 | 19.24 | |
| No. 22 Ga. 1.5-inch Steel Deck w/ min. 4.5" Concrete Slab Beam / Bar Joist ⁷ | 60- Beam | 112 | 14.43 | 2 |
| | 60-Bar Joist | 112 | 14.43 | |
| Concrete/ Masonry – Wall (Non-loadbearing) | | | | |
| Assembly Type | Material Application Thickness (mils) | | Coverage Rate (ft ² /gal) | Rating |
| | Dry | Wet | | |
| 4-inch Hollow CMU Wall | 50 | 93 | 17.32 | 1, 2, 3 |
| 6-inch Hollow CMU Wall | 50 | 93 | 17.32 | 2, 3 |
| 8-inch Hollow CMU Wall | 50 | 93 | 17.32 | 2, 3 |
| 10-inch Hollow CMU Wall | 50 | 93 | 17.32 | 3 |

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.093 m², 1 gallon = 3.78 liters

Notes:

- 2 X 4 wood studs spaced at 16 inches on center, fastened by 3-inch 10d common nails. 3½ inch fiberglass insulation is applied between studs. The gypsum board is fastened with 1⁵/₈-inch course thread drywall screws spaced at 7 inches on center.
- 2 X 4 wood studs spaced at 16 inches on center, fastened by 3-inch 10d common nails. 3 ½ inch fiberglass insulation. The gypsum board is fastened with 1⁵/₈-inch course thread drywall screws spaced at 7 inches on center.
- 2 X 4 Wood studs spaced at 16 inches on center with ¼-inch plywood on exposed face and ½-inch gypsum board on unexposed side with fiberglass insulation. 1 5/8-inch course thread drywall screws spaced 7 inches on center were used to fasten the gypsum board.
- Minimum 2 x 6 wood joists spaced 16 inches on center with 6-inch thick R-13 fiberglass insulation; ¾-inch OSB subflooring fastened with 1⁵/₈ inch screws and ½-inch gypsum board at ceiling 1⁵/₈ inch screws spaced at 8 inches o.c.
- 2 X 8 wood joists spaced at 16 inches on center, subfloor ¾-inch x 6-inch tongue and groove oak flooring.
- Heavy Weight Steel: Minimum 8-inch WF24 steel
Medium Weight Steel: Minimum 6-inch Steel Pipe
Light Weight Steel: Minimum 3-inch x 3-inch Steel Square Tubing
- Minimum joist sizes required are 10J4, 10H4, 12J4, 14J7 or 14K4.



TABLE 3 – PRODUCT INSTALLATION SPECIFICATIONS

| Substrate | Coverage Rates | Application Rates* | Dry Film Thickness | Primer |
|------------------|--|--|---|---|
| Concrete Masonry | 866 ft ² /gal at 1 mil 86 ft ² /gal at 10 mil 28.9 ft ² /gal at 30 mil 17.3 ft ² /gal at 50 mil | Up to 25-30 mil wet per coat depending on application and method (roll, brush, and spray), 24 hour recoat time between coats, 1 coat per day | Measured using an electronic dry film gauge. For method, refer to AWCI Technical Manual 12-B | Required, water-based styrene resin, comparable to Behr 436 |
| PVC | 866 ft ² /gal at 1 mil 86 ft ² /gal at 10 mil 28.9 ft ² /gal at 30 mil | Max 40 mil per coat depending on application method, 1 coat per day | Measured using an electronic dry film thickness gauge. For method, refer to AWCI Technical Manual 12-B | NA |
| Steel | 866 ft ² /gal at 1 mil 86 ft ² /gal at 10 mil 28.9 ft ² /gal at 30 mil | Up to 25-30 mil wet coat depending on application method (roll, brush, and spray), 24 hour recoat time between coats, 1 coat per day | Final thickness shall be measured using an electronic dry film thickness gauge such as a PosiTector 6000. For method, refer to AWCI Technical Manual 12-B | Shall be applied over a compatible primer (ALKYD, EPOXY). Generally not recommended for primers with zinc metals. |
| Gypsum/Wood/OSB | 866 ft ² /gal at 1 mil 86 ft ² /gal at 10 mil 28.9 ft ² /gal at 30 mil | Up to 25-30 mil wet per coat depending on application method (roll, brush, and spray), 1 coat per day | Final thickness shall be measured using an electronic dry film thickness gauge. PosiTector 200 or equivalent may be used. Wet mil thickness dries to 54% | May be used as a finished coat primer. |

Figure 1 – Substrate Label

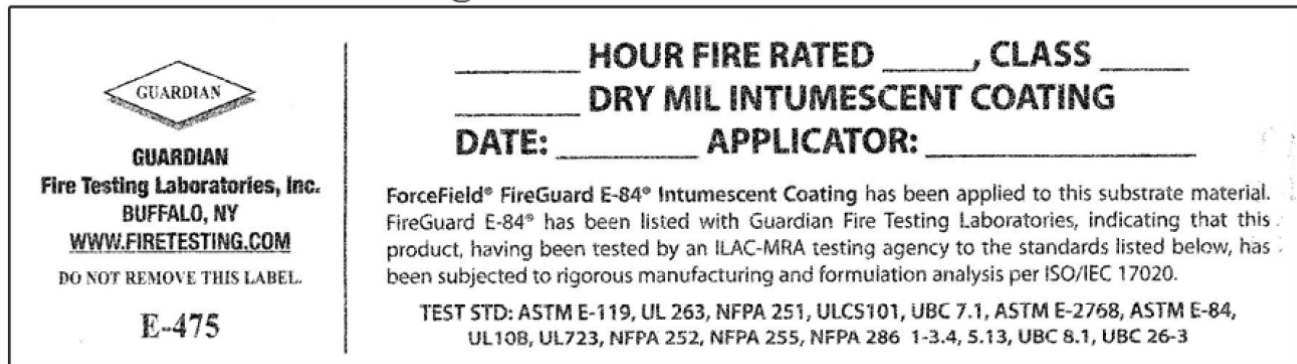


Figure 2 – Wet Film Thickness Gauge

