



*Certified Sustainable Cable Maintenance*

## FS1 Intumescent Cable Coating



*Key features - Application procedure / Inspection - Coverage tolerance / Fire test result*

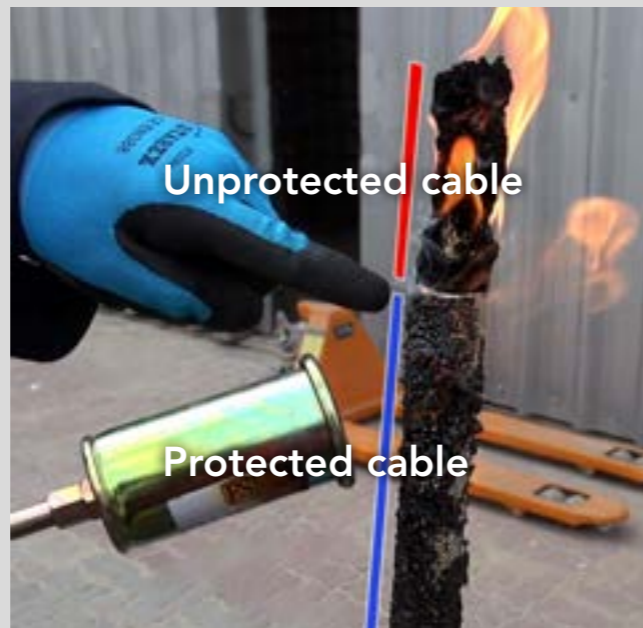


# FS1 intumescent coating - introduction

## Cable fire protection worldwide

FS1 intumescent coating is used for fire protection indoor on electrical LV/HV cables and signal cables in high risk areas like engine room on vessels.

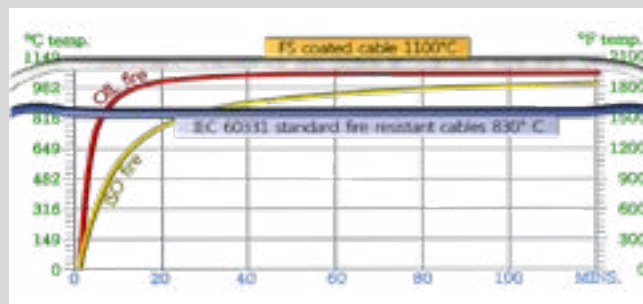
Fire Security has more than 30 years of experience in cable fire protection and is the only coating producer offering application as a turn-key solution worldwide.



## How the protection works

During a fire, the coating will expand up to 100 times its thickness, thus protecting the cable screen and the inner cable from fire damage.

Coated cables will function during a fire, and if the fire is ceased within reasonable time, there is no need for cable replacement.



## FS1 coated cables can survive a hydrocarbon fire for 60 min

The yellow curve below shows the temperature of an ISO fire, which is a fire in a normal room or building. The red curve represents the temperature of an oil fire - up to 1100°C, the temperature to which Fire Security has tested our coatings.

# FS1 intumescent coating - Key features

Our products have been approved by the world's leading classification societies and authorities. In a fire situation our FS1 coating will prevent:

- Ignition of the cable insulation
- Release of toxic fumes from the cable insulation
- Release of poisonous gas (HCL) from the cable insulation
- The cable tray from melting and collapsing



## FS1 acts as an insulator that protects cables, trays and supports

FS1 Intumescent coating product will expand up to 100-times its original thickness. As the coating expands, it becomes considerably more voluminous creating a lightweight char insulator that keeps high temperature away from cable cores and structural members, such as cable supports and cable trays.

FS1 Intumescent coating is made of a series of chemicals suspended in a binder. When the binder is exposed to heat it begins to soften, which allows the suspended chemicals to heat. The chemicals begin to react. A carbonization occurs and this solidifies into an off-black insulating material that is often referred to as char.

## Protects uncoated areas up to 4cm

The picture to the right shows how the intumescent coating expands to provide protection from heat and flames. It is also important to note that the FS1 Product is not burning. Instead, a chemical reaction is taking place that builds up an insulating material that protects even unprotected exposed areas up to 4cm for the whole length of the cable tray vertical and horizontal from heat and direct flame contact.



