Fire Technology To A Higher Power™

ICC-ES ESR-3997

FIRESHELL™ F10E

Technical Data Sheet

PRODUCT NAME

FireShell® F10E is a proprietary thermal barrier coating manufactured by TPR² Corporation with the following equivalent part numbers and trade names.

- FireShell TB
- FireShell JMTC
- FireShell BMSTC
- Blazelok TBX (trademark of Demilec Inc.)

MANUFACTURER

FireShell® F10E is manufactured in the U.S. exclusively by:

TPR² Corporation
36 Plains Road Essex, CT 06426

PRODUCT DESCRIPTION

FireShell® F10E is a water-based, single-component, non-flammable, intumescent, interior coating designed to expand in the event of a fire to provide a protective layer of char that could starve fire of oxygen and prevent flame contact with protected surfaces. It is a non-toxic, drain-safe and non-fuming product.

FireShell® F10E complies with building code requirements for use as an alternative thermal barrier coating system over most SPF insulation systems as per ICC-ES ESR 3997 available at http://www.tpr2.com/ or http://www.icc-es.org/

FireShell® F10E has low-viscosity for ease of application and can be top coated with latex paint per ESR 3997 approvals. Consult your TPR² representative for details.

Applications for FireShell® F10E include:

- Walls, Attics, Crawl Spaces
- Open cell SPF insulation
- Closed cell SPF insulation
- FRP Panel Systems

FireShell® F10E has passed a multitude of combustion and fire safety tests and carries many building code, industrial, and environmental approvals including:

- Meets IBC 803.1.2.1 for interior surfaces
- Meets IBC 2603.9 over SPF
- Meets IRC R316.6 over SPF
- Meets IRC R302.9.4 for interior surfaces
- E84 Class 'A' rated
- LEED Certified Green Product
- Meets EPA Low-VOC Standard
- FM 4975 Listed Fire-Retardant Paint Over Combustible Surfaces

LIQUID PROPERTIES & PHYSICAL CHARACTERISTICS

Property	Value	Test Method
Viscosity:	110-140 KU	ASTM D562
Solids % by Volume:	68% (+/- 3%)	ASTM D2697
Weight Per Gallon:	11.5 lbs. (+/- 0.3)	ASTM D1475
VOC:	<50 g/L	Method 24
Vapor Permeance:	<1.0 perm (Class 3) at 13 mils DFT	ASTM E96
Toxicity/Solvents:	Non-toxic, water-based	
Mold & Fungus Resistance:	10 – no mold growth	ASTM 3273
Shelf Life:	1 year from date of manufacture if stored 45 -100 ºF	
Colors:	White, Gray, Charcoal Black, Tintable by mfg. upon request	
Packaging	5-gal pail or 55-gal drum	
Storage Temperature Range (STR)	> 45 ºF	

PROCESSING & EQUIPMENT PARAMETERS

Cure Time Table

Substrate:	50 ºF	60 ºF	70 ºF	80 ºF	90 ºF
Tack Free:	1 hr. 30 min.*	1 hr. 30 min.*	1 hr. 15 min.*	1 hr.*	45 min.*
Hard:	1 hr. 45 min.*	1 hr. 45 min.*	1 hr. 30 min.*	1 hr. 15 min.*	1 hr.*
Recoat:	2 hr. 30 min.*	2 hr. 15 min.*	2 hr.*	2 hr.*	1 hr. 45 min.*
Thickness:	18-20 WFT	18-20 WFT	18-20 WFT	18-20 WFT	18-20 WFT

Tested independently by third party laboratory.

