



# FIRETEX<sup>®</sup> M90/02

Application Manual



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## 1. Introduction

FIRETEX® M90/02 is a solvent free epoxy intumescent coating, providing an uncompromising solution for the fire protection of steel structures in the most demanding environments. It has been successfully used on over 2000 major projects worldwide.

Epoxy intumescent coatings have major advantages in durability, weight, ease of application and aesthetics. As a result they have become the fire protection method of choice and offer design architects and engineers a highly adaptable PFP solution, which is both practical and functional.

### 1.1. What is FIRETEX® M90/02 and where is it used?

FIRETEX® M90/02 is a two component epoxy coating used to enhance the fire resistance of structural materials 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 material can resist the weakening effects of the heat.

Passive fire protection is predominantly used:

- To insulate structural steel elements against damage or collapse in various fire scenarios, thus maintaining the integrity of the structure and allowing evacuation and fire fighting measures to be effected.
- To insulate walls and decks so reducing the rate at which these structures weaken or transfer heat. Such divisions are used to isolate accommodation areas and safe havens from production, storage and utility areas, providing the maximum opportunity for escape in the event of fire.

FIRETEX® M90/02 is designed to protect against the very severe conditions that are associated with the combustion of hydrocarbon fuels (oil, methane, LNG, LPG, etc.). Typically these fires can involve explosions and jet fires (fuel under pressure) as well as unpressurized fires. Additionally, the aggressive production environments normally associated with these industries require FIRETEX® M90/02 to be extremely durable.

Whilst FIRETEX® M90/02 has excellent durability, it is normal to use a suitable approved anti-corrosive primer and a good quality topcoat. FIRETEX® M90/02 may be directly applied to properly prepared steel (see 2.6.1).

Normal in service temperature range for FIRETEX® M90/02 is between -20°C (-4°F) and 80°C (176°F) please refer to Sherwin-Williams Technical Advice Document TAD 0040 for advice regarding temperatures below this range.

Intumescent coatings are designed to be thermally active, reacting to increased temperatures. FIRETEX® M90/02 is stable in service conditions up to 80°C (176°F), if the design temperature of an item requiring protection is above this then FIRETEX® M89/02 Epoxy Insulant may be used to reduce the temperature of the surface, consult Sherwin-Williams for advice.

Mechanical reinforcement may also be required in the form of a specially designed fire resistant scrim. Full details are contained in Section 3.

The aim of this manual is to provide relevant technical information to the applicator of FIRETEX® M90/02, helping to ensure that the completed project is fit for purpose. It is essential that all applicators of FIRETEX® M90/02 have undergone training by Sherwin-Williams prior to undertaking application work on a project.

Since product failure could threaten life in an emergency fire situation, applicators must not deviate from our recommendations without express written agreement from an authorised Sherwin-Williams FIRETEX representative.

### **1.2.Product quality assurance**

Sherwin-Williams operates Quality Systems to ISO 9001:2008. All raw materials are subjected to Quality Testing before being released for manufacture. Representative batches of FIRETEX® M90/02 are routinely selected from production and subjected to hydrocarbon fire testing. FIRETEX® M90/02 is a UL1709 listed product and is therefore also subject to UL's regular "Follow Up" monitoring programme.

### **1.3.Technical support**

Sherwin-Williams has a technical support network second to none in the industry. Staffed by engineers, chemists, former applicators and other industry professionals. To support our customers in the field we have a dedicated Technical Service Department, working in conjunction with a dedicated Fire Research Department, staffed by degree and PhD qualified scientists.

Technical Service Department personnel have extensive experience of FIRETEX application, both from working in the application industry and also from involvement with the FIRETEX research and development team. They provide support to applicators of FIRETEX in the form of training and ongoing assistance before and during projects.

## **2. Surface preparation and priming**

All surfaces to be protected by FIRETEX® M90/02 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, ICORR, ISO, etc. The standards of surface preparation contained herein are to be considered minimum requirements. Where other client company specifications or product technical data sheets demand a higher level then the higher level should be adopted. In all cases the applicator should obtain and refer to the current product technical data sheet.

### **2.1.Surface defect repair**

All surface defects, including weld splatter, cracks, surface laminations and deep pitting likely to be detrimental to the protective paint system must be removed. All fins at saw cuts; burrs and sharp edges shall be removed by grinding to a minimum radius of 2mm (0.08"). Welds must be inspected for condition, as these are often a source of corrosion. Undercut welds, blow holes, discontinuous seams and other defects must be rectified. As uneven welds are likely to be the source of corrosion they will need to be ground smooth. It is not necessary to grind flush.

### **2.2.Blast cleaning**

All surfaces must be clean, dry and free from surface contamination, refer to SSPC - SP1, prior to abrasive blast cleaning to a minimum standard Sa 2½ ISO 8501-1 (NACE No.2 / SSPC-SP10). Blast profile should generally be in the range of 50-75 microns (2 to 3 mils). When blasting has been completed, all dust and arising must be removed from the cleaned surface by use of a vacuum cleaner, dry, oil free compressed air or brush.

### **2.3.Preparation of galvanised steel**

All surfaces must be clean, dry and free from surface contamination prior to abrasive blast cleaning in accordance to SSPC-SP16. Non- metallic abrasive shall be used at low pressure to ensure that the surface of the zinc is roughened but not removed. A typical profile will be in the range of 25 to 50 microns (1 to 2 mils).

### **2.4.Repair/touch - up**

For small areas of repair/touch up where blast cleaning is not possible, the primer/ intumescent system can be applied to surfaces prepared to a minimum standard of St 3 ISO 8501-1 (SPC-SP3) at the time of coating.

Suitable power tools should be used but wire brushes are not recommended as they can cause surface polishing.

### **2.5.Other surface preparation methods**

Alternative methods of surface preparation may be acceptable, consult Sherwin-Williams for further information.

### **2.6.Priming**

It is essential in a fire situation that FIRETEX® M90/02 remains adhered to the substrate for the duration of the expected protection period. In most cases the substrate will be primed and hence the adhesion of FIRETEX® M90/02 to the primer must be verified.

For this reason only primers & coating systems satisfactorily tested and qualified by Sherwin-Williams shall be used under FIRETEX®. For details of approved primers contact Sherwin-Williams

Primer and top coat painting must be carried out in accordance with the appropriate manufacturer's technical data sheets.

