

Intumescent Coating Systems Dulux Protective Coatings

Dulux FIRETEX[®] Water Based Intumescent Application Guide



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The purpose of this manual is to ensure correct application of Dulux FIRETEX® FX5090 water-based, TCEP-free, thin film intumescent.

For the safe handling and use of Dulux FIRETEX® FX5090 reference must also be made to the current Technical and Safety Data Sheets.

Dulux FIRETEX® FX5090 is fully tested and certified and this information is available to design architects and engineers on request.

The information contained in this application manual is based upon independent test data, comprehensive research and field experience, and is considered to be accurate at the time of publication. However, the contents will be subject to revision from time to time due to our policy of continuously improving our products, processes and service.

Only the electronic copy of this manual is a 'controlled document' and all paper versions are 'uncontrolled'. Thus, the user is advised to ensure they have the latest issue of the manual by contacting Dulux Protective Coatings.

1.0 Introduction

Dulux FIRETEX® FX5090 is a single pack water based TCEP free intumescent coating designed to provide up to 120 minutes fire protection to structural steelwork.

1.1 What is Dulux FIRETEX® Water Based Intumescent and where is it used?

Dulux FIRETEX® FX5090 water based intumescent coating is used to enhance the fire resistance of structural steel members by providing a layer of insulation, which is formed as a result of a chemical reaction initiated by fire. This insulation reduces the rate of heat transfer and extends the time period for which the structural member can resist the weakening effects of the heat.

Dulux FIRETEX® FX5090 series intumescent coating has been designed for cellulosic fire resistance periods up to 120 minutes. The product has been tested and certified in accordance with a range of national and international fire testing standards. Please consult the product data sheet or Dulux Protective Coatings for details of these certifications.

The aim of this manual is to provide relevant technical information to the applicator of Dulux FIRETEX® FX5090 helping to ensure that the completed project is fit for purpose.

It is the responsibility of the applicator to ensure that all coatings are applied in accordance with the stated guidelines in this procedure. Since product failure could threaten life in an emergency fire situation, applicators must not deviate from these guidelines without written agreement from Dulux Protective Coatings.

1.2 Product quality assurance

All raw materials are subjected to ISO 9001:2015 registered quality testing before being released for manufacture. Representative batches of Dulux FIRETEX® FX5090 are routinely selected from production and subjected to fire testing.

1.3 Technical support

Our specialist teams co-ordinate the front line technical and sales focus for the Dulux FIRETEX® FX5090. To support our customers in the field we have experienced Technical Service teams working in conjunction with a dedicated product estimators.

2.0 Surface Preparation & Priming

2.1 Surface preparation

All surfaces to be protected by Dulux FIRETEX® FX5090 must be correctly prepared and primed. Surface preparation and painting should be carried out in line with 'best industry practice' as indicated in many publications by institutions such as NACE, SSPC, AMPP, ASTM, AS, ICORR, ISO, etc.

The standards of surface preparation contained herein are to be considered the minimum requirements. Where other client company specifications or product technical data sheets demand a higher level of preparation, the higher level should be adopted. In all cases the applicator should obtain and refer to the current Dulux FIRETEX® FX5090 product technical data sheet.

2.2 Surface defect repair

All surface defects, including weld splatter, cracks, surface laminations, and deep pitting, are likely to be detrimental to FIRETEX® intumescent coatings, and must be removed prior to abrasive blast cleaning. All fins, burrs, and sharp edges shall be removed by grinding to a minimum radius of 2mm (0.08"). The integrity of welds must be inspected, as these are often a location where corrosion forms. Undercut welds, blow holes, discontinuous seams, and other defects must be rectified. Uneven welds should be ground smooth to ensure proper adhesion of the coating system. It is not necessary to grind weld seams flush.

2.3 Abrasive blast cleaning

All steel surfaces must be clean, dry and free from all surface contamination, refer to AS 1627.1 (similar to SSPC-SP1), prior to abrasive blast cleaning per AS 1627.4 to a minimum standard of ISO 8501-1:2007 Sa 2½, (similar to NACE No.2/SSPC-SP10). Abrasive Blast profile should be in the range specified on the product data sheet of the specified primer coat. When abrasive blasting has been completed, all dust arising must be removed from the cleaned surface by use of a vacuum cleaner, dry oil, free compressed air or brush.

2.4 Priming

Primers must be approved and been satisfactorily tested and qualified for use under Dulux FIRETEX® FX5090.

- A range of primers have been approved. Please contact Dulux Protective Coatings for details of tested products.
- Dulux FIRETEX® FX5090 cannot be applied directly to galvanised steel or zinc rich primers.

