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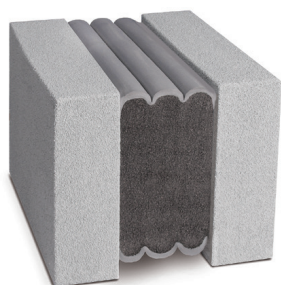


PRODUCT DATA SHEET

Emshield® TFR-RWS

RWS Compliant, Fire-Rated, Tunnel Expansion Joint

US Patents: 8,739,495 C1 9,068,297 9,637,915 9,670,666 10,316,661 B1 10,519,651 10,941,562 10,934,702 10,934,704 11,180,995



Emshield TFR-RWS sample shown here is displayed in substrate mock-up

Product Description

Emshield TFR-RWS is Sika Emseal's Emshield DFR material tested or proved by engineering judgement to meet the requirements of specific tunnel project fire rating scenarios. It features a traffic-grade silicone sealing surface on both the upper and lower faces, adhered to a fire-retardant impregnated foam backing.

Fire-retardant-impregnated foam is coated with a high grade silicone coating. The resulting composite is then factory compressed to less than its nominal size for installation into the joint gap. The system is installed into epoxy adhesive field-applied to the sides of the joint face and fireproofing. A sealant band of supplied silicone fills voids in the substrate to bellows interface and completes the system. The tunnel-facing surface of the TFR-RWS is durable and resistant to typical tunnel-lining cleaning procedures.

What is RWS Tunnel Fire Rating?

RWS (Rijkswaterstaat) is a tunnel fire standard created as a result of testing done in 1979 by the Rijkswaterstaat (Ministry of Infrastructure and the Environment) in The Netherlands. It is based on a worst case scenario of 1765 ft³ (50 m³) of fuel (a tanker load) being ignited in the relatively small confines of a tunnel.

Concrete additives or fire resistive concrete coating or barrier products meeting the RWS standard are able to keep the concrete surface below 716°F (380°C) for the entire two hour duration of the RWS fire curve.

Uses and Applications

For tunnel roofs and walls

- Structural, control, and seismic joints
- Meets RWS (Rijkswaterstaat) time/temperature curve
- FEA proven to handle worst case fuel tanker fire in tunnel (2-Hour, 300MW fire load, max. temperature 2,462°F (1,350°C))
- Used in conjunction with spray-applied fire resistant materials
- Non-invasive anchoring; no mechanical fasteners
- Pre-compressed, self expanding, never in tension

- For curves, straight runs and 90-degree or other angle corners
- Handles variations in joint size through size-switching
- DFR2 meets UL2079, ASTM E1966, ASTM E119 and ASTM E1399

Watertight, 2-Hour Fire-Rated Expansion Joint

Emshield TFR-RWS is a watertight, fire-rated, traffic-durable, primary seal for both retrofit and new structural expansion joints in tunnel roadways, walls and roofs/ceilings. It eliminates the need for additional fire blankets, mineral wools, liquid sealants, cover plates, or other fire stopping materials.

For joints from 1/2-inch (12mm) up to 4-inches (100mm) where +50% and -50% (total 100%), of nominal material size, joint movement is expected.

TFR-RWS is built from Emshield DFR material tested or proved by engineering judgement to meet specific tunnel fire rating requirements.

DFR2 is tested and certified by Underwriters Laboratories (UL), to the rigors of UL 2079.

Features

Watertight – Emshield TFR-RWS is installed with the tensionless traffic-grade, fuel-resistant bellows ensuring that watertightness is achieved.

Fire-Rated – The fire-retardant-impregnated foam ensures a 2-hour fire protection in accordance with UL-2079.

Sound Attenuation – Emshield TFR-RWS minimizes sound transfer which often occurs at the expansion joint gap. Tested results of Emshield foam products in a 1 1/2" gap in a STC 68/OITC 51 assembly are an STC of 64 and an OITC of 52.

