



APPLICATION GUIDE

SINGLE PACK WATERBASED INTUMESCENT COATINGS

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1. INTRODUCTION

Fireshield waterbased intumescent coating (ICS) systems consist of:

- ArchitecturalWhite^{4FR} : a waterborne, thin film intumescent basecoat for the fire protection of interior structural steelwork in C1, C2 and C3 interior building environments. For C2 exterior environments (partially exposed) contact Fireshield.

Fireshield® ArchitecturalWhite^{4FR} can provide up to 90-minute fire protection, it has been optimised and formulated for 30 and 60-minute fire rating.

This document gives detailed guidance on the use and application of Fireshield® waterbased ICS systems and should be read in conjunction with the relevant Technical Datasheet and Material Safety Datasheet.

Reference throughout this document is made to the FPA Australia and New Zealand Good Practice Guide 01 and the ASFP Technical Guidance Document 11 Code of Practice for the Specification and Installation of intumescent coatings on site.

It is also recommended that reference is made to Local Government, Governing Bodies and Council guidelines for installation licensing requirements and compliance requirements particular to the on-site application of intumescent coatings.

2. AREAS OF USE

FireShield® waterbased ICS can be used for on-site application situations to provide fire protection to internal structural steel sections such as open and closed beams and column sections.

For off-site application, please contact FireShield for assistance prior to specification.

Ensure that the correct Country specific certification approvals that are required are being used for each project. Consult FireShield for the latest information.

FireShield® waterbased ICS can be specified for interior environments such as those described in ISO12944 up to C3 Interior corrosivity categories. Consult FireShield for specific recommendations.

FireShield® waterbased ICS can be used over a range of approved priming systems and overcoated with a range of approved top coats (refer to section 6 more details). Only approved primers and topcoats can be used; for use of other primers and topcoats, please contact FireShield for assistance.

A FireShield® waterbased ICS system typically requires the following:

STEEL SURFACE PREPARATION: Correct surface preparation is critical to ensure optimum adhesion for the primer and the FireShield® waterbased ICS to the steel substrate in order to ensure sufficient adhesion for the developing char layer produced under a real fire scenario.

PRIMER SYSTEM: The purpose of the primer is to provide anti-corrosive protection to the steelwork, FireShield® waterbased ICS must always be applied to a suitably primed steel substrate.

FIRESHIELD® WATERBASED

STEEL INTUMESCENTS :

In a fire scenario, the intumescent coating reacts to heat by rapidly swelling to produce a char which acts as an insulating layer between the steelwork and the elevated temperature of the environment.

The dry film thickness of the FireShield® waterbased ICS will vary depending on the size and configuration of the individual steel sections along with the desired period of fire protection required. Dry film thickness figures for FireShield® waterbased ICS are available from FireShield.

TOP COAT:

Used to protect FireShield® waterbased ICS from moisture/high humidity in C1 interior zones and mandatory in C2 and C3 zones, also to provide a decorative finish and reduce dirt and dust retention.

3. STORAGE OF MATERIALS

Fireshield waterbased ICS recommended storage conditions:

- Store at a temperature above +5°C and below +35°C
- Store indoors and undercover in temperate conditions.
- Store away from direct sunlight, do not expose to extreme heat.
- Do not allow to freeze.
- Keep containers closed when not in use.
- Keep out of reach of children.
- The shelf life of Fireshield® waterbased ICS is:
 - Fireshield ArchitecturalWhite^{4FR} is 12 months at +25°C with the expiry month/year label found on the bucket.

Frozen Fireshield material shall be discarded and **NEVER** thawed and applied.

To aid ease of airless spray application in cold environments, Fireshield® waterbased ICS can be stored in a warm environment +15°C to +25°C for at least 16 hours prior to commencement of spraying.

Containers should remain sealed and unopened until needed and used in date order. The shelf life may be reduced when stored at higher temperatures.

4. SURFACE PREPARATION

Correct surface preparation is the foundation for success of any coating application and intumescent systems are no exception. All surfaces to be coated should be clean, dry and free from contamination including dirt, salts, oil and grease and should be assessed and treated in accordance with ISO 8504:2000. Where necessary, remove weld spatter and smooth weld seams and sharp edges.

