On-site and off-site application of intumescent fire and corrosion protection coatings for steel structures
Guidance on selection, specifications, and use

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On-site and off-site application of intumescent fire and corrosion protection coatings for steel structures: Guidance on selection, specifications, and use.

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Institute of Corrosion

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Executive Summary

This is one of several technical guidance documents that have been produced and made available through the CED technical area of the Institute of Corrosion website. The current document is a revision of an earlier document issued in 2010 (see acknowledgements section for further information about this). The document is broadly targeted at the technically aware professional in the construction and building maintenance industries who uses Thin Film Intumescent (TFI) coatings to provide structural steel with fire protection. It provides a definition of intumescent coatings and highlights the key issues concerning specification and use of the types of coating appropriate in particular contexts. It also covers certification, development and handling of the coating, and preparation of the substrate surface, together with the advantages and disadvantages of off-site or on-site application. An emphasis on the corrosion protection aspects of the intumescent system, and information on the types of system that will be effective in this context, are included in the sub-section on environment. A large number of sources of further information are included towards the end of the document.
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1 Introduction and background

1.1 General introduction

The term intumescent describes the property of swelling. A thin film intumescent (TFI) coating is defined as a paint coating with 0.25 to 5.0 mm dry film thickness (DFT) which swells under the conditions of heat and temperature associated with the outbreak of fire, thus preventing spread of the fire. It may be water-based or solvent-based (e.g. epoxy), without any reinforcing mesh. TFI coatings are specially formulated to swell in a fire situation. The coating begins to degrade, and an intumescent film begins to form, once the temperature exceeds 200 °C. Intumescent coatings can be specified for internal and external exposure, giving up to two hours fire resistance for shop or site application. Durability (i.e. life to first maintenance) of up to 25 years or more can be achieved with careful specification and application controls.

1.2 Composition of intumescent coatings

The intumescent paint contains, but is not limited to, two important ingredients:

- A carbonific - a material such as melamine is added to the paint, which will turn into charcoal during the process of intumescence.
- A spumific – a mixture of a specialised pigment and other additives incorporated into the paint. During the process of intumescence, these pigments give off gases and water, causing the coating to swell to 50 times the thickness of the original layer.

These materials are bound inside a resin system such as acrylic or epoxy, depending upon the required durability of the coating in service. The charred film provides an insulation barrier between the fire and the steelwork that is designed to ensure that the steelwork does not exceed the temperature at which it can deform to a destructive condition.

1.3 Specification of full intumescent coating systems

The full intumescent coating system includes the following components:

- **Primer:** this mainly provides corrosion resistance, but also ensures coating adhesion. A variety of primers can be used, but generally they are two-pack epoxies, including zinc-rich epoxies. Alkyd primers are also suitable provided they are of the short oil type (see glossary). When using zinc rich epoxy primers an epoxy tie coat should be applied before the TFI. For small repair areas where manual or mechanical preparation has been carried out, surface tolerant epoxies may be used. Recommended primers are listed in Table 1. The choice of which primer to use depends on the expected environment, classified as C1 – C5 (Table 1). Refer to ISO 12944 Part 2 for detailed environmental classifications.

- **The coating:** coatings may be water-borne (single pack), solvent-based (single pack) or epoxy (two-pack). The type selected again depends mainly on the environment although there are other considerations, which are detailed in Table 2.

- **Topcoat:** A wide range of decorative topcoats are available to protect from moisture and to allow designers to enhance the appearance of the structural steel. They can be single-pack or two-pack topcoats, for internal and external use. Colours are specified in BS4800 or RAL shades. Some manufacturers produce a range of micaceous iron oxide (MIO) finishes and metallic finish coats in RAL 9006 and RAL 9007. The level of gloss can be specified, usually as a percentage, with maximum gloss being around 90%, semi-gloss or sheen at around 50%, low gloss below 30% and matt below 15%. The visual appearance in terms of surface smoothness must be specified (for further information refer to NBS standard M61:440 Basic/450 Decorative/460 High Decorative). It is important that the correct topcoat thickness is applied to provide adequate protection and maintain the

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1 The acronym RAL is derived from the German company that developed this particular colour-matching system: Reichs-Ausschuß für Lieferbedingungen und Gütesicherung.
required fire resistance. Over-application of topcoats can compromise the intumescent properties of the system.