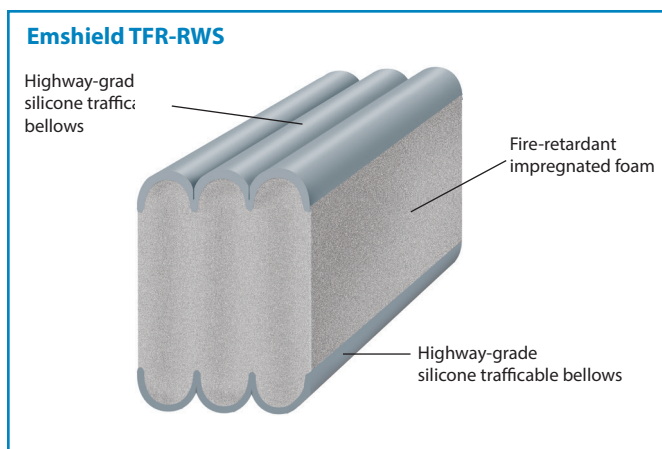
Non-Invasive Anchoring – There are no hard metal-to-substrate connections with Emshield TFR-RWS. This includes embedded pins, anchors, screws, bolts or tracks, trays or rails, flanges or coverplates. The system is locked to the joint faces by means of the 1) back-pressure of the foam, 2) the epoxy adhesive, and 3) the injected sealant bands at the joint face.

Movement Capability – +50% and -50% (100% total) of nominal material size.

Versatility – The standard Emshield TFR-RWS top surface and lower side color is gray (other colors are optional).

Joint-Size Variation – Uniform bellows appearance, and the ability to handle variations in joint size through size-switching, are among other system features.

(Features cont. page 2)



Features (cont.)

Factory-Fabricated Terminations and Transitions – as in all Emseal expansion joint systems, continuity of seal through changes in plane and direction is an essential performance differentiator. Emshield TFR-RWS is manufactured in straight-run sticks which can be joined in the field to Emseal's patented factory-fabricated "Universal-90" Transitions and Terminations. These are factory-fabricated single-piece 90° units which are coated on both sides with silicone coating allowing them to be installed as an upturn termination or as a downturn termination. Each has a 12-inch long horizontal leg and a 6-inch vertical leg. Terminations end in a 45° sealed and mitered end. Transitions end in an uncoated 90° cut to be adhered to another transition piece as used in treads and risers, parapets, curbs and other short-rise applications.

In addition to guaranteeing watertightness, Emseal's "Universal-90 terminations and transitions" allow for much faster and secure installation by eliminating field cutting at angles.

Emshield TFR-RWS and DFR2 builds on Emseal's track record of over 30 years of innovation in sealing structural expansion joints with impregnated foam sealants.

Performance

Capable of movements of +50%, -50% (100% total) of nominal material size.

Standard sizes from 1/2" (12mm) to 4" (100mm).

Depth of Seal for all sizes = 4" (100mm). Note: Typical thickness of concrete for a 2-hour rating = 4" (100mm).

Substrates must be solid, parallel and plumb.

Note: Substrates must be capable of resisting, without deflection, 2.5 psi backpressure from the foam across the area of contact as determined by the supplied materials' nominal dimensions. Consult Emseal.

Performance Limitations – For applications in traffic situations with larger joints (3-inches and above) where full extension movement and high point loads exist, the designer should consider use of a cover plate over the DFR2.

