

Intumescent Coating Systems

Dulux[®] FIRETEX[®] Epoxy Intumescent Application Guide



Protection you can count on.

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1.0 Epoxy Systems

Epoxy based coatings due to their durability and fast cure are frequently applied off site in paint yards and at steel fabricators, these coatings contain virtually no solvents and have very low VOC's. As the epoxy intumescent coatings are chemically cured top coats they can be applied with relative ease. These coatings can reduce the time required for applying the complete coating system.

Epoxy based chemically cured intumescent coatings are the most durable intumescent coating type for all environments.

C1-C3 Environments

For these environments a primer is not required, Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 can be applied directly to abrasive blast cleaned steel, top coats are used where there is a specific colour requirement. Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 are light grey in colour and will chalk and fade when exposed to UV light. Use a weatherable top coat if required for appearance and UV resistance.

C4-C5 Environments

For more corrosive environments an epoxy primer is required prior to the application of Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120, and a final polyurethane or fluoropolymer top coat.

Galvanized Steel

An approved epoxy primer is required prior to the application of Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120.

2.0 Surface Preparation

2.1 Abrasive blast clean

Intumescent coatings are applied to structural steel that has been dry abrasive blast cleaned in accordance with Sa 2.5 per section 4.2 of AS 1627.4 with reference to visual standard ISO 8501-1 Sa 2.5. A uniform angular anchor surface profile of 40-70µm is recommended.

2.2 Secondary surface preparation on site

If there is an extended time between application of the primer and the intumescent, it is important several steps be followed for long term performance to occur:

- Surface contamination such as chalking, debris collection and any collected oils and/or greases are washed off the surface utilizing Gamlen CA1, following all instructions laid out in the product data sheet.
- If zinc oxides/zinc hydroxides, oxidation, staining, and/or other insoluble contaminate are found to be present on the surface after cleaning, it must be fully removed by mechanical means.

If the maximum recoat time has been exceeded, the primed surface must be thoroughly and uniformly scarified. The preferable method of scarification is by utilizing abrasive blasting with a fine abrasive. The method of blast cleaning and the media to be used is ultimately to be selected by the contractor based on their experience and confidence in the capabilities of their equipment and components. However, it is a good practice for the contractor to contact their abrasive supplier for information regarding the efficacy of the abrasive to be used. Good mechanical adhesion is dependent upon the surface preparation being performed correctly. Dulux requires a clean, dry and contaminate free surface that is uniformly dulled, profiled and free of any fractured coating. Below is the suggested procedure:

- Clean all surfaces to be scarified before and after the surface preparation in accordance with AS 1627.1 "Removal of oil, grease and related contamination". Method chosen is to be contingent on specifier approval.
- The prime coating must be thoroughly and uniformly abrasive sweep blasted. The use of fine abrasive and reduced nozzle pressure is suggested. Oxidation, staining, and/or other insoluble contaminate on the prime coat must be removed.
- Abrasive blast test patches are further suggested to determine whether the abrasive and nozzle pressure selected will achieve the desired effect.
- If any areas of rust exist, then the areas must be prepared in accordance with the original specification.
- All edges of remaining sound, tightly adhering coating should be feathered back (beveled) to create a smooth transition from the substrate to the coatings surface. The coating maybe considered tightly adhering if an edge cannot be lifted with a dull putty knife. Any transition margins between the prime coat and exposed steel substrate should be feathered in, creating a smooth transition.
- Any fractured prime coat should be removed, the surface prepared per the original standard and recoated per the original specification.
- To a clean, dry, contaminate free and properly prepared surface, apply the specified system at the specified film thickness.

If small or isolated areas only need to be addressed, these can be thoroughly and uniformly abraded by hand and/or power tools, creating a uniformly dulled and profiled surface. Consult your local Dulux Representative for job specific surface preparation recommendations for the issues being encountered on the project.

2.3 Power tool cleaning

This should only be used for small areas, usually for touch up and repair areas, care must be taken not to polish steel during this method of preparation. In the small areas identified, prepare the substrate in accordance with SSPC SP-11, "Power Tool Cleaning To Bare Metal", Level 1. Consult your local Dulux Representative for further details.

3.0 Primers

3.1 Coating over of approved primers with Dulux FIRETEX® Platinum series

Before application of Dulux FIRETEX® Platinum coatings, ensure the primer to be coated is dry and free from visible traces of rust, breakdown, surface contaminants, especially grease and soluble salts.