2.5 Coating Over of approved primers with Dulux FIRETEX® FX5090

Before application of Dulux FIRETEX® FX5090, ensure the primed surface to be coated is dry and free from all traces of surface contaminants, especially grease and soluble salts.

Areas of break down or damage of the primed surface should be prepared to the specified standard (e.g. BS EN ISO 8501-1:2007 St3, SSPC SP11 Power Tool Cleaning Level 1 for small areas) prior to patch repairing with primer and subsequent application of the Dulux FIRETEX® product.

Ensure that the recoat time/temperature intervals are in line with the primer manufacturer's data sheet.

2.6 Primer queries

If there are any doubts about the suitability for overcoating of the primed substrate e.g. unknown primer, excessive primer dry film thickness, contamination, it is essential to contact Dulux Protective Coatings prior to application of Dulux FIRETEX® FX5090.

3.0 Product Storage and Handling

Consult relevant safety data sheet for information on safe storage, handling and application of Dulux FIRETEX® FX5090. It is important that the most current and up to date safety data sheet for the product being used is referred to ensure that the latest storage and handling guidance is observed.

For operator safety it is essential that all recommended PPE as detailed in the relevant safety data sheet is properly worn/used.

The shelf life of Dulux FIRETEX® FX5090 series products is as follows;

3.1 Shelf life

Dulux FIRETEX® FX5090: 10 months from manufacture.

3.2 Storage

- Both transportation and long-term storage of the product must be in a covered environment, out of direct sunlight and in the temperature range 5°C to 35°C.
- Containers which are open should be properly re-sealed and kept upright to prevent spillages.
- Protect Dulux FIRETEX® FX5090 from freezing conditions at all times.

4.0 Application

The Dulux FIRETEX® FX5090 technical data sheet also contains essential information regarding application parameters and must be read in conjunction with this application manual. A copy of the relevant data sheets can be obtained from Dulux Protective Coatings.

4.1 Recommended equipment

A Graco® Mark V airless spray pump (or equivalent) is required. It is also possible to use electric or petrol-powered spray pumps.

Use 3/8" (9.53mm) fluid lines where lengths in excess of 3 metres are required & short 1/4" (0.63mm) whip end, remove all filters.

FIRETEX® FX5090: Typically requires a nozzle/tip Size of 19–21' thou (0.48–0.53mm)

A fan angle >30° is recommended, but application conditions may require a range of alternative tip sizes.

Operating Pressure of 175kg/cm² (2500 psi) is suggested, but in all instances the pressure should be set to the minimum value to allow satisfactory atomisation of Dulux FIRETEX® FX5090.

4.2 Brush application

The products are suitable for brush application, but due to the nature of the products a ribbed appearance may result and as such are generally not recommended for large areas. Application of more than one coat may be necessary to give equivalent dry film thickness of a single spray applied coat.

4.3 Mixing instructions

As Dulux FIRETEX® FX5090 is thixotropic in nature and develop a false body post manufacture and filling, it is recommended to power mix the materials in the can to ensure that the product flows into the wet end of the spray pump. By doing so, steady flow and reduction in cavitation are improved. It is recommended that the material is stirred using an air powered mixer and double helical blade, typically for a duration of 2–3 minutes.

If necessary, Dulux FIRETEX® FX5090 can be thinned with water (maximum 5%) although thinning will have an adverse effect on sag tolerance. It is the applicator's responsibility to determine the sag tolerance should the products be thinned.

4.4 Application conditions

Dulux FIRETEX® FX5090 must be applied in a dry environment. The coatings must not be exposed to condensation, damp or wet conditions during or after application.

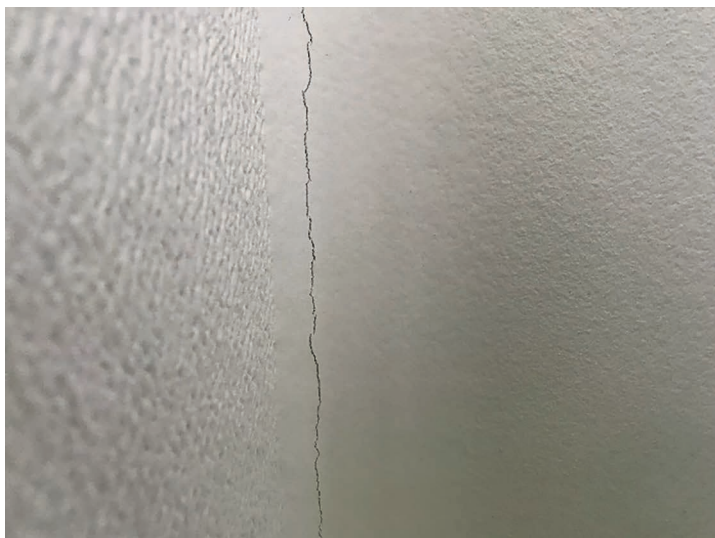
In conditions of high relative humidity, good ventilation conditions are essential. Relative humidity should not exceed 80%. Substrate temperature shall be at least 3°C above the dew point.