## The coating will not reach 100% coverage in hard to reach areas

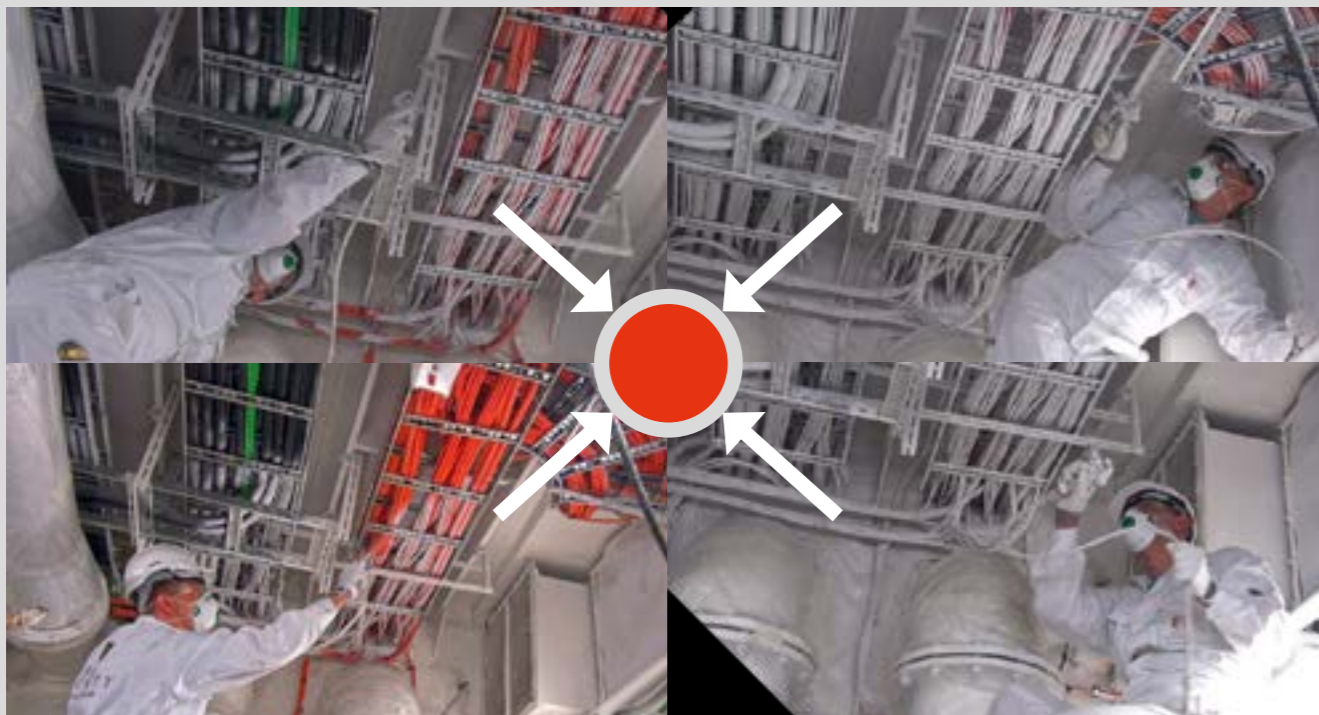
These photos give you an idea of uncoated areas that are visible by using inspection mirrors and inspection cameras in difficult to reach areas.



These examples are accepted FS Standard and Guaranteed that unprotected areas will achieve correct protection in the event of a fire, due to the fact that upon direct flame contact the chemical reaction starts and conceals areas with insulating foam that is released.

## FS guarantees that the coverage is sufficient

Wherever possible, our experienced coating crews will perform the application from 4 different overlapping angles as illustrated below. By completion of the coating our supervisor will inspect all scope areas and we will issue a certificate for the job done. Our solution is recommended by many insurance companies and has become a standard throughout most of the cruise industry.



## FS1 intumescent coating - Application

### Method Statement Fire Security. Doc. No Q-MS 1 240-1 rev. 6



#### 1. Purpose

To ensure correct surface preparation and application of passive fire protective coating on cable trays routed through high risk areas and single cables to smoke detectors and PA systems.

#### 2. Scope

This procedure covers the application of passive fire protective coating to cables.

#### 3. Responsibility

##### Site Manager

-To ensure that all work is performed within environmental conditions.

##### Supervisor

-To ensure that all tests are undertaken, and in the case of witness tests, ensure that the Client Representative is present.

##### Foreman

-To ensure that all work conforms to specifications and is done in a workman like manner.

#### 4. References

Where referred to in this specification, the latest edition of the following specifications, standards and other documents apply. Standard ISO 12944, Part 7, Application IMO Res. MSC.61 (67), Annex 1 Part 5 and Annex 2

#### 5. Description

##### 5.1 Surface preparation (see also "DOC. Q-MS 1 242-1")

Surfaces shall be cleaned with moist rags or service air where necessary before coating application starts.

##### Application:

Fire Security Coating "Firesec FS1" shall be applied through an Airless Spray unit with a minimum ratio of 56:1. For areas where application using spray equipment is not desirable or possible, the coating may be applied by brush.