Steel preparation before priming should be done in accordance with the recommended primers product technical data sheet. The minimum recommended surface preparation is Sa 2½ (ISO 8501-1:2007) or SSPC SP10/NACE 2

PRIMED NEW SURFACES:

The primer surface should be dry and free from all contamination and the Fireshield® waterbased ICS must be applied within the overcoating intervals specified (consult the relevant primer product data sheet). The primer must have been applied to a properly cleaned substrate as detailed above.

Areas of breakdown, damage etc., should be prepared to the specified standard e.g. Sa 2½ (ISO 8501-1:2007) or SSPC SP10/NACE 2, Abrasive Blasting, or Commercial Grade Power Tool Cleaning SSPC SP15 (for small areas) and patch primed prior to the application of the Fireshield® waterbased ICS .

Should the primer's suitability for overcoating be in doubt in any way, for example, primer type unknown, primer not approved, excessive dry film thickness, surface contamination, surface glossiness etc, Fireshield MUST be consulted prior to the application. Untreated/un-primed steel cannot be painted directly with a Fireshield® waterbased ICS , this includes nuts, bolts, steel cleats and base plates.

Generally steel erected on site will already have been blasted and primed, this guide is for the application of the Fireshield® waterbased ICS onto pre-primed steel surfaces and does not detail the primer application and its requirements, this information should come from the primer Manufacturer.

However, the following minimum requirements must be followed prior to the primer application for the successful application of Fireshield® waterbased ICS, the steel surface should be:

- Assessed and treated in accordance with ISO 8504:2000
- A minimum abrasive blast cleaning of SSPC-SP10 or Sa2.5 (ISO 8501-1:2007) AS1627.4.
- Or a minimum power tool clean to SSPC SP3.
- Free from grease, rust, flaking paint and mill scale, see AS1627.1, Definitions 2.1 for requirements.

Ensure the Primer is the correct primer for the Corrosion Class (see table below for interior only) and complies with AS/NZ2312.1 Section 2.

Corrosive Class	Environment Classification	INTERIOR ONLY
C1	Very low	Inside heated or air-conditioned buildings with clean atmospheres. Low relative humidity and no likelihood of damp or condensation e.g. offices, schools, shops, hotels.
C2	Low	Occasional damp or wet conditions. Unheated buildings where water leakage or condensation may occur, e.g. unheated warehousing, sports halls, plant rooms etc and in roof voids.
C3	Medium	Constant damp atmosphere but may be warm and well ventilated. Production rooms with high humidity and some air pollution, e.g. food processing plants, kitchens, laundries, breweries, dairies.

EXISTING PAINTED SURFACES

During a refurbishment or renovation, existing painted structural steel members may require an upgrade which includes fire rating with an application of Fireshield® waterbased ICS.

Fireshield® waterbased ICS can be painted over some existing paint systems that have adequate adhesion to the steel member, contact Fireshield for existing paint types and tests to be performed for confirmation.

5. APPLICATION ENVIRONMENT

FireShield® waterbased ICS s should be applied at air and substrate temperatures between +10°C and +35°C.

The surface must be dry and the surface temperature must always be a minimum of +3°C above the dew point. In line with good painting practice, application should not take place in conditions which are deteriorating, e.g. where the temperature is falling and is likely to go below +10°C or where there is a risk of condensation forming on the steel.

For optimum application and drying, the air and substrate temperature should be greater than +10°C and relative humidity less than 75%. Application at temperatures below 10° and at higher humidity will slow drying and could compromise the ultimate coating performance.

The use of electric heaters, indirect fired heaters where no power is available or dehumidifiers are recommended to maintain optimum environmental conditions where appropriate for application. Some heaters can be detrimental to the drying and curing of the product as they create moisture, these should be avoided.

Air movement is the most significant factor affecting the drying of water-borne coatings. Good air flow and ventilation are always recommended, ensure there are no areas around the steel structure being coated without adequate ventilation.