Areas of break down or damage on the primer should be prepared to the specified standard (e.g. AS 1627.1-2003, ISO 8501-1:2007, Sa 2., SSPC SP11 Power Tool Cleaning, Level 1 for small areas) prior to patch repairing and subsequent application of specified Dulux FIRETEX® Platinum product.

Ensure that the over coating time/temperature intervals are in line with the primer manufacturer's data sheet and the Dulux FIRETEX® Platinum series primer approval.

Contact Dulux Protective Coatings for a list of approved primers.

Note: For C1-C3 environments Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 do not require primer, always refer to the project specification for the correct coating system.

4.0 Top Coats

In all instances where a topcoat is to be applied this must be an approved product for use with Dulux FIRETEX® Platinum series, specified DFT's should be followed, this includes any subsequent re-decoration of fire protected steelwork.

Contact Dulux Protective Coatings for a list of approved topcoats.

5.0 Application

5.1 Equipment

- Airless spray unit Graco® K60FH2 (60:1) or equivalent.
- 3/8" (9.5mm) or 1/2" (12.7mm) diameter material hose, max 20m in length. If using 1/2" material line, the addition of a 3/8" (2m) whip line is allowed.
- The use of a 3/8" non-restrictive SS swivel connection between the spray gun and the material line is recommended for ease of application.
- Use a Graco® XHF direct feed spray gun w/ XHD RAC switch tip and guard or equivalent.
- Graco® 4500W/240v explosion proof inline heater and heater mounting kit - Graco® part numbers 243863 and 17V573 or equivalent (material temp at nozzle needs to be 35°C for proper atomisation).
- Spray tips / nozzle sizes
 - Dulux FIRETEX® Platinum: 482 - 584 microns (0.019 - 0.023")
 - Dulux FIRETEX® Platinum-120: 533 - 584 microns (0.021 - 0.023")
- Stainless Steel Hopper fitted to allow gravity feed of the coating to the pump.
- Heavy duty paint mixer with a large diameter (160mm). Use a double helical mixing blade and a power mixer similar to an Intex® Mega Mixer AMX 620 to thoroughly and uniformly mix the material, scraping the side of the pail, folding the material back into the body of the product while mixing.

5.2 Procedure

- Ensure all equipment is clean (Duthin® 450).
- Remove both the pump filter and the spray gun filter.
- Do not use a suction hose on the pump, a stainless steel hopper must be fitted to gravity feed the pump.
- During flushing with solvent prior to painting ensure there are no leaks.
- The product should be stored at 20-25°C for 12-24 hours prior to application. Product at a higher temperature will be easier to mix, and will flow more freely through the pump, pot life will vary according to product temperature.
- First mix component A until homogeneous and then add component B, ensure all of component B is used.
- It is recommended to decant the mixed product into a container and then remix material in the new container.
- The in-line heater is used to achieve an ideal temperature of 35°C at the spray tip. A higher temperature setting may be required initially. Material should not be recirculated as heated material in mass will greatly reduce the useable life of the material.
- A pressure of approx. 200bar (3000 PSI) in the spray gun is required to achieve a good finish.
- After every 5 - 6 kits the equipment should be flushed with solvent. This is accomplished in two stages. First, Duthin® 450 or CR Reducer (either new or filtered) is run through the pump for five minutes. Then a second flush is done, again for five minutes using fresh Duthin® 450 or CR Reducer (this solvent can be used for the first flush cycle of the next flush cycle). After the end of a work shift, the pump is flushed as stated. This time, after the second flush, the lower end of the pump is disassembled and thoroughly cleaned to remove all traces of coating material. It should be noted that the amount of flushing needed is dependent on temperatures and extended spray times.
- Complete cleaning is required at the end of every shift/day.
- Ensure there is sufficient distance between the nozzle and the steel substrate to avoid a displacement of the thick coating by the spray pressure.
- Regular checks of wet film thickness should be done in order to achieve the specified coating thickness for the relevant steel item.

6.0 Quality of Finish

6.1 Definitions of Finish as set out in SCI P160 (Blue Book)

The aesthetics of an intumescent finish can vary depending on application techniques and the nature of a project. The standard of finish required by the client should be included in the coating specification and agreed upon with the applicator before commencing application. Samples or test patches should be prepared by the applicator and agreed upon by interested parties. Typically, the range of finishes are defined as:

(i) Basic finish:

The coating system achieves the required fire performance and corrosion protection performance, but is not required to achieve any requirements for standard of finish.