The standards referred to in the above paragraph were current in 2017. Details for all standards quoted in this document are given in Section 8.2.

Table 1: Primer type and dry film thickness for different environments

<table>
<thead>
<tr>
<th>Environment ISO 12944</th>
<th>Primer</th>
<th>Typical minimum DFT (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 onsite</td>
<td>Epoxy zinc phosphate</td>
<td>75</td>
</tr>
<tr>
<td>C1 offsite*</td>
<td>Epoxy zinc phosphate blast primer</td>
<td>25</td>
</tr>
<tr>
<td>C2</td>
<td>Epoxy zinc phosphate</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Zinc-rich epoxy</td>
<td>50</td>
</tr>
<tr>
<td>External C3/C4</td>
<td>Epoxy zinc phosphate</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Zinc-rich epoxy</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Epoxy zinc phosphate and Epoxy MIO</td>
<td>150</td>
</tr>
<tr>
<td>External C5-I/C5-M</td>
<td>Consult the TFI manufacturer</td>
<td></td>
</tr>
</tbody>
</table>

* The TFI coating shall be shop applied to this primer offsite prior to erection of the steelwork.

Table 2: Selection of TFI coating formulation according to environment classification

<table>
<thead>
<tr>
<th>Environment ISO 12944</th>
<th>Solvent-based, single pack</th>
<th>Water-borne, single pack</th>
<th>Epoxy, two pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal C1</td>
<td>Use internal or external grade TFI. Use topcoat if possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
<td>No topcoat required unless possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
<td>No topcoat required unless possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
</tr>
<tr>
<td>Internal C2</td>
<td>Use internal grade TFI. May be exposed to weather during construction for limited periods without topcoat. Use topcoat for long term durability.</td>
<td>Consult TFI manufacturer.</td>
<td>No topcoat required unless possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
</tr>
<tr>
<td>External C2/C3/C4</td>
<td>Use external grade TFI. May be exposed to weather during construction for limited periods without topcoat. Use topcoat with an external grade coating for long term durability.</td>
<td>Not usually recommended for C3 or C4.</td>
<td>No topcoat required unless possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
</tr>
<tr>
<td>C5</td>
<td>Consult TFI manufacturer.</td>
<td>Not recommended.</td>
<td>No topcoat required unless possibility of exposure to weather during construction or if needed for abrasion resistance or aesthetic considerations.</td>
</tr>
</tbody>
</table>
The selection of each component of the TFI system must be specific to the needs of the project in question and must be considered for compatibility with the other elements of the coating system. If the primer system is old and the source unknown then it may need to be removed completely and the steel re-primed before application of the intumescent coating.

Many of the intumescent fire protection coatings are supplied ready for use and do not require diluting. Single pack intumescent base coats can be supplied in 200 litre barrels, greatly improving transfer efficiency and wastage. It is important if an intumescent base coat requires thinning for application that the correct thinner is used. Some solvents can retard drying significantly and delay delivery of the steelwork to site.

Specifications for TFI coating systems can be either ‘Performance’ or ‘Detailed’, as described below.

1.3.1 Performance specification

The Performance Specification should confirm the design requirements and performance criteria, enabling the fire protection contractor to select the most suitable products to protect the steel frame. The steel primer is usually selected by the steel contractor, hence compatibility between primer, intumescent coating and topcoat must be considered.

The following points should be included in the specification:

- Design service life (Section 2.1)
- Fire resistance period (see Section 2.2)
- Life to first maintenance criteria and timeframe (see Section 2.3).
- Environmental exposure (see Section 2.4).
- Aesthetic considerations (finished appearance, colour and gloss level).
- Other special requirements in particular areas (see Tables 2 and 3).
- Client review of information and approval process.
- Define any warranty or guarantee requirements with related inspection and maintenance criteria.