Property	Value
Sag Resistance:	34 mils on walls; 24 mils on ceilings*
Processing Pressure:	>2200 PSI at the gun tip*
Minimum Material Temperature:	>62 ºF
Ambient Temperature Range:	50 - 95 ºF
Minimum Substrate Temperature:	50 ºF
Ambient RH% Range:	40% – 60% (requires < 70%)
Recommended Sprayer:	Graco 695 or equivalent (> 0.74 gpm delivery rate)
Recommended Gun:	Graco HD Texture Gun or equivalent
Recommended Tip Size:	.521 - .525 reversible, self-cleaning is recommended
Coverage:	80 – 92 sq. ft. per gal.**

COMBUSTION PROPERTIES

Property	Value	Test Method
Flame Spread Index:	<25	ASTM E-84
Smoke Development:	<50	ASTM E-84

**Drying times and processing parameters can vary depending on substrate, temperature and condition, elevation, humidity (static & dynamic), equipment, applicator technique, and other factors. During installation, the applicator must observe spray pattern, application thickness, and characteristics of the coating and adjust equipment setup and/or settings as needed to ensure proper cure time, adhesion, coverage, and performance of the coating.*

*** Refer to the TPR² product matrix and ICC-ES ESR 3997 available at http://www.tpr2.com/ or http://www.icc-es.org/ for required coverage rates for your specific SPF insulation product. Actual coverage rates may vary depending on the finished SPF surface texture.*

APPLICATION PROCEDURES

The successful installation and effectiveness of FireShell® F10E will depend on many factors including the equipment capabilities & settings, the

temperature of the coating in the container, ambient temperature & RH%, substrate temperature & moisture content, substrate type & condition. It is

the responsibility of the applicator to take these factors into consideration prior to installation.

Cold material will develop higher viscosity which

can cause problems during processing such as pump cavitation and poor pre-mixing material. If material appears thickened due to storage at cold temperatures, store material in a warm area prior to application to bring material temperature to > 62° F.

FireShell® F10E can be applied with airless spray equipment. Areas requiring special detail or touch up can be brushed or rolled.

When using airless spray equipment ensure the equipment has a volume output not less than 0.74 gpm (gallons per minute) and an operating pressure of 3300 psi. The sprayer should be equipped with a filter screen 30-mesh.

To ensure proper pressure and delivery to the spray gun use the following rules for hose diameter & length:

- Min. 3/8" ID up to 75'
- Min 1/2" ID up to 200'
- Min 3/4" ID greater than 200'
- Min 3/8" ID & Max 6' L for whip hose

Always use larger diameter hose sections nearest the pump.

We recommend using a Graco Reverse-A-Clean (RAC) X gun tip with no internal diffuser and an orifice size of .521 - .525.

ALWAYS USE EQUIPMENT AND COMPONENTS WITH THE PROPER PRESSURE AND MATERIAL DELIVERY RATINGS THAT ARE IN GOOD WORKING ORDER.

A natural bristle brush or a medium nap roller can be used for touch-up and edge work, or for small areas that are not practical for spray application.

Most SPF insulation systems can be coated in a single application to achieve building code compliance. Refer to the TPR² product matrix and ICC-ES ESR 3997 available at www.tpr2.com and www.icc-es.org for recommended coverage rates for your specific SPF insulation product.

Should your SPF product require more than one coat to comply with building code, individual coats of FireShell® F10E should be applied in perpendicular direction to the previous coat to achieve a cross-hatching application.

The maximum single-pass application rate for FireShell® F10E is 27 wet mils.

The actual dry film thickness achieved in the field application is dependent upon many variables including method of application, and surface textures. It is the sole responsibility of the coating applicator to apply the proper amount of material required to achieve the minimum dry film thickness specified for the given requirements for the project. To accurately achieve proper coverage applicator must check wet film thickness during application with a wet film gauge on multiple coupons evenly spaced throughout the project application area. Dry film thickness (DFT) is calculated from a measured wet film thickness (WFT) equation as follows:

- DFT = WFT x % solids by volume

To calculate your Theoretical Application Rate (TAR) in gallons per 100 square feet, use the following equation:

- TAR = (WFT)/16

DO NOT APPLY WHEN SUBSTRATE SURFACE IS BELOW 55 ºF, OR WHEN WEATHER CONDITIONS WILL NOT ALLOW ADEQUATE CURING OF THE COATING.