It is possible that an increase in the local relative humidity will soon reach unacceptable levels with little air movement being present, this can result in extended drying and overcoating times. However, forced ventilation such as the use of portable fans in direct contact with freshly applied ArchitecturalWhite^{4FR} is not recommended as it can lead to surface defects, for example skinning or wrinkling. The recommended air movement is 4 air exchanges per hour.

FireShield® waterbased ICS s must be protected from condensation and water during application and drying. Always protect from the following during application, even when top coated:

- Pooling, standing or running water.
- Driving rain.
- High humidity/condensation

6. HEALTH AND SAFETY

FireShield® waterbased ICS is intended for use only by professional Registered Applicators in industrial situations in accordance with the advice given in this document and on product buckets and should not be used without reference to the Material Health and Safety Data Sheets (MSDS) and Technical Datasheet (TDS) which FireShield has provided to its customers.

All work involving the application and use of this product should be compliant with all relevant National Health, Safety & Environmental standards and regulations.

If for any reason a copy of the relevant Material Health and Safety Data Sheet is not immediately available, the user should obtain a copy before using the product.

Protective measures should be taken when handling or applying the products in accordance with the product Material Safety Data Sheet. In particular:

- Wear eye protection
- Use respiratory protection for spraying meeting the requirements of AS/NZS 1715 and AS/NZS 1716
- Wear overalls, impervious gloves and safety shoes.
- When using do not eat, drink or smoke.

7. PRIMERS

Fireshield® waterbased ICS must **ALWAYS** be applied over an approved priming system which will provide the required anti-corrosive protection to the steelwork over the lifetime of the structure it is protecting. Fireshield® waterbased ICS are not designed to give anti-corrosive protection alone and are therefore **NEVER** applied directly to steel substrates.

Fireshield® waterbased ICS have been tested as part of a coating system for use in fire situations. A list of the approved primers can be found on the Fireshield website.

Typical primer dry film thickness recommended dependant on the primer product being used. Consult primer product data sheet for recommended primer thickness prior to application.

The recommended dry film thickness for the priming system is found on the primer manufacture's datasheet. If the maximum primer thickness exceeds the maximum dry film thickness of the datasheet, consult primer manufacturer or Fireshield for recommended actions.

8. TOP COATS

Only top coats approved by Fireshield should be applied over Fireshield products. A list of the approved topcoats can be found on the Fireshield website.

Prior to the application of the topcoat, the applicator must ensure that the specified dry film thickness of the Fireshield® waterbased ICS has been achieved. The Fireshield® waterbased ICS should be allowed to harden sufficiently so that accurate DFT readings can be taken.

The surface of the Fireshield® waterbased ICS must be clean, dry and free from contamination before overcoating with the topcoat. The top coat must be applied within the overcoating intervals specified. Consult the Fireshield® waterbased ICS product technical data sheet for specific details.

Depending on the choice of top coat colour, two or more coats may be necessary to achieve full opacity and coverage. The DFT of the topcoat required will come from the topcoat manufacturers technical datasheet. It should be noted that the quality of surface finish is entirely dependent on the final surface appearance of the Fireshield® waterbased ICS ; it is important that the intumescent is applied and finished to the required quality prior to application of any topcoat (see section 10 for further information).

Where the Fireshield® waterbased ICS is to be subjected to environmental conditions other than internal dry (C1 as defined in ISO 12944-2), then an approved topcoat **MUST** be applied. Even when the Fireshield® waterbased ICS is correctly top coated, any contact with ponding, standing or running water must be avoided.

The minimum overcoating interval for Fireshield® waterbased ICS with all topcoats is 48 hours.

9. APPLICATION + EQUIPMENT

AIRLESS SPRAY:

Equipment Recommendations:

PUMP	Graco TexSpray MARK V or similar / larger, Minimum 5 LPM Rating
SPRAY GUN	Graco Heavy-Duty Texture Gun or Similar
SPRAY TIP	Graco LTX425 Switch Tip and Guard or similar. Orifice size range of .015" - .021". Choose appropriate fan width depending upon structure(s) to be coated.
ATOMISING PRESSURE	2,500 – 3,000 P.S.I.
MATERIAL HOSE ID	Up to 30 M of 3/8" material line & 3 M of ¼" whip line

Power stirring is essential to ensure that the FireShield® waterbased ICS is mixed to a uniform consistency. Do not mix excessively, there is a risk of incorporating excessive air.