1.3.2 Detailed specification

Detailed specification involves reference to the relevant standards and codes of practice listed in Section 8 of the present document. In particular the ISO standard BS EN 16623:2015 Paints and varnishes - Reactive coatings for fire protection of metallic substrates - Definitions, requirements, characteristics and marking, and the Association of Specialist Fire Protection TGD 11 Code of practice for the specification & on-site installation of intumescent coatings for fire protection, should be consulted.
2 Design considerations for TFI coating systems

This section gives details of the factors that need consideration when specifying an intumescent coating.

2.1 Design service life

The requisite and achievable design life period should be determined, taking maintenance costs into consideration. Different design lives may be appropriate for different parts of a building. Design life periods of up to 25 years are achievable.

2.2 Fire resistance period

The fire resistance period is the period of time during which the coating must provide protection. It is obtained from the following:

- The Building Regulations – Approved Document B: Building regulation in England covering fire safety matters within and around buildings
- Fire engineering design
- Insurer or client user defined period

Typical fire resistance periods are 0.5, 1, 1.5 and 2 hours. Refer to the ASFP Yellow book for further guidance.

2.3 Life to first maintenance

The life to first maintenance (LFM) is the time between the application of the coating system and an agreed period of time before the coating should be maintained. This is usually a minimum of 10 years, although the ISO 12944 high durability period is based on a 15 year LFM.

The specified LFM can be based on one or more of the following considerations:

- Aesthetic appearance - changes due to weathering or UV degradation.
- Corrosion resistance of the underlying metal
- Resistance of the coating to the environment

The full service life cost should be weighed against what is available in the budget.

2.4 Environment

The selection of the TFI system depends on the environmental conditions to which it will be exposed and whether the material is to be applied on- or off-site. Table 3 indicates the standard classification of environmental types (based on ISO 12944) and the associated corrosion risk. Consideration should be given to the environmental conditions during construction, taking into account the possibility that an environment which is identified as C1 may be exposed to C3 conditions for an extended period during construction. The specific environment (C1, C2, C3 etc – see Table 3 below) should be identified and specified for all parts of the steel frame requiring fire protection; these environmental classifications influence the selection of both primer and TFI, as outlined in Tables 1 and 2, Section 1.3. Careful consideration should be given to areas of high humidity or those that will be subject to external weathering. Marine and industrial atmospheres require particularly accurate assessment.
### Table 3: Comparison of environmental standards (refer to ISO 12944)

<table>
<thead>
<tr>
<th>Corrosivity Category</th>
<th>Risk</th>
<th>Exterior</th>
<th>Interior</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Very low</td>
<td>N/A</td>
<td>Heated buildings with clean atmospheres, controlled environments.</td>
<td>Offices, shops, schools, hotels, residences, airport terminals, hospitals.</td>
</tr>
<tr>
<td>C2</td>
<td>Low</td>
<td>Atmospheres with low level of pollution. Rural</td>
<td>Unheated buildings where condensation may occur. Cavity walls in clear separation outside the vapour barrier of cladding systems, semi controlled environments.</td>
<td>Depots, sports halls, plant rooms, dry warehouses, roof voids, exhibition halls, vehicle depots, etc.</td>
</tr>
<tr>
<td>C3</td>
<td>Medium</td>
<td>Urban and industrial atmospheres, moderate sulphur dioxide pollution. Coastal areas with low salinity.</td>
<td>Uncontrolled environments with high humidity and some air pollution.</td>
<td>Kitchens and food processing plants, laundries, breweries, dairies.</td>
</tr>
<tr>
<td>C4</td>
<td>High</td>
<td>Industrial areas and coastal areas with moderate salinity. Urban and industrial atmospheres with moderate sulphur dioxide pollution and/or coastal areas with low salinity.</td>
<td>Urban and industrial atmospheres with moderate sulphur dioxide pollution and/or coastal areas with low salinity.</td>
<td>Chemical plants, swimming pools, coastal ship – and boatyards.</td>
</tr>
<tr>
<td>C5-I</td>
<td>Very high</td>
<td>Industrial areas with high humidity and aggressive atmosphere. Coastal. Industrial areas with high humidity and aggressive atmospheres.</td>
<td>Buildings or areas with almost permanent condensation and with high pollution.</td>
<td></td>
</tr>
<tr>
<td>C5-M</td>
<td>Very high</td>
<td>Coastal and offshore areas with high salinity. Coastal.</td>
<td>Buildings or areas with almost permanent condensation and with high pollution.</td>
<td></td>
</tr>
</tbody>
</table>
3 Application of a TFI system