It is recommended to store the paint at between 10 °C and 30 °C at least 24 hours prior to use. All storage of the coating must be ensured to be above 1 °C in order to keep the coating free from frost.

Spray first one coat of the material onto the surface to be protected and, if necessary, only then gently roll the material surface to remove air voids, pinholes etc.

Spray the coating using the same method as above until desired film thickness is achieved



## 5. Thickness

All dry film thickness is average thickness. Fire Security coating should be applied such that the standard of application reflects the following criteria as a minimum standard for Quality Inspection:

Recommended thickness as per Certification of "Fire Sec FS1" is 0.7 mm.

The average thickness may be controlled by wet film comb and by average consumption.

The correct thickness is equal to a paint consumption of approx. 1.45 Ltr. Per M2 of coated surface. The average thickness is to be controlled by consumption and spot checks by wet film thickness testing every 50 meters.

The coating must cover the whole cable bundle around (not each cable separately). Cable trays that are enclosed will be coated externally.

In areas with space constrains Fire Security's representative is qualified and responsible to verify that the coverage of coating is sufficient and that the fire protective objective of the coating has been met. Blind spots will occur in confined spaces, this is normal procedure in passive fire protection. Due to the quality and expanding nature of the FS1 Coating, these areas will be concealed in a fire situation. Maximum allowed width of uncoated area is 4 cm.

## 6. Equipment

- Air Compressor 100cfm or as required.
- Airless Spray unit Graco 56:1
- HP-Washing unit (only if required).

## 7. Personal safety equipment

- Standard PPE
- Safety Harness for working on Scaffolding in heights >2m

## 8. Housekeeping

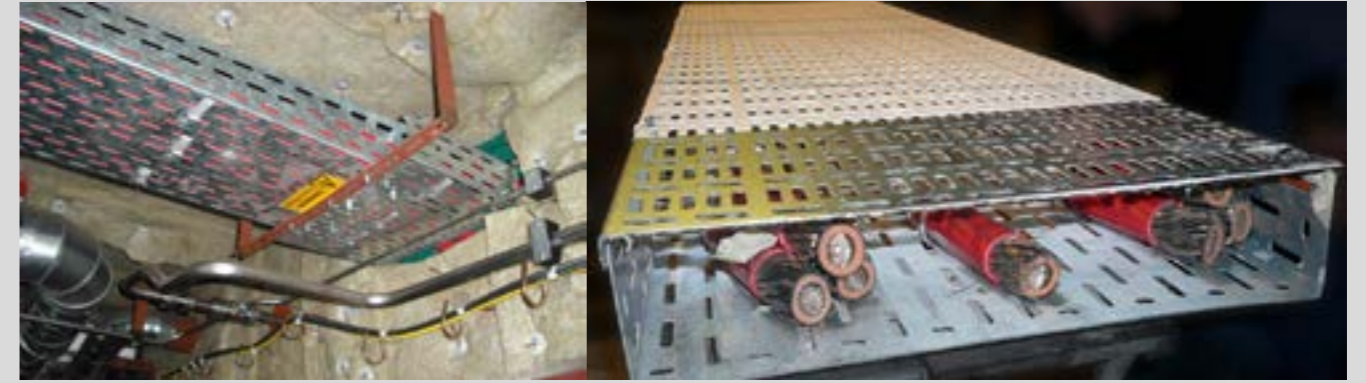
Good housekeeping is to be performed every day. Empty buckets are to be collected and disposed according to site specific rules.

## 9. Documentation

DRQ0048A – QC DAILY REPORT.



# FS1 coating of perforated cable tray boxes



## The coating will be applied to the cable tray externally

Based on the expanding feature of the FS1 intumescent coating, we apply the coating externally on enclosed perforated cable trays. This procedure is backed by in-house testing and the following official fire test.



## Fire test performed at BRE Global, an officially approved fire test centre in UK.

FS President and client representatives from Carnival Corporation were present at the test lab in January 10 2013.

### 1.Introduction

The requirement of the work was to determine the performance of cables enclosed with a covered, perforated cable tray, covered with a nominal 0.7mm thickness of Fire Security FS1 intumescent coating when tested in accordance with the requirements of IEC 60331-21:1999 (1).

### 2.Details of sample received and tests carried out

The cables tested were 33.7mm diameter, 185mm<sup>2</sup> single core cables. An array consisting of 3 off bundles of 3 cables were inserted into a 1550mm x 300mm x 85mm covered perforated cable tray protected with a nominal 0.7mm thick layer of FS1 coating.

### 3.Test result

The burner position and flame temperature was verified as 765 °C on 10 January 2013 in accordance with the procedure given in IEC 60331-11:1999 (2).