At application temperatures below 10°C, drying times will be significantly extended, and spraying characteristics may be impaired.

A minimum air and substrate temperature of 5°C is required to ensure proper film formation.

The application of Dulux FIRETEX® FX5090 at elevated material and substrate temperatures may reduce the sag resistance of the product. It is the responsibility of the applicator to determine what thickness of product can successfully be applied at the prevailing ambient conditions.

Occasionally impaired film formation such as cracking may occur on edges of flanges and external or internal angles of structural steel, depending on geometry, over-application and ambient conditions. This does not detrimentally affect the fire performance properties of the product but should be repaired prior to being put into service.



Typical example of surface cracking at inner corners

4.5 Recoat Windows

No more than two coats by airless spray should be applied within any 24-hour period.

If the maximum recommended thickness per coat is exceeded or high film thicknesses are overcoated prematurely, cracking and/or blistering may occur. This is even more important when high film thicknesses/loadings are involved.

Product data sheets will state minimum periods before an intumescent film can be overcoated, however these are guide figures and the experience of the applicator and inspector will also play a key role in deciding when the coating is dry enough to recoat. There will still be a percentage of water retained in the film when it is overcoated.

4.6 Exposure

Dulux FIRETEX® FX5090 must be applied with a topcoat to provide long-term durability and fire protection performance. For a list of approved topcoats contact Dulux Protective Coatings. If it can be guaranteed that application and subsequent in-service conditions will be in a C1 environment as defined in AS/NZS 2312.1:2014, then no topcoat is required.

4.7 Spray techniques

- Keep overlap areas down to a minimum.
- Do not trigger the gun, a uniform and continuous film is required.
- Try to ensure the gun is aimed directly at steel to avoid dusty finish – even more important when ambient temperatures are raised.
- Ensure good air movement and proper ventilation are present.
- Typical application thickness per coat by airless spray for Dulux FIRETEX® FX5090 is 1000 wet film thickness. See Product Data Sheet for a specific minimum and maximum range.
- The maximum average applied DFT must not exceed the maximum tested DFT. If this occurs, then it will be necessary to abrade or remove to reduce the thickness. Refer to the applicable product data sheet for specific maximum dry film thickness.
- Dry spray is usually not detrimental to the performance of the fire protection. Dry spray is usually an aesthetic issue only. However, over coating dry spray can lead to inter-coat adhesion issues and as such it is strongly recommended to remove or abrade to a smooth finish.
- In-Shop activities;
 - Plan the paint shop to have a good lay-out area (trestles/bogies).
 - Have planned procedures in application and handling of completed painted sections to reduce damage.

4.8 Recommended topcoat/sealer coats

In all instances where a topcoat is to be applied this must be an approved product for use with Dulux FIRETEX® FX5090, specified DFT's should be followed, this includes any subsequent re-decoration of fire protected steelwork.

For a list of approved topcoats contact Dulux Protective Coatings.

Almost invariably, there will still be a small percentage of water still retained in the film when layers are coated over. The retained water will be added to as water/solvent from the applied topcoat is applied over the underlying coating. However, the physical drying will continue as the film is built up to completion, and as the coated steelwork is sent out for construction and commissioning.

The release of water will decrease at an exponential rate as the water has to diffuse from deeper within the coating layers and theoretically it could take several months (or longer) to reach a true equilibrium.

Under normal exposure conditions, the gradual release of retained water will proceed without any noticeable effect; however under certain extreme (in particular very warm weather) exposure conditions, there may be a situation where the release of retained water vapour from the intumescent layers exceeds the rate at which the sealer coat will allow the water vapour to diffuse out, which may result in the formation of blisters underneath the sealer.

This phenomenon is rare; however, it could be influenced by the following factors:

- Thickness of the applied Dulux FIRETEX® FX5090 and sealer coat layers. (High loadings of Dulux FIRETEX® FX5090 contain more water to be released, and thicker sealer layers will be less permeable to water release).
- Exposure to strong solar heat – Sections exposed to direct sunlight will get hot quickly. (This may be exacerbated if the steel is behind glass, leading to a greenhouse effect).
- Colour of the sealer coat (Darker colours have greater solar absorption and will heat up to a greater extent).
- Section factor of the steel (Thinner steel will have less heat sink than thicker sections, and thus heat up more rapidly).
- Chemistry of the sealer coat (Single pack acrylics are more permeable to water release than two pack PU's).