The intumescent coating is usually applied as a spray to give the thickness required to give the specified fire resistance. The thickness of intumescent coating usually varies depending on the fire resistance period required and the steel section size (see the ASFP “Yellow Book” 4th Edition for guidance on thickness determination and fire testing).

3.1 On-site application of TFI coatings

An intumescent fire protection coating is often applied on-site after erection of the steelwork by specialist operatives. The advantages of applying the coatings on site are:

- no transport or handling damage
- no need to reinstate site connections after installation
- reduced application costs (lower overheads, use of cheaper water-based products often possible, sealer coat not always needed)
- generally optimal decorative appearance

The disadvantages of on-site application are:

- higher total project costs due to need for site access of equipment such as mobile elevated working platforms
- potential damage to buildings and cars in the vicinity
- requirement for protective measures and masking before spray application can commence
- health risks to other operatives
- potential extensive downtime due to weather conditions affecting the overall site programme
- disruption to other trades
- potential for quality control issues due to poor access and lighting
- potential for inter-coat contaminations from site dust etc

For further information refer to ASFP technical guidance document: TGD 11 Code of practice for the specification and on-site use of intumescent coatings for fire protection of structural steel.

3.2 Off-site application of TFI coatings

Intumescent fire protection coatings are often applied off-site by specialist operatives. The advantages are:

- controlled or monitored environment during application
- no risk of damage to buildings and cars by overspray
- no health risks to other trades
- better quality control
- no potential delays due to weather
- no disruption on site, reduced total project costs

The disadvantages are:

- possible transport and handling damage
- requirement to reinstate site connections after installation
- increased initial application costs due to factory overheads
• requirement for some site access to be provided to carry out site touch up

For further information refer to the Steel Construction Institute publication P160 Structural fire design: Off-site applied thin film intumescent coatings (Second edition). Part 1 of this publication presents background information regarding the use of off-site applied intumescent coatings for structural steelwork while Part 2 presents a model specification.

3.3 Qualification of installers

The minimum skills requirement of installation operatives should be defined by nationally recognised qualifications, for example NVQs, or by completion of a recognised training scheme offered by an accredited organisation (e.g. Industrial Coatings Applicator Training Scheme, ICATS). It is advisable to use fire protection contractors who are members of a Third Party Installer Scheme (e.g. BRE Global Ltd LPS1531 Approved or equivalent).

4 Rating, testing and inspection

The rating, testing and inspection of a thin film intumescent (TFI) system during the installation process are important for ensuring the long-term life and fire performance of the installation.

The work should be inspected by a qualified and experienced TFI intumescent coating inspector (e.g. Institute of Corrosion, Coating Inspector Level 2 or 3 or equivalent). All inspection equipment should be calibrated and have a current Certificate of Calibration.

4.1 Fire rating

Intumescent coatings are tested for 0.5, 1, 1.5 and 2 hour fire ratings.

4.2 Materials testing

Intumescent Fire Protection Coatings are manufactured in accordance with British Standard BS 476 Fire Tests. Steel members are tested in a furnace under dynamic loads at intervals of 0.5, 1, 1.5 and 2 hours. Once a material has reached a certain stage of development it is sent to an independent testing house such as Warrington Fire Research Centre or the Loss Prevention Council. Full independent testing is then carried out in accordance with BS 476 and each material is given a certification.