(ii) Decorative finish:

In addition to the requirements for (i) above, a good standard of cosmetic finish is generally required, when viewed from a distance of 5m. Minor orange peel or other texture resulting from application or localised repair is acceptable.

(iii) Bespoke finish:

In addition to the requirements for (i) above, the coating finish is required to have a standard of evenness, smoothness and gloss agreed between the specifier and contractor. When agreeing a bespoke standard of finish, the specifier and contractor should take account of the effects of steel size, section shape, design complexity and the required period of fire resistance.

The Contractor shall provide for a basic finish unless otherwise noted in the contract.

6.2 Improving the quality of finish

In many cases the applicator can avoid sanding to remove film imperfections such as stipple and wet film gauge marks by following these steps while the applied coating is in a specific state of cure.

- 1) At an ambient average temperature of 25°C, allow the painted structure to “tack up” for 45-60 minutes before manipulating the applied film.
 - a) This time-frame will vary depending upon the environmental conditions. In an inconspicuous place make sure the film is ready first before proceeding.
 - i) If coating comes back onto the roller-cover it is not ready.
 - ii) If the roller cover sticks to the coating, is hard to roll (heavy drag associated with rolling), leaves roller nap in the film and/or pulls sticky material back onto the roller cover the cure has gone too far.
- 2) Using a 5mm x 100mm shed resistant roller cover lightly wetted (remove any dripping excess before beginning) with xylene, roll back forth over the area which needs to be smoothed out, ensuring to not overwork the area.
 - a) In some cases, a wetted flat blade and/or wetted trowel (with xylene) may be found to better address specific areas better than a roller cover.
 - b) Refresh the tool being used with xylene as needed to maintain a lightly wetted state. Remove any coating residue from the tool as needed with a clean rag as needed.

Note, Dulux FirePro® products should not be thinned during application. The above instructions for solvent are for wetting tools and preventing a sticking of the coating to tools when they are being used on an already applied coating.

6.3 Dry film thickness measurement

Measurement procedure/guidance notes.

Calibration:

In accordance with ISO 2808:2001 or SSPC PA 2, calibration of the DFT gauge should be carried out following the manufacturer's instructions using a smooth plate (similar in composition to the substrate being measured) at least 1.2 mm thick. The calibration should be checked using shims above and below the expected DFT.

ISO 2808 refers to a figure of 25 µm as a correction factor for blast profile. It is intended to use this correction factor for measurements of all coating thicknesses above 50 µm nominal. When using SSPC PA 2, refer to Appendix 8 on guidance to adjust for surface profile.

Calibration checks should be performed prior to carrying out measurements, in the environment in which the measurements are to be taken. During a series of measurements, the calibration should be rechecked on a regular basis.

Measurement procedure:

Tests shall be carried out in accordance with the following:

(i) I Sections, Tee Sections and Channels

Webs: Two readings per metre length on each face of the web.

Flanges: Two readings per metre length on the outer face of each flange. One reading per metre length on the inner faces of each flange.

(ii) Square and Rectangular Hollow Sections and

Angles: Two readings per metre length on each face.

(iii) Circular Hollow Sections.

Eight readings per metre length evenly spread around the section.

(iv) Where members are less than 2 m in length, three sets of reading shall be taken, one near to each end and one at the centre of the member. Each set shall comprise the number of readings on each face given by (i), (ii), or (iii) above, as appropriate.

(v) For Flat Plates take five readings per metre square

The proportion of items, or of the coated area, to be surveyed will need to be agreed between Dulux Protective Coatings and the customer.

If defects are identified a more detailed survey may be appropriate.

6.4 Paint film thickness acceptance criteria

Intumescent coating schemes

These criteria are based on the required thickness as stated in the paint specification, advised by the applicator or from the FDE loading schedule:

- (i) The average dry film thickness applied to each element shall be greater than or equal to the specified nominal value. No more than 10% of the DFT readings should be below 80% of the recommended DFT.
- (ii) The average measured dry film thickness on any face of any member shall not be less than 80% of the specified nominal value.
- (iii) Dry film thickness values less than 80% of the specified nominal value are acceptable, provided that such values are isolated.