DO NOT APPLY IF RAIN, DEW, OR FREEZING TEMPERATURES ARE LIKELY TO OCCUR BEFORE PRODUCT CAN DRY AND CURE.

DO NOT APPLY WHEN AMBIENT TEMPERATURE IS WITHIN 5 °F OF THE DEW POINT OR IS EXPECTED TO BE WITHIN 5 °F OF THE DEWPOINT WITHIN 24 HOURS FOLLOWING APPLICATION.

STORAGE, MIXING & THINNING

FireShell® F10E is available in ready-to-use, factory-sealed, standard-sized, five-gallon pails or fifty-five-gallon drums. Other container sizes may be available upon request.

DO NOT ALLOW MATERIAL TO FREEZE.

Storage at temperatures below acceptable minimum storage temperature may shorten shelf life. Product warranty is void if material is stored below or above recommended storage temperature.

DO NOT THIN.

Prior to use thoroughly mix FireShell® F10E with an air or electrically driven power mixer for a minimum of 2-4 minutes or until product color and viscosity is uniform. Mixer speed should be set fast enough to uniformly mix the entire container but not so fast as to introduce air into the coating while mixing. For five-gallon pails use a minimum 3" mixing blade, for drums use a minimum 6" mixing blade.

Previously opened containers, or containers that have been stored for an extended length of time, may develop a skin on top of or at the edges of the coating, which must be removed prior to mixing.

SURFACE PREPARATION

SURFACE TEXTURE OF SPF WILL GREATLY AFFECT MATERIAL ADHESION, SAG RESISTANCE, AND COVERAGE RATE.

SPF surface should have a fine, orange-peel texture (or rougher), and be flat for optimum adhesion and material coverage. SPF surface that is bumpy, or significantly uneven will decrease coating coverage.

SPF that has a glossy or slick appearance may need to be abraded or "scuffed" to roughen the surface to promote adhesion of coating.

SPF surface must be clean, dry and free of any mildew, oil, grease, dirt, or other foreign contaminants that would prevent proper adhesion. Any such contaminants must be removed from the application surface.

For application in high humidity or low temperature environments apply product in thin passes to promote proper drying & curing.

SAFETY & ENVIRONMENT

FireShell® F10E is installed by independent contractors. It is recommended that building owners verify that your contractor maintains proper credentials, insurance, licenses, and is properly trained to safely install coatings.

FireShell® F10E achieves a Class A Fire rating. It is formaldehyde-free, halogen-free, low-VOC, HFC-free, and PBDE-free.

Always read and follow all job site safety requirements as set forth by state and federal safety regulatory agencies such as OSHA and NIOSH.

Always read and follow all Material Safety Data Sheets provided with all shipments. Additional copies are available upon request from TPR² or your technical representative.

Basic PPE safety equipment is required for personal protection including, but not limited to: long-sleeve chemically resistant overalls, rubber gloves, splash shield or safety glasses with splash guards, rubber or leather boots w/ covers.

DO NOT USE NEAR HIGH HEAT OR OPEN FLAME.

DO NOT TAKE INTERNALLY AND PREVENT CONTACT WITH SKIN OR EYES.

KEEP OUT OF THE REACH OF CHILDREN.

CURE TIME & RECOATING

FireShell® coatings are latex based. To ensure that successive coats are applied properly, it is important to understand how they dry and cure. As the coating dries, the liquid components evaporate. As liquid evaporates from the coating it becomes cured while the evaporated liquid becomes water vapor suspended in the air surrounding the coating.

The drying time between coats is normally longer than simply "dry to touch" or "tack-free", especially with thicker coating applications. "Dry to touch" or "tack-free" means you can touch a coated surface without getting paint on your hand. While this is a stage in the curing process, this indicates that the liquids have evaporated only from the surface of the paint, and does not mean that the coating is dry enough to add a second coat without creating significantly longer drying time.