#### **2.6.1. Application of FIRETEX® M90/02 to bare steel**

It is also possible to apply M90/02 directly to blast cleaned steel, but in such instances it is essential that the product be applied within 4 hours of blasting, in a controlled environment (RH <60%; Air temperature >15°C (60°F); Steel temperature minimum 3°C (37°F) above dew point). Areas of mechanical damage to the FIRETEX® M90/02 must be repaired immediately to ensure corrosion protection of steel is maintained.

#### **2.6.2. Zinc Silicate Priming System**

The use of zinc silicate primers under epoxy PFP should be treated with extreme caution because of their inherent mechanical weakness and known failures within the industry. Zinc silicates are prone to 'splitting' within the film when subjected to impact damage, especially when over-coated with high build, high strength films. This tendency is more prevalent when primer DFT is high and/or when temperatures are low. Consequently very high levels of site control over both application & dry film thickness are essential, as is knowledge of the lowest conceivable operating temperature in service.

It is for this reason that zinc silicate is not normally recommended under FIRETEX® M90/02, although a view can be taken on a project specific basis and after testing as noted above.

#### **2.6.3. Over coating of approved primers with FIRETEX® M90/02**

Before application of M90/02, ensure the primer to be coated is dry and free from all traces of surface contaminants, especially grease and soluble salts. Ensure that the over-coating time/temperature intervals are in line with the primer manufacturer's data sheet and the FIRETEX® M90/02 approval.

## 3. Reinforcement

### 3.1.Reinforcement System

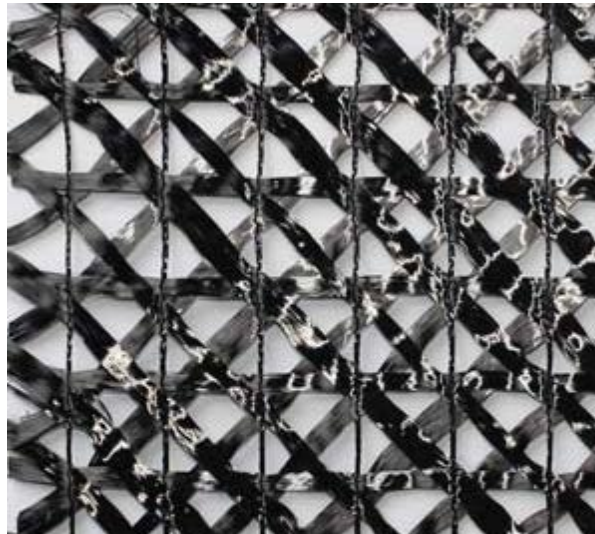
When FIRETEX® M90/02 reacts in a fire the char developed needs to be reinforced by the incorporation of a high temperature scrim cloth, FIRETEX® J220. This is incorporated at the time of application at approximately mid-film depth.

Where lengths of scrim overlap, it is essential to ensure good bonding between layers by fully 'wetting out' the scrim cloth.

Two methods of installation can be used depending on the total film thickness required, the complexity of the job and the applicators preference in terms of number of 'jobsite visits'.

- A) Apply FIRETEX® intumescent to approximately one half of the total thickness required. While still wet, install the scrim cloth ensuring it is fully 'wetted out', using a trowel or roller. Within the same application shift apply a 'thin coat' (typically 1mm (40 mils) but need not be exact) such that the scrim cloth is 'sealed'. Allow to cure sufficiently such that meaningful film thickness measurements can be taken and then apply further material to achieve the desired specification thickness.
- B) Apply approximately one third of the total thickness of FIRETEX® intumescent required and allow to cure sufficiently to take meaningful film thickness measurements. Subsequently apply a thin wet coat (about 1mm (40 mils)) and then install into this the scrim cloth, ensuring that it is fully 'wetted out', using a trowel or roller. While still wet apply a further thin coat and allow to cure sufficiently such that meaningful film thickness measurements can be taken. The aim is to get this 'mid part' of the film to be about one third the total required thickness. Finally apply the final coat to achieve the desired specification thickness.

FIRETEX® J220 Scrim Cloth



To ensure the correct durability and fire protection performance the FIRETEX® J220 Scrim must be fully wetted out during installation. At terminations the FIRETEX® M90/02 must be extended 25 to 50mm (1 to 2") past the end of the FIRETEX® J220 to completely encapsulate the scrim, see section 4.9.



### 3.2.Reinforcement requirements from certification

For projects where the fire case is cellulosic fuelled fire the FIRETEX® J220 Scrim should be overlapped at joints by a minimum distance of 25mm (1”).

For hydrocarbon fire protection the FIRETEX® J220 Scrim overlap distance should be determined from the below table:

FIRETEX® J220 Scrim Overlap Distance		
Certifying Body	Hydrocarbon Pool Fire	Hydrocarbon Pool & Jet Fire
<b>UL</b>	50mm (2”)	N/A
<b>Lloyd’s Register</b>	50mm (2”)	150mm (6”)
<b>Det Norske Veritas</b>	50mm (2”)	50mm (2”)
<b>American Bureau of Shipping</b>	50mm (2”)	50mm (2”)

In all cases where scrim is required it should be installed at approximately the midpoint of the total coating thickness, practically this means it should be located within the mid 1/3 of the applied coating.

## 4. Application

The FIRETEX® M90/02 data sheet also contains vital information regarding application parameters and must be read in conjunction with this manual. A copy of the data sheet can be obtained from Sherwin-Williams or from our web site at [www.protectiveemea.sherwin-williams.com](http://www.protectiveemea.sherwin-williams.com)

Application must only be carried out by personnel who have received training in the correct use of FIRETEX® M90/02 from Sherwin-Williams Technical Service team. After successful completion of the training each operative will receive a certificate to confirm this.

The mixing ratio is 2 parts base to 1 part additive by volume.

The Base component is coloured White and the Additive component is coloured Blue. When correctly mixed a homogeneous Pale Blue colour should be achieved, free from streaks of either white or darker blue.

Regular wet film thickness checks should be made during the application process.

### 4.1. Application conditions

The following conditions are the absolute limits under which FIRETEX® M90/02 shall be applied. Note that the optimum conditions are the preferred application conditions and these are also given below.

Minimum air temperature:	10°C (50°F)
Maximum Relative Humidity:	85%
Minimum steel temperature:	3°C (5°F) above dew point temperature.
Maximum Steel Temperature:	75°C (167°F)

The optimum conditions for application and curing of FIRETEX® M90/02 are:

Temperature:	15°C to 35°C (60°F to 86°F)
Relative Humidity:	<75%

The warmer the air temperature, the shorter will be the working life after application for trowel and rolling finishing.