TFR-RWS System Sizing

| Product Code* | Nominal Material Size (Joint Size at Mean T°F) | Depth of Seal |
|---------------|---|---------------|
| TFR-RWS-0050 | 1/2" (12mm) | 4" (100mm) |
| TFR-RWS-0075 | 3/4" (20mm) | 4" (100mm) |
| TFR-RWS-0100 | 1" (20mm) | 4" (100mm) |
| TFR-RWS-0125 | 1 1/4" (30mm) | 4" (100mm) |
| TFR-RWS-0150 | 1 1/2" (40mm) | 4" (100mm) |
| TFR-RWS-0175 | 1 3/4" (45mm) | 4" (100mm) |
| TFR-RWS-0200 | 2" (50mm) | 4" (100mm) |
| TFR-RWS-0225 | 2 1/4" (55mm) | 4" (100mm) |
| TFR-RWS-0250 | 2 1/2" (65mm) | 4" (100mm) |
| TFR-RWS-0275 | 2 3/4" (70mm) | 4" (100mm) |
| TFR-RWS-0300 | 3" (75mm) | 4" (100mm) |
| TFR-RWS-0325 | 3 1/4" (85mm) | 4" (100mm) |
| TFR-RWS-0350 | 3 1/2" (90mm) | 4" (100mm) |
| TFR-RWS-0375 | 3 3/4" (95mm) | 4" (100mm) |
| TFR-RWS-0400 | 4" (100mm) | 4" (100mm) |

*NOTE: Product Code begins with TFR-RWS designation.
[e.g. TFR-RWS-0100 = 1-inch (25mm) TFR-RWS]

Colors

Standard traffic surface color is Sikasil® WS-295 Deck Gray (consult Emseal for options). Alternate colors for the bottom coatings are available as an option — consult Emseal.

Testing and Standards (DFR2)

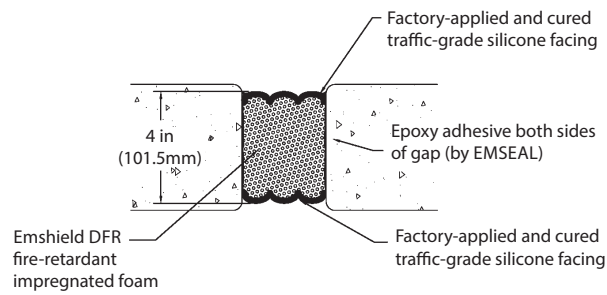
Emshield DFR2 has been tested and certified under UL 2079 and as a result meets the requirements of ASTM E1966, ASTM E119 and ASTM E1399.

UL 2079, like ASTM E1966, was developed to encompass the fire testing of ASTM E119 and the movement cycling regime of ASTM E1399.

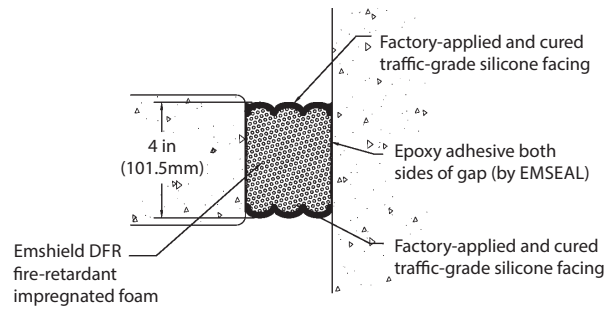
Laminations – Emshield DFR2 has passed UL 2079 when configured with either vertical, compression-bonded laminations OR with horizontal, adhesive-bonded laminations. The orientation or presence of laminations in any form is inconsequential to the performance of the product under the UL2079 testing criteria.



TFR-RWS In Deck/Wall/Ceiling Applications



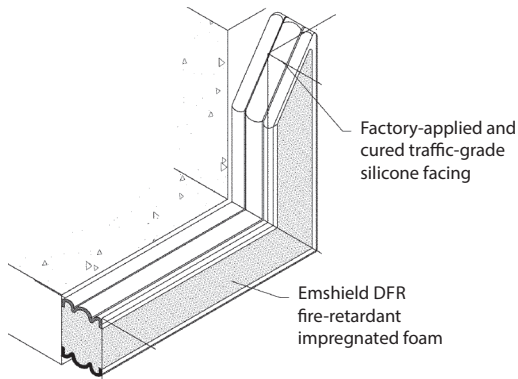
Equal Size Substrates



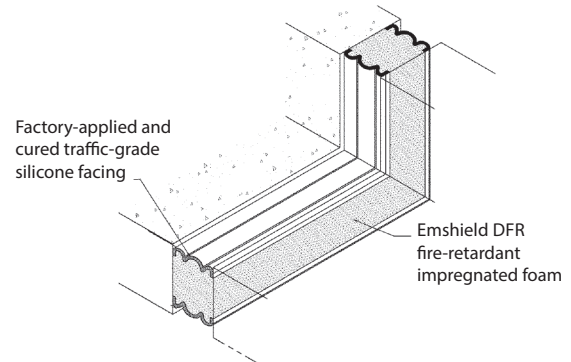
**Varied Size Substrates
(Often - Deck to Wall)**