The steel condition should be examined prior to surface preparation to ensure that the steel conforms to grade A or B ISO 8501. This specifies a range of rust grades and preparation grades for steel surfaces, each defined by written descriptions along with representative images.

4.3 Surface preparation

Before application of any coating, the steelwork must be blast cleaned to a minimum standard of Sa2½ as defined in the ICorr technical guidance document ICorr/CED/CT02 and in accordance with ISO 8501-1. This ensures that the steelwork has an adequate level of cleanliness, including removal of mill scale, as well as the required surface profile.

The equipment used, and the type and size of abrasive particles, should be checked to confirm that the process will produce the standard of cleanliness and surface profile/amplitude specified.

On completion of the blast cleaning the surfaces should be checked for the specified profile/amplitude, the standard of surface condition, the level of soluble salts and the presence of surface dirt/dust. For further information refer to the ICorr technical guidance documents ICorr/CED/CT01 Inspection and Testing and ICorr/CED/CT02 Surface Preparation and methods. The second of these includes details of an increasingly popular alternative surface preparation - water jetting.
4.4 Primer application inspection
The specified primer must be checked for compatibility with the TFI. The primer thickness specified should be checked and the batch numbers recorded.

Ensure that the environmental conditions are within limits set by the manufacturer.

The application method and equipment used should also be checked to ensure that the coating as applied to the steel within the specified time will be fit for purpose.

Care should be taken to avoid application defects and to ensure uniform thicknesses are achieved on edges, corners, welds, etc. and any other vulnerable points, preferably by stripe coating, as described in the ICorr technical guidance document ICorr/CED/CT03.

4.5 TFI coating inspection
The checks described in Section 4.4 must be repeated before application of the TFI coating.

The primed steelwork should be checked to see if any damage has occurred during transportation or handling.

The surface of the primer should also be examined for any surface contaminants – refer to the ICorr technical guidance document ICorr/CED/CT01.

An overall DFT survey should be carried out on the primed steelwork to establish the average primer thickness level – refer to the ICorr technical guidance document ICorr/CED/CT01. This thickness is deducted from the final total DFT once the TFI has been applied and cured. This is to ensure that the TFI thickness is at the level required to give the specified fire resistance.

During the application the operative should regularly check the wet film thickness to ensure that this is in accordance with the supplier’s data sheet, in order to give the specified dry film thickness on completion of the drying time.

The frequency and location of the dry film thickness measurements should be recorded. For guidance on frequency of readings and pass/fail criteria refer to ASFP TGN 11 Code of practice for the specification and on-site installation of intumescent coatings.

4.6 Topcoat inspection
Where specified the application of a topcoat is generally recommended to protect the TFI from the ingress of moisture and for cleaning and general protection.

Where a single topcoat is specified the inspector should establish that the single coat has adequately covered the TFI coating. There should be a colour difference specified between the topcoat and the base TFI to enable visual inspection to be carried out. The use of an illuminated magnifier (x10) is useful for identifying any misses or pinholes in the topcoat. If present, these should be eliminated by application of a further topcoat.

When the topcoat has dried the final inspection check should be carried out on the completed coated surface. A third party approved installer should then issue a Certificate of Conformity, identifying the scope of the work, location of the work and the products used, with a unique certificate number issued by the third party installer scheme company.

5 Maintenance

5.1 Durability
The durability of intumescent base coats can vary significantly. Thin film epoxy-based intumescent coatings tend to have much greater durability than other coating types in severe environments to
which external steelwork may either be permanently exposed, or exposed for a significant period of
time before being covered by cladding or a glass protective envelope. This factor is particularly
significant in highly polluted or coastal environments. Where the structure is destined to be
exposed in an interior environment, single-pack materials tend to be used, as there is less
durability required. However, even with single pack thin film intumescent paints, there is a wide
spectrum of durability capabilities and specialist advice should be sought.

5.2 Planned activity
The recommended periodic inspection and maintenance requirements for TFI systems are usually
available from the TFI manufacturer.