When temperatures drop below 10°C (50°F), curing time will be significantly extended and will effectively cease below 5°C (41°F). If application has to take place in environments subject to such conditions then appropriate measures must be taken (such as enclosures, heating, dehumidification, etc.) to elevate the temperature of the work-piece, the spray pump, fluid delivery lines and FIRETEX® M90/02 containers.

Care must be taken to avoid condensation in the containers and equipment and to ensure the steel substrate meets the above requirements for dew point.

### 4.2. Storage

The product shall be used within the 'use by' date stated on the container label.

The use by date refers to the long term storage of the product in a covered environment out of direct sunlight and in the temperature range 0°C (32°F) to 30°C (86°F). It is accepted that temperature control during shipping is more difficult and hence temperature may be allowed to be in the range -5°C (23°F) to +35°C (95°F) for a maximum period of 6 weeks.

#### **4.2.1. Product conditioning immediately prior to application**

To obtain optimum application characteristics the material should be stabilised at a temperature of 20°C to 25°C (68°F to 75°F) prior to use for single component pump or trowel application. For plural component pump application the material should be at 30°C to 35°C (86°F to 95°F).

### **4.3. Spray equipment**

FIRETEX® M90/02 may be applied using a plural component specifically designed for the purpose of PFP application; it may also be applied through suitable single component pumps after proper thinning, see section 4.5.

Due to the range of factors which can affect application it is suggested that Sherwin-Williams Technical Service Department be involved at the start of a project to help ensure application progresses smoothly.

The following information is given to assist applicators in achieving satisfactory application of FIRETEX® M90/02. It is the responsibility of the application contractor to ensure all equipment is working correctly and that the operators have been correctly trained by the equipment supplier.

#### **4.3.1. Single component pump**

A pump with a minimum ratio of 68:1, such as the Graco Xtreme X70, or equivalent, should be used to spray thinned FIRETEX® M90/02.

The maximum length of fluid line recommended for this type of application is 25m (82'), and if external temperatures are low, it will be beneficial to insulate this line. Fluid line diameter should be at least ½" (13mm) ID although a short whip end of 3/8" (9.5mm) may be used to facilitate use of the gun.

The pump should be fitted with a 30's mesh filter.

Suction hoses should not be used; the FIRETEX® M90/02 should be supplied using a ram feed and wiper plate to fit the material container.

#### **4.3.2. Plural component pump**

Sherwin-Williams have evaluated plural component pumps for the application of FIRETEX® M90/02. The following pumps have been found to be capable of satisfactory application of the material:

- Wiwa Duomix 333
- Graco XM PFP

Other pumps currently available may be acceptable, consult Sherwin-Williams Technical Service Department for advice.

### **4.3.3. Flushing of equipment**

Cleanser Thinner No.C9 is recommended may be used for flushing out lines and equipment. If preferred and agreed between interested parties, equipment may be cleaned with a blend of 1:1 volume, Xylene (CAS No: 1330-20-7, EINECS No. 215-535-7):Methyl Ethyl Ketone (CAS No: 78-93-3, EINECS No: 201-159-0), but a final flush out with Thinner No. C9 should precede use of FIRETEX® M90/02.

### **4.4.Application by plural component spray**

The pump must be configured to deliver a volumetric ratio of 2:1 (base:additive).

A ratio check must be performed before spraying commences, after any break in spraying, and a minimum of two times per shift. The correct weight ratio for FIRETEX® M90/02 is 2.4:1, measured results between 2.3:1 and 2.5:1 are acceptable.

Spraying must not take place if the weight ratio obtained in the ratio check is outside the acceptable limits.

It is possible to apply FIRETEX® M90/02 in one coat to a minimum thickness of 1mm (40 mils) and a maximum thickness of 7mm (275 mils). This can be achieved in one of two ways:

- (a) By applying the M90/02 as more of a jet than a fan, levelling off with a trowel or float prior to rolling, if required, to obtain a smooth finish. This method may be used on smaller items of structural steelwork to minimise material losses.
- (b) By applying the M90/02 with a normal spray pattern. It may still be necessary to roller to obtain a smooth finish. This method of application may be used for larger areas such as larger structural steelwork items, fire and blast walls, vessels and vessel skirts, etc.

Due to the heating and processing of the FIRETEX® M90/02 when being applied through a plural component spray the working time of the applied material will typically be 20 to 30 minutes. Scrim installation and/or surface finishing must take place within this time.

Excessive agitation of the holding tanks or recirculation of the heated material may have a detrimental effect on the performance, if spraying will be interrupted for 2 hours or more the pump should be shut down.

The temperature of the material should not exceed 60°C (140°F).

#### **4.4.1. Spray tips and operating pressure**

Typical Nozzle Size: 0.89 to 1.09mm (0.035" to 0.043")  
Fan angle will depend on the substrate being coated.

Operating Pressure: 210 kg/cm<sup>3</sup> (3000 psi)

The above is given as a guide only.

### **4.5.Single component spray application**

For areas where application using Plural Component spray equipment is not possible or desirable, FIRETEX® M90/02 can be spray applied using an airless spray pump of minimum ratio 68:1, fitted with a ram feed plate and wiper to fit the size of drum.

Thinning will be required but when thinned on site this must not exceed 10% and will normally be in the range from 5% to 7%. The reason is that excessive thinning post manufacture will mean a reduced tolerance to curtaining during application. The solvent used for thinning should be Sherwin-Williams Cleanser Thinner No. 9, or a Xylene/MEK mixture in the ratio 1:1 by volume.

Exact levels of thinning required will depend on air temperature, M90/02 temperature and the equipment used. However, recent projects have shown 6% addition of Cleanser Thinner No. 9 to give good results with M90/02 temperature in the region of 25°C (77°F) after mixing.

For any given dry film thickness, the required wet film thickness of M90/02 will vary depending on the level of thinners added. In the region of 1% to 10% thinning a reduction in volume solids as per the following table can be assumed:

Solvent Addition %	Resulting Volume Solids %
0	100
1	99
2	98
3	97
4	96
5	95
6	94
7	93
8	92
9	92
10	91

Calculation of wet film thickness (WFT) from known dry film thickness (DFT) and known volume (solids) V(S) %

$$\frac{100}{V(S)} \times DFT \text{ (mm)} = WFT \text{ (mm)}$$

E.g. 6% thinned; required DFT = 5mm

$$\frac{100}{94} \times 5\text{mm} = 5.32\text{mm (WFT required)}$$

The required volume of thinning solvent may be added to the M90/02 blue additive to facilitate removal from the container but this must be done no more than 16 hours prior to use. If the additive is thinned and left for a period of time prior to use, then a reaction will occur between the additive and the solvent, rendering the product unusable. Once the additive component has been thinned mixing with the base can then commence in the normal way. Only full kits of M90/02 should be thinned as this ensures the correct ratio of base to additive, and hence correct curing of the mixed product.