TFR-RWS Universal-90 Terminations and Transitions

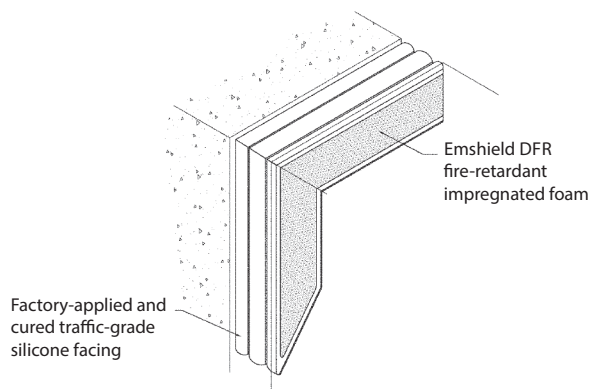
US Patent: 9,200,437 Patent Pending



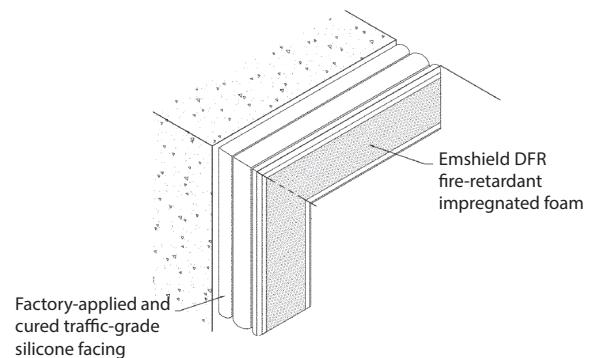
Upturn Termination to Vertical Rise



Horizontal to Vertical Upturn Transition



Downturn Termination to Vertical Overhang



Horizontal to Vertical Downturn Transition



Design/System/Construction/Assembly

This material, as DFR, has been tested to UL/ULC 2079 and is manufactured under UL's Follow-Up Service. The material is being supplied as a fire-rated component of a wall or floor assembly. It has been tested to UL 2079 in assemblies as depicted in Emseal's various listings in the UL Online Certifications Directory. Use of this material in assembly configurations other than depicted in the named UL listings will not encumber or lower the resistance of the deck or wall assembly but is done so at the designers' discretion and responsibility for designing substrates as part of a fire rated assembly that meet applicable standards for the project. Similarly, the published information in the UL Listings cannot always address every construction nuance encountered in the field. Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Listed or Classified products or materials. Authorities Having Jurisdiction should be consulted before construction to ensure that specific adjacent substrates and assemblies are detailed and constructed to meet local fire-rating requirements.

CAD & Guide Specs

[Guide Specifications](#) and [CAD details](#) are available online at Emseal.com or by [contacting Emseal](#).

Warranty

Standard or project-specific warranties are available from Emseal on request. Each product can only perform its designed function if it, and the joint-gap into which it is installed, is sized to suit anticipated joint movements in consideration of the movement capability of the product and in consideration of the temperature at time of installation, and if it is installed in strict accordance with Emseal's installation instructions.

Availability & Price

Emshield TFR-RWS is available for shipment internationally. Prices are available from local representatives and/or directly from the manufacturer. The product range is continually being updated, and accordingly Emseal reserves the right to modify or withdraw any product without prior notice.

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Product Data Sheet
Emseal Emshield TFR-RWS
July 2022 Version SE-2.1



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