The NBS specification M61 requires the supplier to confirm the recommended repair and
maintenance materials compatible with the original TFI system.

It is good practice to carry out a visual inspection of TFI coating systems on an annual basis to
check for mechanical damage and repair, and to rectify this damage as soon as is reasonably
practical. Where possible an experienced and trained painting contractor who is a member of a
third party approved installer scheme should be used.

5.3 Topcoat appearance
Depending on the type of TFI system, it may be possible to carry out a number of repeat topcoat
applications for cosmetic maintenance purposes. It is important to contact the manufacture of the
TFI system for guidance.

Excessive use of multiple coats of decorative paint is not advisable and may be detrimental to the
fire performance of the system.

If high UV radiation levels are expected in service a topcoat with high UV resistance and colour
retention should be selected.

Where the TFI system is subject to frequent heavy cleaning or wash-down, the TFI system should
be specified with this duty in mind.

5.4 Maintaining water resistance
Where a TFI system is installed in areas subject to weathering, either sheltered or fully exposed to
the weather, the architect should incorporate appropriate design details and suggest the use of
high performance sealants to mitigate the possibility of water ingress into the TFI system.

The collection of ponding water (see glossary) on top of steel beams, casual water (see glossary)
at ground level where steel columns are exposed, steel-to-masonry joints which are not weather
tight, and steel exposed near ground level, have all been known to cause difficulties with the
durability of intumescent coatings in the past.

6 Summary of key points

6.1 Environmental classification
Environmental classification using ISO12944 is critical to the selection of the correct intumescent
coating and topcoat (see Section 3.2 Table 1).

It is preferable for the chosen intumescent coating system to have third party certification. When
using intumescent coatings in C2, C3, and C4 category environments seek third party accredited
certification or equivalent to verify that the intumescent coating system is suitable.

6.2 Primer selection
It is vital that the appropriate primer is selected. The intumescent coating is dependent on the
primer to give long-term adhesion and corrosion protection appropriate to the environment. The
primer has to be compatible with the intumescent coating to enable good adhesion of the intumescent coating to the steel in the event of a fire.

If the primer is applied at too high a dry film thickness then poor adhesion may be the result. The maximum permitted primer dry film thickness should always be checked with the manufacturer of the TFI.

The use of zinc-rich epoxy primers is sometimes more appropriate than galvanising the steel. When the steel is galvanised the use of T Wash or Mordant solution is required. These are acid treatments used to promote adhesion to the galvanised steel surface. Note that for health and safety reasons the use of acids on site in this type of application may not be appropriate.

6.3 **Specification**

Rigorous adherence to the specifications of both ASTM standard G10 (Standard test method for specific bendability of pipeline coatings) and NBS M61 (Intumescent coatings for fire protection of steelwork) will lead to a satisfactory technical result.

The use of a topcoat on a TFI system is not usually a requirement in buildings with environmental classification C1. Where a building cannot be made weatherproof there is a risk of water damage. This may mean costly repairs are required. The use of a topcoat would mitigate this issue.

6.4 **Workmanship**

It is advisable to use fire protection contractors who are members of a Third Party Installer Scheme (e.g. BRE Global Ltd LPS1531 Approved or equivalent). Using experienced companies that are suitably trained (either ICATS or manufacturer-trained) is good practice.

The importance of testing and inspection during the application of a TFI system is vital for achieving optimum performance. The required levels of quality assurance and traceability should be provided by fire protection contractors who are approved and can offer a Certificate of Conformity from the third party installer scheme company.

7 **Acknowledgements**

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8 **Sources of further information**

Advisory trade associations such as ASFP (Association of Specialist Fire Protection) and SCI (Steel Construction Institute), as well as the Intumescent Coating Manufacturers, are essential sources of detailed information and specific advice.

8.1 **Specific sources of information**

Association of Specialist Fire Protection TGD 11 Code of practice (CoP) for the specification & on-site installation of intumescent coatings for fire protection – comprehensive document expanding upon all aspects of intumescent coatings covered in the present document.