It is recommended that a heavy-duty mixer specifically designed for high viscosity epoxy PFP is used, or alternatively a heavy-duty air or electric powered mixer with suitable paddle. The base of the mixer should have a clamp suitable for retaining the pail during mixing.

Maximum wet film thickness achievable will depend on many factors such as air and steel temperature, spray tip size and complexity of the steelwork as well as the level of thinning. Typically 3mm – 4mm (120 to 160 mils) should be achievable.

Depending on material usage rate, equipment configuration and ambient conditions, it may be necessary to flush the unit with solvent regularly to prevent build up of FIRETEX® M90/02 within the pump. This should be discussed with Sherwin-Williams' Technical Services Team.

Due to the incorporation of solvent the working time for the material will be extended compared to unthinned product. Applicators should expect a working time of 20 to 40 minutes, depending

on the ambient conditions, scrim installation and/or surface finishing must take place within this time.

Previously applied coats of FIRETEX® M90/02 must be hard to the touch prior to applying subsequent coatings.

#### **4.5.1. Spray tips and operating pressure**

Typical Nozzle Size: 0.69 to 0.84mm (0.027” to 0.033”)

Fan angle will depend on the substrate being coated.

Operating Pressure: 350 kg/cm<sup>3</sup> (5000 psi)

The above is given as a guide only.

### **4.6. Finishing after spray application**

Spray application of FIRETEX® M90/02 should result in a smooth uniform film, however in some circumstances it may be desired to use a trowel and/or roller to attain the required standard of finish. FIRETEX® M90/02 can be ‘dry rolled’ without solvent or material ‘pick up’. The optimum time will be temperature dependent but for most projects it has been found to be in the region of 10 to 20 minutes after spraying. A medium pile simulated sheepskin roller has been found to give good results but other short or medium ‘nap’ synthetic rollers may be suitable. It is recommended that suitability of roller be established on a small area prior to use.

If preferred, solvent can be used to ‘dampen’ the roller as per normal site practice for application of epoxy PFP but one must ensure that the roller is suitable for use with strong solvents. The quantity of solvent used should be kept to a minimum.

All horizontal flat surfaces must be finished to provide a slight incline designed to shed water and prevent pooling.

#### **4.6.1. Stipple finish**

FIRETEX® M90/02 when finished using a roller will have a smooth surface. The typical application of a polyurethane top coat will result in a glossy surface which will emphasize all roller or trowel marks and any unevenness in the coating system, characteristic of coating systems applied at high thickness. The creation of a stipple finish can reduce the visual impact of irregularities in the surface of the coating.

The acceptable finish should be agreed prior to the project commencement, either within the project specification or as a part of the reference areas discussion, see section 9.

Where a stipple finish is to be used the DFT of the applied FIRETEX® M90/02 should be determined and accepted before the stipple finish is created, since this makes it more difficult to accurately determine the DFT.

Sherwin-Williams think it reasonable to allocate a nominal DFT to the stipple layer such as 0.3 to 0.5mm (12 to 20 mils), hence the applied FIRETEX® M90/02 DFT can be accepted provided it is greater than the specified DFT less an agreed figure, e.g. 0.3mm (12 mils). Once the DFT has been accepted the stipple coat can be applied. Such a procedure must be agreed by the client before being implemented.

#### **4.7. Hand application**

For small areas it is also possible to apply FIRETEX® M90/02 by trowel, plaster trowel or other similar tool, and then smooth off using a roller as detailed in section 5.6.

It is essential that the correct mixing ratio is observed; Sherwin-Williams recommend that only complete 20kg kits of material be used as these are supplied with the correct ratio of base and additive materials.

#### **4.8. Over coating**

Cleaning of contaminated surfaces between coats will be achieved by thorough washing with detergent, followed by rinsing with clean fresh water and drying. If contamination cannot be removed by this method, consult Sherwin-Williams Technical Services Department.

The use of solvent to clean between coats is not normally required but may be specified in certain circumstances. Where solvent is specified for cleaning between subsequent coats of FIRETEX® M90/02 or topcoat care must be taken not to use excessive quantities and this is best achieved by using a clean 'lint free' cloth damped with approved solvent (see Section 5.3.3). Solvent should not be applied directly to the substrate and must be allowed to fully evaporate prior to commencing over coating to avoid solvent entrapment.

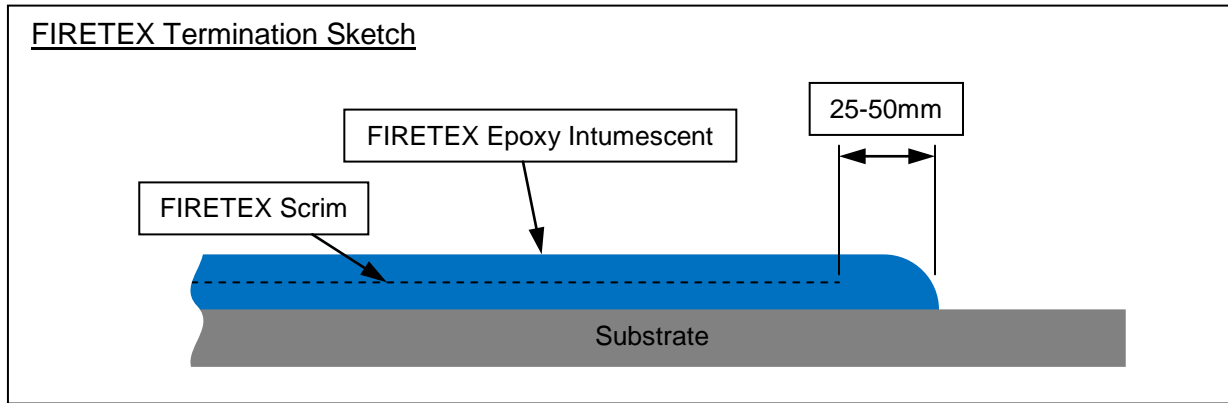
On occasions it may occur that FIRETEX® M90/02 has already been top coated when it is subsequently determined that additional thickness is required. In certain cases, depending on the topcoat applied, it may not be necessary to fully remove all the topcoat. In ALL such cases consult Sherwin-Williams Technical Services Department.