Where any single thickness reading is found to be less than 80% of the specified nominal value, a further two, or where possible three, readings shall be taken within 150 to 300 mm of the low reading. The initial reading may be considered isolated if all the additional readings are at least 80% of the specified nominal value. If one or more of the additional readings are less than 80% of the specified nominal value, further readings shall be made to determine the extent of the area of under thickness.

- (iv) All dry film thicknesses shall be at least 50% of the nominal value.

When measuring intumescent fire protected steelwork the mean must not exceed the maximum fire tested thickness for that type and orientation/use/geometry of section.

Where possible the primer thickness should be determined prior to the application of the intumescent coating. This mean value and the blast profile correction should then be subtracted from the primer and intumescent thickness, measured before the application of any topcoat.

If it has not been possible to measure the primer thickness and the primer and intumescent thickness and hence determine the intumescent thickness accurately then the specified nominal thickness for primer and topcoat may be used.

In either case the 50 and 80% values relate to the full primer (and topcoat) thickness plus 50 or 80% of the specified Intumescent thickness.

i.e. Specification:

Primer = 25 µm, Intumescent = 1000 µm, Topcoat = 50 µm

50% value = Blast Profile + Primer + 50% Intumescent + Topcoat
600 µm = 25 + 25 + 500 + 50

80% value = Blast Profile + Primer + 80% Intumescent + Topcoat
900 µm = 25 + 25 + 800 + 50

7.0 Repair Areas

7.1 Repairs to top coat only

It is important that Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 are sanded in order to create a profile for the adhesion of the top coat. The edges of the existing top coat should be feathered back to create a smooth surface for the best visible appearance. The repair should overlap by at least 25mm onto sound existing top coat.

7.2 Repairs to intumescent coating and top coat

All areas where Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 are damaged, they must be re-instated to the specified DFT.

The intumescent coating must be abraded to create a profile for adhesion. Take care not to apply intumescent coatings over the existing top coat. In accordance with the relevant datasheet and the applicable over coating time, apply the top coat over lapping at least 50mm onto sound, properly prepared top coat.

7.3 Repairs to primer, intumescent coating and top coat

For areas that are damaged, and the substrate is exposed, see section 2.3 for surface preparation recommendations. Once the surface is clean only the bare substrate should be primed with the specified primer. Overlapping onto the existing primer is recommended, but do not apply the primer on Dulux FIRETEX® Platinum or Dulux FIRETEX® Platinum-120.

Once the primer is dry to overcoat apply the intumescent coating to the correct DFT and do not overlap onto the existing top coat.

In accordance with the relevant datasheet and the applicable over coating time, apply the top coat over lapping at least 50mm onto sound, properly prepared top coat.

8.0 Coat backs

When there are both protected and unprotected structural steel items on a project, and unprotected items join to protected items, the unprotected item should be protected (coat back) for 500mm from the protected item.

9.0 Junction between different fire protective systems

Best practice is to protect individual steel or structural elements with one protective system. Mixing of different systems on an individual item should be avoided. Fire testing of all possible interfaces is not practical and is impossible.

Existing fire protection that is to be overlapped or abutted must be cured.

Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 may be butt jointed to existing: fire boards, fire sprays (vermiculite) and reactive coatings.

10.0 Over-Cladding of Intumescent coatings

All intumescent coatings expand in the event of a fire and adequate space is required for this expansion. For Dulux FIRETEX® Platinum and Dulux FIRETEX® Platinum-120 allow for 30x expansion. Where cladding is mounted onto continuous fixings/spacers fabricated from steel or timber these should be considered part of the steel item and should be protected from fire.

11.0 Surface finish and appearance

11.1 Basic finish appearance

The coating achieves the required fire protection and conforms to the specification.

11.2 Decorative finish appearance

When the coating is viewed from 5m, minor orange peel and texture is acceptable. Local repair areas may be visible. The coating achieves the requirements for fire protection and is applied in accordance with the specification.

11.3 Bespoke finish appearance

It is important the following considerations are taken into account and agreement is established prior to application of the intumescent: the size and shape of steel, design complexity, the required level of fire protection and therefore the DFT.

Unless otherwise stated, it is generally accepted that the basic finish appearance is to be expected. When a decorative or bespoke finish is required the specifier should request that the applicator prepare relevant samples for approval.

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