All FireShield® waterbased ICS are supplied ready for use. **DO NOT DILUTE OR THIN.** Manual mixing is not recommended.

NOTE: Never use the same tools for solvent-based paints and for waterborne paints. These items must be cleaned thoroughly and used only for fire-retardant paint. Any filters in the airless spray must be removed from both the gun and holding filters.

MULTIPLE COAT APPLICATION

Where the specified DFT of the FireShield® waterbased ICS is greater than 800 microns, the total thickness should be built up in two or more applications or coats, using the recommended overcoating intervals from the technical datasheet. Up to a maximum wet film thickness of 800 microns per coat can be applied.

Prior to overcoating ensure the previous coat is dry. Particular attention should be paid to the internal angles of flanges and webs where excessive build-up of paint can occur, and air flow may be restricted. Excessive paint application in these areas can be removed by simply smoothing with a small paint brush down the internal angles whilst the paint is still wet.

Drying can be optimized by maintaining air temperatures above +10°C by improving air flow, particularly in areas where natural air flow is restricted and by keeping relative air humidity as low as possible. Drying times will be optimized if successive coats are of similar thickness. For further advice on overcoating intervals contact FireShield.

During application it is important that the applied wet film thickness is continually monitored to ensure the required thickness is being applied for compliance.

BRUSH and ROLLER APPLICATION:

FireShield products can achieve compliance when brushed or rolled, provided the correct film builds are achieved. However, the resulting finish may not be acceptable visually in some environments. It is generally recommended for small areas, repairs and touch-up only as it may result in a textured finish.

A sample should be provided to the Specifier prior to application for approval when brush or roller application is used.

Between 100-300 microns wet film thickness can be achieved per coat. For typical 60-minute dry film thicknesses multiple coats applied by brush or roller will be required. The appearance of brush or roller applied FireShield® waterbased ICS will be different to that of the spray applied coating, which will provide the smoothest finish.

The level of finish of the FireShield® waterbased ICS will vary depending on the method of application. Spray application of the coating is generally considered to give a superior appearance to brush application.

Particular requirements for the quality of the finish should be stated in the specification. For non-visible areas, for example, the standard of finish achieved may not be of concern. At the outset of a project it is strongly recommended that a sample area is prepared and the standard of cosmetic finish is agreed by all parties concerned.

For guidance, ASFP Technical Guidance Document 11 section 2.1.11 outlines three standards which can be specified. These are:

a. Basic Finish:

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

b. Decorative Finish:

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

c. Bespoke Finish

In addition to the requirements for (a) 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 following checks should be done prior to application:

- Is the primer intact, un-damaged, contaminated or showing any degree of deterioration.
- Is the primer compatible with the FireShield® waterbased ICS and applied in accordance with the primer manufacturer's technical data sheets requirements.
- Is the primer within the primer manufacturer's overcoating period.
- Has the primer thickness been measured and recorded.
- Is the primer surface clean and dry.
- Drying times expected (in respect to product thickness, ventilation, temperature and relative humidity)
- Batch numbers recorded.
- Where different structural steel sections require different intumescent coating thicknesses, is each appropriately marked or otherwise identified for application and record purposes.
- The Applicator must ensure that all relevant safety data sheets, technical datasheets, application instructions and method statements are available to the application operative(s) and that they are fully understood.
- All work should be scheduled to ensure that the conditions required by FireShield (temperatures and humidity, over-coating times etc.) can be met.
- It is important that where application is to be carried out in a partially clad building (i.e. not theoretically open to the elements), the Applicator ensures that the building is water-tight and that areas where coatings are to be applied are not directly exposed to external weather conditions at any time.

10. FILM ABNORMALITIES

A number of potential film defects are detailed below together with recommended remedial treatment.