#### **4.9. Terminations**

Where the PFP terminates abruptly at the end of an I-section, Channel section or T-section, the reinforcing mesh should be folded around the edges. This measure is essential to ensure that the ends of fire-protected sections do not suffer erosion damage in the event of Jet-fire.

Other terminations should be protected ("masked off") prior to application of the FIRETEX® M90/02. Note: It is essential to remove such protection before the coating cures as removal after this will be substantially more difficult.

The following sketch shows the recommended method of terminating FIRETEX® where protection of the full item is not required:



To ensure the correct durability and fire protection performance, at terminations the FIRETEX® M90/02 should be extended 25-50mm (1-2") beyond the end of the scrim. The end of the scrim must be completely encapsulated.

#### 4.10. Exposed top flanges

Some designs may not allow for the coating of top flanges. This decision would form part of the fire and safety case analysis and is determined by the client's engineer. It is not a decision that can be made by Sherwin-Williams.

#### 4.11. Block Outs

When applied in an application facility prior to erection the FIRETEX® M90/02 should be finished differently at connections due to the requirement for the scrim, when installed, to be overlapped at joints.

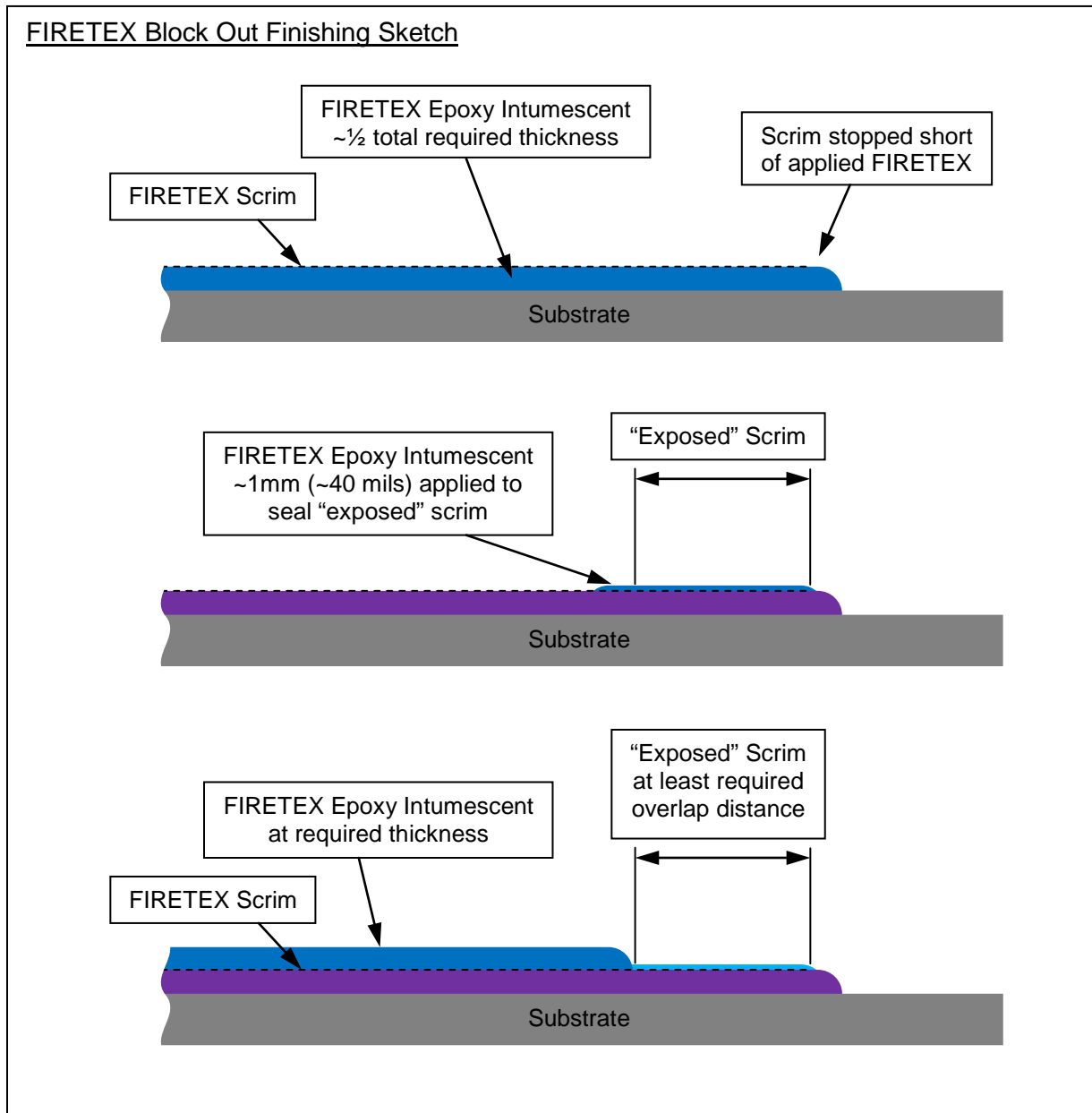
When applying around block outs the FIRETEX® J220 scrim shall be stopped at least 25mm (1") short of the edge of the wet FIRETEX® M90/02. The scrim shall be thoroughly bedded into the wet material as this will be exposed until the item is assembled on-site and the connection is protected with FIRETEX® M90/02, possibly a period of months.

Note:- Sherwin-Williams recommend that the scrim is sealed with around 1mm (40 mils) of FIRETEX® M90/02 immediately after it is installed to provide protection and make this area easier to clean in preparation for the on-site coating completion.

When preparing to apply the remaining FIRETEX® M90/02 the masking shall be stepped back so as to leave "exposed" scrim. The distance of this step should be sufficient to allow the required scrim overlap when the site completion work is carried out.



The following sketch shows the recommended method of finishing the FIRETEX® when further material will be applied once the item is assembled on-site:



#### 4.12. Site completion of connections

Depending on the areas which will require coating on-site this may be done by hand trowel application or airless spray.

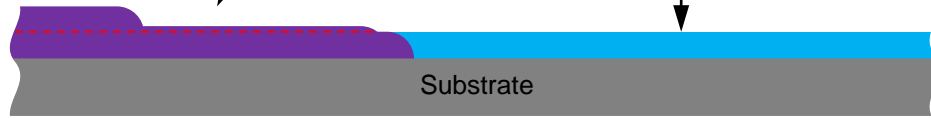
Prior to the application of any FIRETEX® M90/02 the condition of the surfaces to be coated must be inspected and any remedial action taken to ensure that the surface is intact, clean, dry and free of contamination.

The following sketch shows the method of completion for areas blocked out at the off-site application stage.