ICorr technical guidance documents:

- ICorr/CED/CT01 Inspection and Testing
- ICorr/CED/CT02 Surface Preparation and methods

Definitions used for fire protection related terms can be found at the Association for Specialist Fire Protection (ASFP) website: www.asfp.org.uk

A list of TFI manufacturers can be found in the ASFP “Yellow Book” 4th Edition.

Third party accredited intumescent products may be found in the LPCB ‘Red Book’, where LPCB certified products are listed, or Warrington Fire Certification, where ‘Certifire’ certified products are listed.

8.2 Standards

ISO 12944 Paints and varnishes - Corrosion protection of steel structures by protective paint systems: Part 1: General introduction; Part 2: Classification of environments; Part 3: Design considerations; Part 4: Types of surface and surface preparation; Part 5: Protective paint systems; Part 6: Laboratory performance test methods; Part 7: Execution and supervision of paint work; Part 8: Development of specifications for new work and maintenance.

National Building Specifications (NBS) standard M61: Intumescent coatings for fire protection of steelwork – lists protective coating systems for steel, general requirements, surface preparation, coating application, basic/normal/high decorative finish.

BS EN 16623:2015 Paints and varnishes - Reactive coatings for fire protection of metallic substrates - Definitions, requirements, characteristics and marking – lists the performance criteria, assessment methods and verification for reactive coating systems for fire protection of metallic structures.


BS EN ISO 4618: 2014 Paints and varnishes - Terms and definitions. This defines various terms relating to material coatings including paints and varnishes along with their raw materials.

ASTM G10 Standard test method for specific bendability of pipeline coatings. This provides information on the ability of coatings applied to pipes to resist cracking, disbonding or other mechanical damage as a result of bending.

8.3 General information


BRE Global Ltd – Building Research Establishment, Bucknalls Lane, Watford, Herts, WD25 9XX https://www.bre.co.uk/breglobal

Tata Steel Europe Ltd (formerly Corus Construction and Industrial) - 30 Millbank London SW1P 4WY. https://www.tatasteeleurope.com/
References


BS5950 Part 8. Code of practice for fire resistant design

Corus – Fire design of steel structures – JD: 1000: UK04/2004


Corus – The prevention of corrosion on structural steelwork.


10 Appendix: Glossary of terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Intumescent</td>
<td>The property of swelling or state of being swollen</td>
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<tr>
<td>Intumescent coating</td>
<td>Coating which swells under specific conditions</td>
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<tr>
<td>Carbonific</td>
<td>Paint additive that turns into charcoal during intumescence</td>
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<tr>
<td>Spumific</td>
<td>Mixture of additives and specialised pigment which facilitate intumescence by giving off gases and water</td>
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<tr>
<td>Primer</td>
<td>Coating component in contact with substrate - provides adhesion and corrosion protection</td>
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<tr>
<td>Short oil</td>
<td>A medium incorporating a low proportion of oil relative to its resin content</td>
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<tr>
<td>RAL</td>
<td>Colour matching system developed at Reichs-Ausschuß für Lieferbedingungen und Gütesicherung GmbH</td>
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<tr>
<td>Design service life</td>
<td>The forecast or requisite life expectancy of the product based on its design</td>
</tr>
<tr>
<td>Fire resistance period</td>
<td>Period of time during which the coating must provide protection</td>
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<tr>
<td>Life to first maintenance</td>
<td>Specific desired time periods prior to first maintenance – these may vary. The American Galvanizers Association defines the time to first maintenance as 5% rusting of the base steel surface, which means 95% of the surface has some zinc coating remaining.</td>
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<tr>
<td>Full service life cost</td>
<td>Sum of all recurring and one-time costs over the full life span of the system, including purchase, installation, operating, maintenance and upgrade costs.</td>
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<tr>
<td>Ponding water</td>
<td>Unwanted water forming a pool on flat structural areas (long-term)</td>
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<tr>
<td>Casual water</td>
<td>Temporary accumulation of water, e.g. after rainfall.</td>
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