Building a thick coating, intentionally or unintentionally, or spraying the coating over an uncured substrate may create problems in the drying and curing process. Until all the liquids have completed evaporated, the coating is not cured. Normal full cure time is 2-4 weeks. Once cured the coating becomes a durable and inert fire protective finish. Even under adverse application conditions, the coating will eventually cure; however, the noncompliant application procedure may affect adhesion quality, lingering odors, drying time, and the warranty of the coating.

ENVIRONMENTAL CONDITIONS & DRYING

Proper ambient air-movement, proper substrate and coating temperatures, and low humidity are necessary for proper adhesion and drying of the coating. The following example illustrates the drying potential of 10,000 ft.^{3} of air at various temperatures:

- 90 °F air can evaporate 2.6 gal of water
- 40 °F air can evaporate 0.5 gal of water

FireShell® coatings are approximately 68% solids which mean each five-gallon pail of coating contains roughly 1.5 gallons of water that must be evaporated from for the coating to dry and cure.

As a reference, an attic in a 1,600 ft.^{2} house with a gable roof that has an 8/12 pitch will have an attic volume of approximately 10,600 ft.^{3}. Based on the above illustrations, conditions in this attic would need to be extremely dry with an interior temperature more than 90 °F prior to coating application to be assured of proper drying of one five-gallon pail of coating.

Low temperatures or humidity over 70% RH in the attic prior, during, or after application can hinder drying of the coating and can produce lingering odors due to the slow evaporation of the liquid components.

Odors emitted from the coating as it dries should be similar to those found in low-odor latex paint. Under proper drying conditions these odors should quickly dissipate and not cause any lingering issues.

To avoid problems associated with improper drying of the coating always observe Application Procedures and product recommendations.

VENTILATION

Closed areas, such as unvented attics, will require mechanical, negative-pressure, cross ventilation during the spraying and drying period. Mechanical, negative-pressure, cross ventilation is the ONLY effective method of ventilating closed or confined spaces where coatings must be applied to ensure proper drying.

For ventilation, it is important to ensure you create negative pressure (vacuum) in the enclosed spray area to evacuate water vapor and any off-gassed components of either the SPF insulation system or coating to exterior, unoccupied space. This can be achieved using a whole-house ventilation technique outlined below:

- Review and observe all application parameters, product limitations & recommendations on the technical data sheet to ensure the work environment is suitable for the application of coating.
- Inspect the foam substrate to ensure it is dry, clean and secured to its substrate.
- Use a "supply" blower to draft fresh exterior air to one end of the enclosed space via a hose from the non-occupied exterior.
- Ensure the supply air flows across the immediate vicinity of the spray operation.
- Use an "exhaust" blower to evacuate the stale, moisture laden air from the opposite end of the enclosed space through a hose to the exterior of the building.
- The exhaust blower must have a larger air volume output than the supply blower to ensure the enclosed space is maintained at a negative pressure in relationship to the surround area.
- Do not arrange the ends of the hoses where the supply air is drafting air from the exhaust hose.
- Do not exhaust the stale air into any living space or garage area. It must be exhausted to a safe uninhabited open area.
- Place a filter over the exhaust hose to avoid spreading overspray.
- Ensure the lengths of supply and exhaust hoses and filter do not restrict the air movement.
- Constant monitoring of humidity and temperature is necessary until coating has dried thoroughly to ensure the spray environment remains within the application parameters specified on the coating technical data sheet. If the humidity exceeds 70% RH during the drying period while using mechanical, negative-pressure, cross-ventilation, then mechanical dehumidification may be required as supplementary drying aid until the coating is thoroughly dry.

DO NOT USE PROPANE, KEROSENE, OR DIESEL COMBUSTION HEATERS TO HEAT A CLOSED SPACE.

Burning fuels like this in a confined space depletes oxygen and can create a dangerous buildup of toxic gasses including CO and CO^2. Always observe OSHA and NIOSH regulations for using heaters in confined or closed spaces.