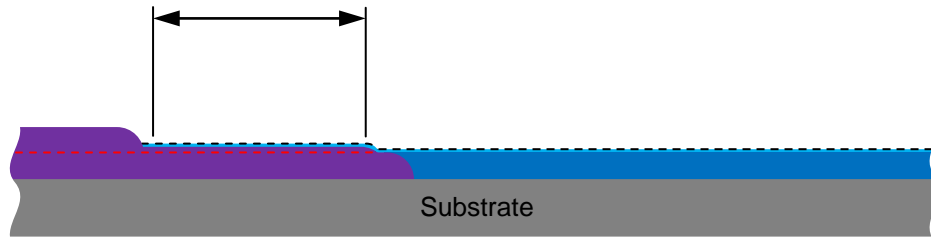
On-Site Completion of Block Outs

FIRETEX Epoxy Intumescent and scrim applied off-site

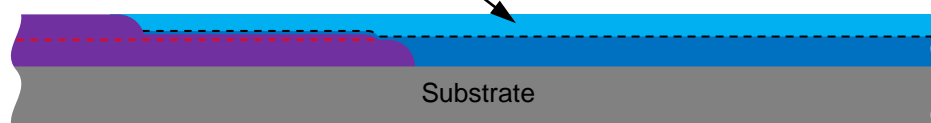
FIRETEX Epoxy Intumescent applied on-site to ~1/2 thickness



Scrim installed into wet FIRETEX and overlapped at least the specified distance



FIRETEX applied to achieve specified thickness



### 4.13. Repair of Damage

Damage to the applied FIRETEX® M90/02 must be repaired to ensure the correct long term performance of the coating system.

- a) Damage of the surface only, the scrim and underlying material is intact.
- b) Damage including the scrim, the primer is intact.
- c) Damage exposing the substrate

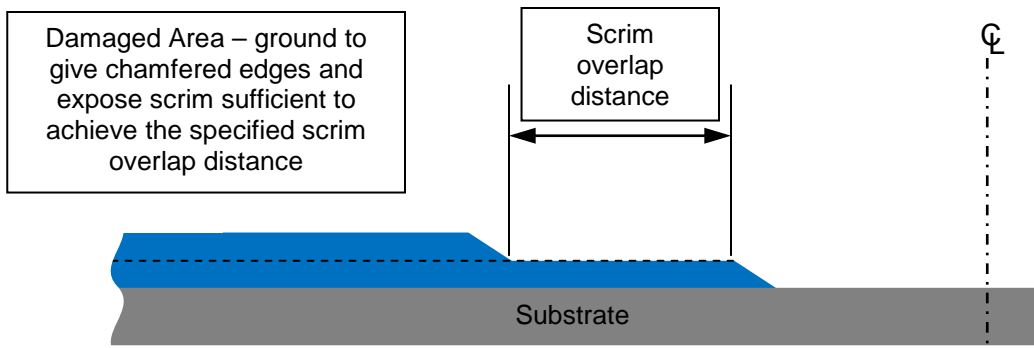
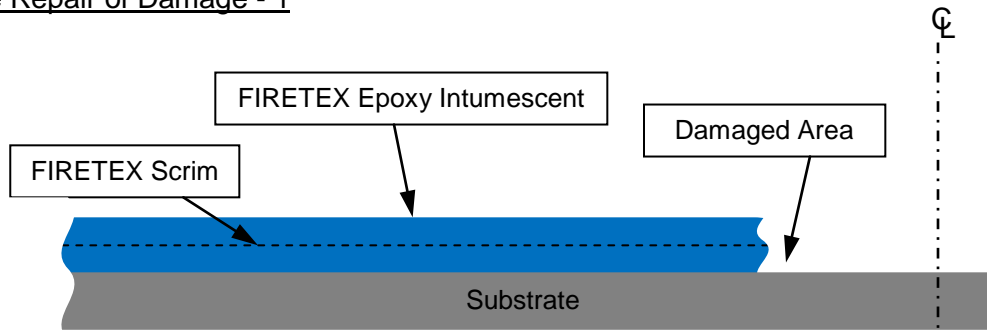
Damage to the surface, where the scrim and underlying material is sound and intact can be repaired by removing any damaged material, ensuring the exposed surface is intact, clean, dry and free of contamination, then reapplying the FIRETEX® M90/02 and top coat per specification.

The situations described in b) and c) would be repaired as shown in the following sketches. Two methods are described, the second of which results in a ridged or stepped appearance to the repair and should therefore be discussed with the client prior to using.

Notes:

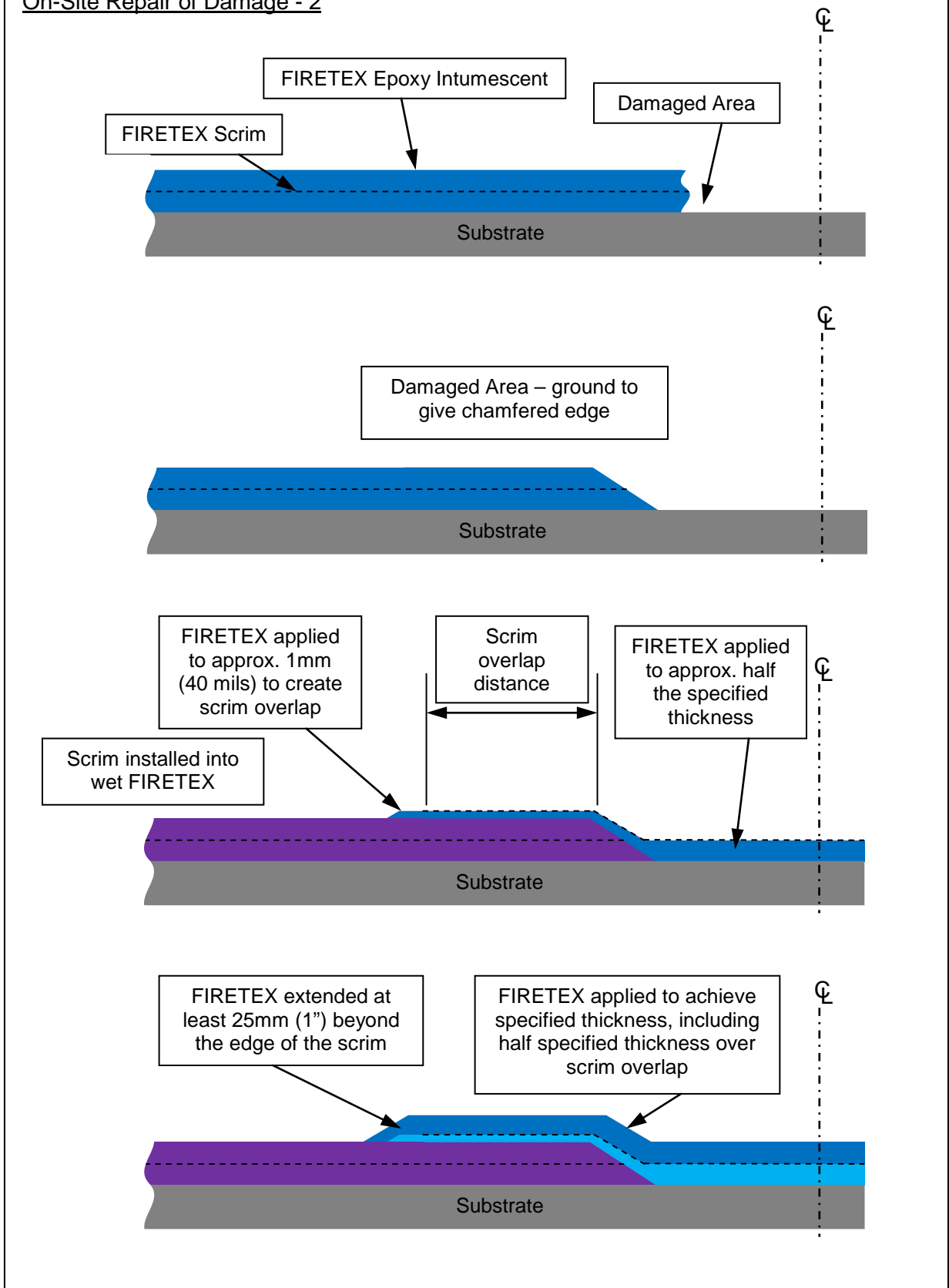
- All surfaces to be coated shall be prepared in accordance with the guidance given in the product's data sheet or application manual.
- Where the damage has exposed the substrate the affected area should be prepared in accordance with the guidance given in section 3 of this manual.
- Providing the FIRETEX® can be applied before the prepared clean surface has degraded it is not necessary to apply a primer, see section 2.6.1.
- The top coat shall be removed in areas where new FIRETEX® M90/02 will be applied over the existing (intact) coating system.

On-Site Repair of Damage - 1



Complete the repair as described in section 5.12, On-Site Completion of Connections

On-Site Repair of Damage - 2



## 5. Coatback

Secondary steelwork and non-protected under deck areas need to be protected to an extent with FIRETEX® M90/02 to prevent heat transfer into the primary structure. There is no agreed standard for the determination of coatback required. However a commonly adopted industry norm is to coatback along secondary steelwork for a distance of 450mm (18"). It is normally considered that the distance should be measured from the point at which the secondary member connects to the primary.

Please note, however, that Sherwin-Williams have data on other coatback distances and alternative recommendations may be given. These will be project specific and dependent on the view of both the client and the verification society. If distances other than 450mm (18") are considered appropriate then please contact Sherwin-Williams.

## 6. Thickness control and measurement

One of the most important aspects of quality control in the use of FIRETEX® M90/02 is the attainment of correct dry film thickness.

The proposals given below are those considered appropriate by Sherwin-Williams, however, where these proposals differ from project requirements, the client's advice must be sought in determining which documentation takes precedence.

The following proposals for thickness measurement and tolerance are in line with those broadly adopted by the intumescent fire protection industry within the UK civil building sector.

### 6.1. Methods of measurement

For film thickness measurement of epoxy PFP two types of method are typically employed:

- Destructive - The 'drill depth gauge'
- Non-destructive - The electromagnetic gauge

#### 6.1.1. Destructive method

Drilling holes and the use of a calibrated depth gauge is acceptable provided all damage is repaired after measurements have been taken.

#### 6.1.2. Non-destructive method

The use of magnetic induction or eddy current gauges for the measurement of paint film thickness has been common for many years. More recently gauges have become available that will measure high thickness of coatings, e.g. Elcometer 456, from Elcometer.

Immediately prior to measuring the applied film thickness the gauge should be calibrated in accordance with the manufacturer's instructions. Calibration should be carried out using the designated smooth steel plate provided with the instrument. Smooth plastic shims specifically designed for calibration and traceable to a national standard must be used. Two shims should be chosen, one having a thickness no more than 50% above the maximum, the other no more than 50% below the minimum of the DFT range to be measured. Gauge accuracy should be determined by measuring, on the smooth steel calibration plate, a further traceable calibration shim of known thickness within the previously calibrated range.

Primer DFT should be determined prior to application of FIRETEX® M90/02.

FIRETEX® M90/02 DFT should be determined prior to application of topcoat. Failure to do this may require topcoat to be removed should the DFT's prove to be under specification.

### 6.2. Frequency of measurements

The following information is given for guidance only and does not seek to over-ride any project specific requirement for dry film thickness measurement. Where possible reference should be made to client project specifications or standards such as NACE, SSPC, BS, ISO, etc.

As a minimum all open (H, T or channel section) or closed profile (CHS, SHS) structural members should have thickness readings taken every 1m (3') along the length of each coated face. In the case of CHS readings should be taken on at least 4 equidistant points around the circumference and every 1m (3') along the length of the section.

### 6.3.Acceptance criteria

These criteria are Sherwin-Williams preferred requirements but in most cases the client's project specifications will take precedence.

- a) The average of all readings in the defined measurement area must be equal to or greater than the specified thickness.
- b) Where any single thickness reading is found to be less than 80% of the specified thickness, further readings in the area of the low reading should be taken as follows:
  - Where the web, flange or other face is wide enough then three, nominally equidistant readings should be taken at a distance of 150 - 300mm (6" – 12") away from the low reading.
  - Where the web, flange or other face is not wide enough to allow the above, then two nominally equidistant readings should be taken at a distance of 150 - 300mm (6" – 12") away from the low reading.
  - For CHS, 2 additional readings should be taken nominally equally spaced at a distance of 150 - 300mm (6" – 12") from the low reading along the length of the CHS.
  - If one or more of these additional readings are also less than 80% of the specified thickness further readings should be taken to establish the extent of the low area. The whole area should then be brought up to the required thickness by application of more FIRETEX® M90/02.
- c) Individual thickness readings of less than 50% of the specified thickness are not acceptable.
- d) Individual thickness readings of more than 44mm (1760 mils) are not acceptable.
- e) The measured average thickness of an item should not exceed 33mm (1320 mils)



## **7. Topcoat selection**

Although FIRETEX® M90/02 has a high degree of exterior durability in its own right, performance, longevity and decorative appearance will be enhanced if a topcoat is applied. For normal atmospheric exposure 50-75microns (2-3mils) of a good quality polyurethane coating will be specified, advice on suitable top coats can be obtained from Sherwin-Williams.