Over-Application

Excessive film thickness will lead to extended drying times and may lead to other surface defects. This will be more apparent in areas such as corners and internal angles of universal sections and may result in hairline cracking in these areas. This cracking is not detrimental to the integrity or fire performance the FireShield® waterbased ICS system. To eliminate these effects, caution should be exercised when coating narrow-webbed sections. If necessary, the wet film thickness per coat should be reduced from the 800 microns maximum allowable.

Overspray / Dry Spray

Any dry overspray of the FireShield® waterbased ICS onto adjacent primed steelwork should be removed from the surface prior to further application. Failure to do so may impair adhesion and affect final appearance.

Overspray present on the FireShield® waterbased ICS may give a rough appearance to the surface. Sometimes this can be dusted off but abrasion may be required to achieve a satisfactory smooth finish onto which a topcoat can be applied in order to satisfy the requirements for cosmetic appearance.

Overspray can be minimised by:

- improved spray technique
- reduction of air pressure
- appropriate tip fan size.
- The sprayer should be close enough to the work surface at all times to minimise airborne overspray without leading to excessive ripples or other texture in the coating caused by the pressure of the spray.

All dry overspray must be removed prior to top coating the FireShield® waterbased ICS .

For large areas or areas where overspray may be unavoidable, it is advised that the adjacent steelwork be covered or taped to prevent overspray damaging cosmetic appearance. Overspray will have the appearance of a non-closed film and/or surface roughness.

Sagging

This is the result of excessive film thickness and poor spray technique or over-thinning. Any areas which are subject to excessive film build should have the coating removed and re-applied.

11. DRY FILM THICKNESS MEASUREMENT

After sufficient drying time an inspection of the dry film thickness (DFT) should be carried out using a suitable calibrated gauge. An electromagnetic induction instrument with a statistical function to store readings and give an average is most useful. Where dry film readings include a primer and/ or top coat an allowance must be made for these coatings and subtracted from the total reading.

The Applicator is responsible for the execution of the necessary inspections, recording and quality measurements during the application. When quoting dry film thickness, it should be made clear whether the quoted thickness refers individually to the primer, intumescent coating or topcoat, or to the system as a whole.

The following is the recommended procedure for measuring dry film thickness and acceptance criteria based on Section 4.7 Dry Film Thickness, ASFP Technical Guidance Document 11.

Readings should be taken on every steel section as follows:

I Sections, Tee Sections and Channels

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

Square and Rectangular Hollow Sections and Angles

- Two readings per metre length on each face.

Circular Hollow Sections

- Eight readings per metre length evenly spread around the section
- Where members are less than 2m in length, three sets of readings shall be taken, one at each end and at the centre of the member. Each set shall comprise the number of readings on each face as appropriate.

Dry Film Thickness Acceptance Criteria

The average DFT of each steel section should be equal to, or greater than, the specified DFT. Where any single thickness reading is found to be **less than 80%** of the specified thickness:

- a further three readings should be taken on the same face within a 300mm radius of the low reading.
- If one or more of the additional readings are also less than 80% of the specified thickness, further readings should be taken to establish the extent of the area of under thickness and the whole area should be brought up to the specified thickness.

Individual thickness readings of less than 50% of the specified thickness are not acceptable

The average measured dry film thickness of any steel section should not exceed by more than 10% of the maximum stated dry film thickness for the particular steel shape and orientation (as quoted in the latest published loading tables for all FireShield® waterbased ICS systems.)

Remedial Procedure : Non-Compliant DFT

Final dry film thickness of the FireShield® waterbased ICS that is not compliant with the appropriate fire design listing will require remedial action. Areas of low thickness may be random but frequently a pattern can be observed e.g. low thickness tending to occur on inner flanges. Additional FireShield intumescent should be applied to ensure compliance with the DFT acceptance criteria stated earlier.

The surface of the existing FireShield® waterbased ICS coating must be clean, dry and free from all contamination. If the topcoat has already been applied it will need to be removed. Where the dry film thickness exceeds the recommended limit, guidance should be sought from FireShield Coatings.

Dry Film Thickness of the Topcoat

Follow the guidelines of SSPC PA2 or the appropriate section of AS3894

APPLICATION PAPERWORK

All FireShield intumescent products are a compliance based passive fire protection system that must be installed by a Registered Applicator that is a suitably qualified or a competent person able to sign off their own work.