Any such blistering will not have an adverse effect on the fire protection integrity of the system however it will be necessary to repair any blistered areas in order to maintain the integrity of the sealer coat in the given exposure environment, and to meet the aesthetic decorative requirements of the client. Dulux Protective Coatings will provide remedial specifications in any such instances.

The factors listed above should be given due consideration in order to reduce the possibility of this water retention and blistering taking place under extreme exposure conditions.

5.0 QC Inspection

As with any painting project, good inspection and record keeping is essential. Dulux Protective Coatings recommend at a minimum the following records be kept by the applicator regarding the application of Dulux FIRETEX® FX5090:

- At least two times per day, more frequently if the environmental conditions are changing:
 - Air temperature
 - Substrate temperature
 - Relative humidity
 - Dew point
 - Product batch numbers

Further records should also be kept in order to provide traceability of the material usage:

- Product batch details
- Areas coated
- Primer condition and thickness
- Operator/sprayer
- Any cleaning or preparation work prior to painting
- Localised conditions/issues (e.g. leaking water, adjacent operations)

6.0 Handling of Coated Steelwork

Due to the application, loading, transportation and erection of fire protected steelwork, some form of damage to the sections is inevitable in the form of contact point marks, handling or erection damage. Some of this can be mitigated by the careful placement of 'chop blocks', using nylon lifting strops or lifting eyes, and careful handling of steelwork during transport and erection.

Other factors that will affect this are the film thickness applied, the number of coats applied and the length of time that the coating is allowed to dry prior to handling.

7.0 Repairs

Repairs to damaged intumescent coatings must be carried out as soon as possible to prevent further damage and moisture ingress.

Any areas of damage which exhibit surface rusting shall be prepared by mechanical means to AS 1627.2, ISO 8501-1:2007 St3 if surface tolerant primer is allowed. Otherwise prepare the surface in accordance with SSPC SP-11, Level 1. Primer shall be applied to any bare metal areas prior to any intumescent being applied.

Surrounding coatings are to be removed back to a firm sound edge. Areas of damage to the intumescent coat only, shall be removed to a firm, sound edge.

Dulux FIRETEX® FX5090 suitable for brush application but due to the nature of these materials, a ribbed appearance will result. Application of more than one coat may be necessary to give equivalent dry film thickness to a single applied coat.

7.1 Repair methods

All surfaces to be coated shall be prepared in accordance with the guidance given in the product's data sheet or this application manual.

Any topcoat shall be removed in areas where new Dulux FIRETEX® FX5090 will be applied over the existing (intact) coating system.

Damaged Dulux FIRETEX® FX5090 shall be removed until a firm edge is achieved. Where the existing coatings will be over-coated as part of the repair, these should be abraded to ensure good adhesion of the subsequent coats.

Where Dulux FIRETEX® FX5090 is to be used, follow the application and usage information provided in the product data sheet and this application manual. Care shall be taken to ensure that the area of repair satisfies the specified DFT for the structural member under repair. If specified, topcoat can then be applied to the finished Intumescent repair.

NOTE: Where there is damage to the coating greater than 25mm in size, it is essential repairs are carried out to ensure coating integrity, durability and fire performance.

8.0 Quality of Finish

NBS Definitions for Intumescent Finish

440 Basic Finish

Definition: Reasonably smooth and even. Orange peel, other texture, minor runs and similar minor defects are acceptable.

450 Normal Decorative Finish

Definition: Good standard of cosmetic finish generally, when viewed from a distance of 5m or more. Minor orange peel or other texture is acceptable.

460 High Decorative Finish

Definition: High standard of evenness, smoothness and gloss when viewed from a minimum distance of 2m.

Definitions as set out in SCI P160 (Blue Book)

R470 The quality of finish falls under the following categories

(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.

9.0 Dry Film Thickness Measurement Procedures Guidance Notes

9.1 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 1.2mm thick. The calibration should be checked using shims of known thickness above and below the expected DFT.

9.2 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 2m 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 5 readings per metre square.

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

9.3 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 Dulux Protective Coatings loading schedule:

- (i) The average dry film thickness applied to each element shall be greater than or equal to the specified nominal value.
- (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 300mm 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 of section.

The primer thickness should be determined prior to the application of the Intumescent coating. The 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 is not been possible to measure individual primer thickness and the combined primer and Intumescent thickness, thus determining the Intumescent thickness accurately, then the specified nominal thickness for primer and topcoat may be used and assumptions can be drawn from those thicknesses.

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 μ , Intumescent = 1000 μ , Topcoat = 50 μ

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

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

10. Additional Notes

10.1 Application defect photos:



Typical examples of surface cracking, these areas should be scraped back to a firm edge before re-applying the original FX5000 DFT Loading specification, any bare metal or compromised primer should be prepared and re-primed.

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