Test voltage (Uo/U)	Test duration	Comment	Result
600/1000V	60 min	No fuses ruptured nor lamps extinguished	Pass

### 4.Conclusion

IEC 60331-21:1999 gives the following acceptance criteria:

*"The cable possesses the characteristics for providing circuit integrity as long as during the course of the test; -the voltage is maintained, i.e. no fuse fails or circuit breaker is interrupted-a conductor does not rupture, i.e. the lamp is not extinguished"*

The 185mm<sup>2</sup> single core cables when inserted into a covered, perforated cable tray protected with a nominal 0.7mm thickness of Fire Security FS1 intumescent coating met the fire resistance time of 60 min when tested to the requirements of IEC 60331-21:1999 with a flame temperature of 765 °C.



## Sustainable Cable Maintenance

*Protecting and prolonging the life span of electrical cables, FS has proven its worth for decades. We have an extensive reference list stretching from industrial plants, oil rigs and cruise ships to offshore wind farms. Our products are approved by leading classification societies and authorities. Our core activities are:*



*Using warranty backed applications only, FS repairs and upgrades damaged cables.*

### **Cable life extension**

The FS coating systems upgrade your cables and extend the lifetime by up to 3 times. No other fire protective cable coating is certified to be as resistant to UV, water, mud, oil, and a wide variety of damaging chemicals.

### **Cable repair**

We repair cable sheaths that are damaged by UV, oil, mud, and mechanical stress. The coating restores the cable value, prevents future damage to cables and cable jackets, and eliminates the need for large-scale replacement. This is done with minimum shutdown time.

### **Fire protection**

No other cable coating system has equal or better fire protection properties. Our coating provides superior fire protection compared to standard cables and can upgrade existing cables to the highest fire technical standard.

**SAVE LIVES / SAVE COSTS / SAVE THE ENVIRONMENT**





## Certified Sustainable Solutions

*FS offer certified sustainable solutions to extend cable life and avoid electrical fire, using nothing but non-toxic materials.*



Our commitment to the environment is documented through our DNV ISO 14001 environmental management systems certification.

mitigates the negative end-of-life environmental impact of cables, as well as the inherent environmental and resource cost of excessive production and installation of new cables.

### Repaired cables are fully restored and functioning

FS procedures are tested and approved. We deliver a turnkey solution that avoids operation shutdown, removes the costly need for cable replacements, and halts the spread of further damages. Rejuvenated cables continue their operation with a warranty backed application.

Fire Security products and systems are LEED compliant, non-toxic, solvent-free, phosphate-free, and do not contain asbestos or any other substance identified as being carcinogenic. Our products release no poisonous and corrosive gases and smoke.

### Significant reduction of excessive production and waste

By extending the life of cables, FS limits the need for resource-intensive cable replacement. Cables contain large volumes of plastic, PVC, XLPE in sheets and insulation. Those components are commonly incinerated openly or disposed of in landfills. Extending cable lifetimes

### Prevention of toxic and poisonous gasses

Our coatings prevent flame propagation and prevent escalation from a small fire to a major incident. FS cable fire protection minimizes impact from short circuits, removes cables as a source of combustion and prevents the release of toxic & poisonous gasses.



#### GREENHOUSE GAS EQUIVALENCIES CALCULATIONS

The Global Warming Potential (GWP 100) of production of 1000 meters of Single Core 630 mm<sup>2</sup> Voltage Grade 64/110KV cable is 32863 kgCO<sub>2</sub>eq. Extending the operating life of such cables and avoiding replacement has significant positive impacts.



**1 meter = 82 miles**  
Keeping just 1 meter of cable in service is the equivalent of removing the GHG emissions of an average family car being driven for 82 miles.



**10 meters = 39,975 charges**  
Keeping just 10 meters of cable in service is the equivalent of removing the CO<sub>2</sub> emissions of 39,975 smartphones being charged.



**100 meters = 1.1 tonnes**  
Keeping just 100 meters of cable in service is the equivalent of avoiding the GHG emissions of 1.1 tonnes of unrecycled waste in a landfill.



**1000 meters = 76 barrels**  
Keeping just 1000 meters of cable in service is the equivalent of removing the CO<sub>2</sub> emissions from the consumption of 76 barrels of oil.



## Certified Sustainable Cable Maintenance

FS offer certified sustainable solutions to extend cable life and avoid electrical fire, using non-toxic materials.

*Save Lives / Save Costs / Save The Environment*

Our products have been approved by leading classification societies and authorities including U.S. COAST GUARD, IMO MED D & IMO MED B, Lloyd's Register, Achilles, Bureau Veritas, DNV, RINA, NMA, ABS, FM and UL



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