In addition, the process of burning fuels such as kerosene, propane, or diesel adds significant amounts of water vapor to the environment, which furthers hinders the evaporative drying process.

ADDITIONAL LIMITATIONS

FireShell® F10E should not be used for exterior applications.

It should not be used where it will stay submerged in water or below grade where back-fill material will be in permanent contact with the coating.

FireShell® F10E should not be used in areas that are or will be subjected to extreme temperature or

humidity conditions such as swimming pool rooms, car washes, hot yoga studios, spas, hot tubs, saunas, cold-storage, or other areas where temperatures or humidity levels may be abnormally high or low under normal use. Contact your TPR² representative if you have questions regarding other extreme use applications.

Installation must comply with all applicable building codes.

DISPOSAL & CLEAN UP

Consult Safety Data Sheets (SDS) prior to handling and disposal.

Cured product may be disposed of without restriction. Product containers that are "drip free" may be disposed of according to local, state and federal laws.

Spills or overspray during application can be cleaned/removed with soap and water for uncured material.

COLORS & FINISH

FireShell® F10E produces a flat finish when fully cured and comes in standard off-white, gray, and charcoal black.

Custom colors may be available for an additional fee. Minimum order quantities apply for all custom colors. Samples must be approved by customer prior to production. Contact your TPR² representative for more information.

DISCLAIMER

The information provide herein is believed to be reliable, but unknown risks may be present.

The data presented herein is subject to change without notice and is not intended for use by nonprofessional applicators, or those who do not purchase or utilize this product in the normal course of their business.

The contractor, building owner, and/or applicator are responsible to perform any pertinent tests to determine the product's suitability for the intended application.

The installer is responsible to adhere to all health and safety requirements including OSHA, NIOSH and any others that may have jurisdictional authority in the application area.

Final determination of fitness of the product for any particular use is the responsibility of the buyer.

WARRANTY

FIRESHELL® LIMITED MANUFACTUERS WARRANTY

TPR² Corporation (hereinafter referred to as the "TPR²") warrants that each Fireshell® Product (hereinafter referred to as the "Product"), will be free from defects and manufacture up until its expiration date. If the Product does not conform to this warranty, the sole and exclusive remedy shall be replacement of the Product. Except where prohibited by law, TPR² shall not be liable for any loss or damage arising from the Product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted.

TPR² shall not be responsible for defects or failures of the Product, when such was not installed by a properly trained installer, not applied in accordance with the Product documentation and testing or otherwise caused by improper installation of or damage due to fire, storms, floods, Acts of God, abuse, neglect or defects, failure or damage caused by materials adjacent to the Product, or damage caused by alteration after completion of installation of the Product or improper installation or preparation of the substrate.

Statements made by contractors, subcontractors and installers about the performance qualities of the Product or contained in advertising literature does not contain an expressed warranty.

Persons or entities making claims under this Limited Warranty must notify TPR² in writing of the defect promptly following its discovery and must submit with this notice, proof of the date of purchase, contractor who applied the Product and the date, location and description of the circumstances under which the defect occurred or was first noticed. Notice shall be given in writing to the below address.

TPR² Corporation
36 Plains Road Essex, CT 06426

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USEFUL TOOLS AND INSTRUMENTS

Whole-house ventilation blower and hose assembly. These items are available at many industrial supply and safety stores and online including Northern Tool and Equipment, (www.northerntool.com)

Uninsulated, flexible HVAC duct may be used for ducting the air into and from the workspace as a convenient and inexpensive alternative to the hose assembly pictured above.

A hand-held temperature and moisture meter like the Fluke 971 pictured is an ideal instrument for monitoring the workspace environment to ensure it is within acceptable spraying and application parameters. This instrument is available from several online sources.

If mechanical dehumidification is required to enable drying. A standard household or commercial dehumidifier like the Ebac RM85 shown below can be used until the coating is thoroughly dry. Typically, mechanical dehumidification will be required continuously for several days after coating application and units like the one below are often available for rent at an industrial rental store or can be purchased online.