## 8. Reference areas

Reference areas are suitable areas on a structure, selected to be representative of the project as a whole, which are used to:

- Establish an acceptable standard of surface preparation, unless the steelwork is already coated with a suitable primer for subsequent FIRETEX® M90/02 application.
- Check the coating system application and establish an acceptable standard of finish.
- Enable the performance of the coating system to be monitored.

Sherwin-Williams recommend that reference areas be created on all FIRETEX® projects, but consider them to be mandatory on projects meeting the following criteria:

- Projects where over 1,000m<sup>2</sup> (10,800ft<sup>2</sup>) will be protected with FIRETEX® M90/02.
- Projects where the service environment may be outside the normal conditions identified on the product data sheet or application manual.
- Projects where it is envisaged that the protected structure will be subjected to abnormal stresses, such as:
  - Large or rapid temperature fluctuations,
  - Mechanical stress resulting in significant deformation of components,
  - Exposure to corrosive chemicals,
  - Frequent or prolonged immersion,
  - Etc.

Please consult Sherwin-Williams for advice regarding whether reference areas should be prepared on a particular project.

If reference areas are to be created this should be done as per ISO 12944-7&8 and agreed between the interested parties, who as a minimum must include Sherwin-Williams and the purchaser of the FIRETEX® M90/02.

The number, size and location of the reference areas will be agreed on a project by project basis.

The application of the reference areas must be done in the presence of a member of Sherwin-Williams Technical Service Department, who must accept the application work as correct and representative of an achievable standard for the project as a whole.

## 9. Record keeping

Sherwin-Williams recommend that as a minimum the following records be kept by the applicator regarding the application of FIRETEX® M90/02.

At least two times per day and more frequently if the conditions are changing:

- Air temperature
- Substrate temperature
- Relative humidity
- Dew point

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

- Areas coated
- Primer condition and thickness
- Product batch numbers
- Operator/sprayer
- Pump used

See appendix 2 for an example daily log sheet.

## Appendix 1, Quick application guide – Plural component spray

**Substrate:** The substrate will normally be abrasive blast cleaned and primed with a suitable primer. The primer must be clean, dry and free of contamination and/or defects at the time of FIRETEX® M90/02 application. For more details see Section 3.

**Material Pre-Conditioning:** To ensure optimum application characteristics FIRETEX® M90/02 should be allowed to stabilise at a temperature of 30°C to 35°C (86°F to 95°F) prior to application using plural component spray.

**Application Conditions:** The optimum conditions for application and curing of FIRETEX® M90/02 are given below, more details can be found in Section 5.1:

Temperature:	15°C to 35°C (60°F to 86°F)
Relative Humidity:	<75%
Minimum steel temperature:	3°C (5°F) above dew point temperature.

**Plural Component Spray Application:** The pump must be configured to deliver a volumetric ratio of 2:1.

Setup and operation of the pump is the responsibility of the application contractor, the following parameters are given for guidance, further information regarding application can be found in Section 5:

Holding tank temperature (A&B):	45°C (113°F)
Line heater temperature:	50°C (122°F)
Minimum pump output pressure:	210 kg/cm <sup>3</sup> (3000 psi)
Tip orifice:	0.89 to 1.09mm (0.035" to 0.043")
Weight ratio:	2.4:1

**Reinforcement:** FIRETEX® J220 scrim must be incorporated within the mid 1/3 of the FIRETEX® M90/02 film. It must be installed into uncured, wet coating and fully wetted out using scrapers or rollers. At joints the scrim should be overlapped, as below, for additional details see Section 4.

Pool fire:	50mm (2")
Jet fire:	50mm (2") or 150mm (6") under Lloyd's Register

**Surface Finishing:** FIRETEX® M90/02 may be worked with trowels and rollers for 20 to 30 minutes after spray application to evenly distribute the applied material, to help eliminate trapped air and to provide a smooth finish. Solvent may be applied to rollers to help minimise material pickup but if this is done the quantity of solvent used must be kept to the absolute minimum, also see sections 4.6 and Appendix 1.

**Dry Film Thickness:** Sherwin-Williams recommend that the dry film thickness (DFT) be checked after each application of FIRETEX® M90/02, this will allow the thickness of subsequent coats to be adjusted if required in order to reduce waste caused by over application or rework due to under thickness. In any case the DFT should be checked and approved before the top coat is applied, see Section 6 for further details.

**Stipple Finish:** FIRETEX® M90/02 may be left with a smooth surface after roller finishing. Frequently however, after the dry film thickness has been checked and approved, it is given a discontinuous coat of additional FIRETEX® M90/02 to create a stipple finish. This breaks the gloss of the coating system and tends to give a more pleasing visual appearance.

## Appendix 2, Example FIRETEX M90/02 - Daily Log

Report N <sup>o</sup> :	Project Name:							
Date:	Prepared by:							
Area I.D. / Drawing number:								
Applicator & Reprs. Name:								
ENVIRONMENTAL CONDITIONS (to be recorded every hour)								
Time								
Ambient temp.								
Relative Humidity								
Dew point								
Substrate temperature								
Mesh Type:	Area (m <sup>2</sup> )/(ft <sup>2</sup> ):			Overlap (mm)/(inch):				
FIRETEX M90/02 Storage Temperature	Part A:			Part B:				
Batch Numbers								
M90/02 Weight Ratio	Shift 1		Shift 2		Shift 3			
Part A								
Part B								
Spray Equipment type and I.D.								
Area I.D. (if different from above)								
Specified thickness (mm)/(inch)								
Thickness applied to date (mm)/(inch)								
Thickness apply today								
Area coated (m <sup>2</sup> )/(ft <sup>2</sup> )								
M90/02 Batch Numbers								
Part A								
Part B								
M90/02 Qty used (# kits)								
Part A								
Part B								
Solvent used:	Type:			Qty (L)/(USGal):				
NOTES								
Authorized name & signature:								

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***SHERWIN-WILLIAMS®***

**To learn more, contact us**

Europe & Middle East: +44 (0)120 452 1771

North America: +1 800 524 5979

Asia: +8621 5158 7798

[www.sherwin-williams.com/protectiveEMEA](http://www.sherwin-williams.com/protectiveEMEA)