By completing the relevant paperwork, the Applicator is confirming that their aspect of the building work complies with the building approval and the relevant building laws.

Applicators must complete and sign a Statement of Construction/ Producer Statement (PS3) / Form 16 (only one of these depending on the local Council/Building Certifier requirements).

A copy of the signed Statement of Construction/ a Producer Statement (PS3)/ Form 16 combined with the daily application record must be forwarded to the Main Contractor or in the absence of a Main Contractor, the property owner or his agent.

In some Territories or Provinces local Council require that Passive Fire Installers are registered and licensed, please enquire with your local Council prior to installing any FireShield intumescent products. Contact FireShield for further information.

Records and reports

Site records should contain the following information:

- All records should identify the areas inspected with reference to the relevant drawings, and should include:
- Environmental conditions – air and substrate temperature, relative humidity and dew point.
- Dry film thicknesses per coat and for the full fire protection system, for each element of the structure. Measurements should include:
 - the member identification mark
 - the number of readings taken
 - maximum coating thickness recorded
 - minimum coating thickness recorded
 - average coating thickness
 - any supplementary readings taken to establish if low readings (below 80% of specification) are limited and isolated areas.
- Variations, corrective actions or concessions carried out in relation to environmental conditions or dry film thicknesses.

12. REPAIR AND INSPECTION PROCEDURE

The repair method will depend upon the extent of the damage. Repairs should be carried out at the earliest opportunity using the appropriate procedure from the following options.

Damage Down to Steel

Remove unsound and damaged coatings to a neat firm edge with sound adhesion. Remove all corrosion products. For limited small areas prepare steel surface in accordance with SSPC SP15 without polishing the substrate. For large areas of repair, the exposed steel surface should be prepared by abrasive blasting to a minimum standard of Sa2½ (ISO 8501-1:2007) or SSPC SP10/NACE 2.

Feather coat edges by abrading. Reinstatement the original or other priming system recommended. Avoid overlap of primer onto surrounding FireShield® waterbased ICS coating. Reinstatement the FireShield intumescent coating within the recommended overcoating limits of the repair primer.

Apply the FireShield® waterbased ICS in multiple applications by brush if necessary or spray if possible. If a topcoat has already been applied to the existing system, minimise overlap of fresh FireShield® waterbased ICS product over the existing topcoat. Apply topcoat as appropriate.

Damage Not Requiring Primer Repair

Depending on severity of damage, either lightly abrade the damaged area to a feathered edge or cut out a suitable area of the FireShield® waterbased ICS and feather out the edges. If cutting out, do not damage the priming system, otherwise repair as for damage down to steel will be required.

Reinstatement the FireShield® waterbased ICS to the required dry film thickness using the method described above. After the appropriate overcoating interval apply an approved topcoat in accordance with original specification. Hairline cracks are not detrimental to the integrity or fire performance of the FireShield® waterbased ICS. Where they do occur repairs can be carried out by application of a brush coat of the FireShield® waterbased ICS or a stripe coat of topcoat followed by a full coat of the topcoat.

Damage to Topcoat Only

Remove loose or unsound coatings to a firm edge and feather the edges. All surfaces should be clean, dry and free from all contamination. Reinstatement top coat in accordance with original specification.

Future Inspection and Maintenance

The fire protection properties of the FireShield® waterbased ICS system will remain as long as the integrity of the coating is maintained. Regular inspections of the FireShield® waterbased ICS fire protection system should be carried out. Any defects, damaged areas etc. must be repaired as recommended above.

The inspection intervals for a project should be stated in the specification. Typically, inspections should be carried out every 12 months. Topcoats must be maintained as a continuous film to protect the FireShield® waterbased ICS from the environment.

However, excessive build-up of top coat thickness could be detrimental to the fire protection system and must be avoided. As a guide the maximum recommended number of topcoats is two, applied at 50 microns DFT per coat. Only approved topcoats can be applied over all FireShield® waterbased ICS products. For further information contact FireShield.