

# **Method Statement FM MS 08 FB**

Hydrocarbon fire protection of structural steelwork using FireMaster FB 100

Rev 2: March 2022

## CONTENTS

### 1 Introduction and Overview of system concept

- 1.1. System Description
- 1.2. FireMaster FB 100 Product Specification
- 1.3. Fire testing and Fire Protection Thickness Requirements

### 2 Installation Procedure

- 2.1. Preparation of steel surface
- 2.2. Retention mesh
- 2.3. Fixing of mesh
- 2.4. Spray Equipment Required
- 2.5. Setting the correct mix of FireMaster FB 100 and water
- 2.6. Spray Application Technique
- 2.7. Quality Assurance during installation

### 3 Post-Installation Procedures

- 3.1. Inspection and Repair

## 1 Introduction and Overview of System Concept

### 1.1 System Description

The system consists of sprayed application of FireMaster FB 100, a lightweight cementitious fire protection material, onto structural steelwork. A supporting mesh attached to the flanges only of the steel is used to assist retention. The system is UL Certified for up to 4 hours hydrocarbon fire protection of structural steelwork in accordance with UL 1709 test procedure.



The basic steps of installation are:

1. Fix anchor points to the steel work
2. Fix steel mesh over the steelwork flanges
3. Mix FireMaster FB 100 with water and spray onto the steelwork
4. Level surface of FireMaster FB 100 if a smooth surface is required
5. Allow to dry for approximately 2-3 hours
6. Allow to dry for 24 to 48 hours before applying any surface coating (if required) depending on climate

## 1.2 FireMaster FB 100 Typical Specification

Weight, dry materials of construction	630 kg/m <sup>3</sup>
Installed density	1085 kg/m <sup>3</sup>
Dry density, 50°C	595 kg/m <sup>3</sup>
Cold crushing strength, ASTM C-133, 50°C	1.6 MPa
Shore D Hardness ASTM D2240 - 15e1	34±2.5
Reaction to Fire EN 13501-1	A1
Thermal Conductivity at 100°C ASTM C-177	0.174 W/m K
Packaging	20 kg bags

## 1.3 Fire Testing and Fire Protection Thickness Requirements

The system is tested for hydrocarbon fire protection of structural steelwork to UL 1709 standard

### Fire Rating and Minimum Thickness Data

UL Certificate BYBU.XR749

Applied density: minimum 642 kg/m<sup>3</sup> average 672 kg/m<sup>3</sup>

Minimum W/D of 0.84 (or maximum Hp/A of 159m<sup>-1</sup>)

Fire Protection Period	Minimum thickness to be applied
1 hr	20 mm
2 hrs	33 mm
3 hrs	44 mm
4 hrs	54 mm

## 2. Installation Procedure

### 2.1 Preparation of Steel Surface

Surfaces should be clear of rust and any major debris. FireMaster FB 100 has high adhesion strength and the bond strength of the system is enhanced by a mesh reinforcement fixed to the flanges.

### 2.2 Retention Mesh

Mesh is fitted to the flanges only. It is not required in the web of the steel.



The mesh should have the following typical specifications:

- Galvanised steel (optional stainless steel)
- Wire diameter: 1 mm
- Mesh Dimensions: 50mm x 50mm
- Supplied in rolls of typical width 1000mm to 15000mm



## 2.3 Fixing of Mesh

The mesh is retained using Hilti HFB fastening clips. These clips ensure that fast installation of the mesh is possible, without the need for twisting or tying around anchor pins as the mesh locates into a groove in the clip. The clips are available in various sizes to facilitate fixing of the mesh approximately half-way through the sprayed thickness

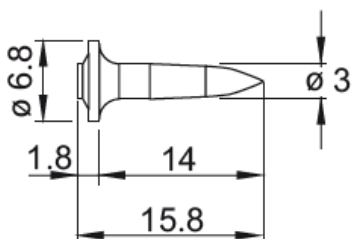


The clips are fixed to the steel using the Hilti BX 3 mechanical anchor system using a Hilti XS14 B3 MX fixing pin. These pins are 14mm long and are installed using a Hilti BX cordless electric power tool. This avoids the need for powder actuated guns or welding equipment. The pin compacts in length during installation, it does not penetrate through the steel plate.

Follow the tips for installation printed on the fastener packaging

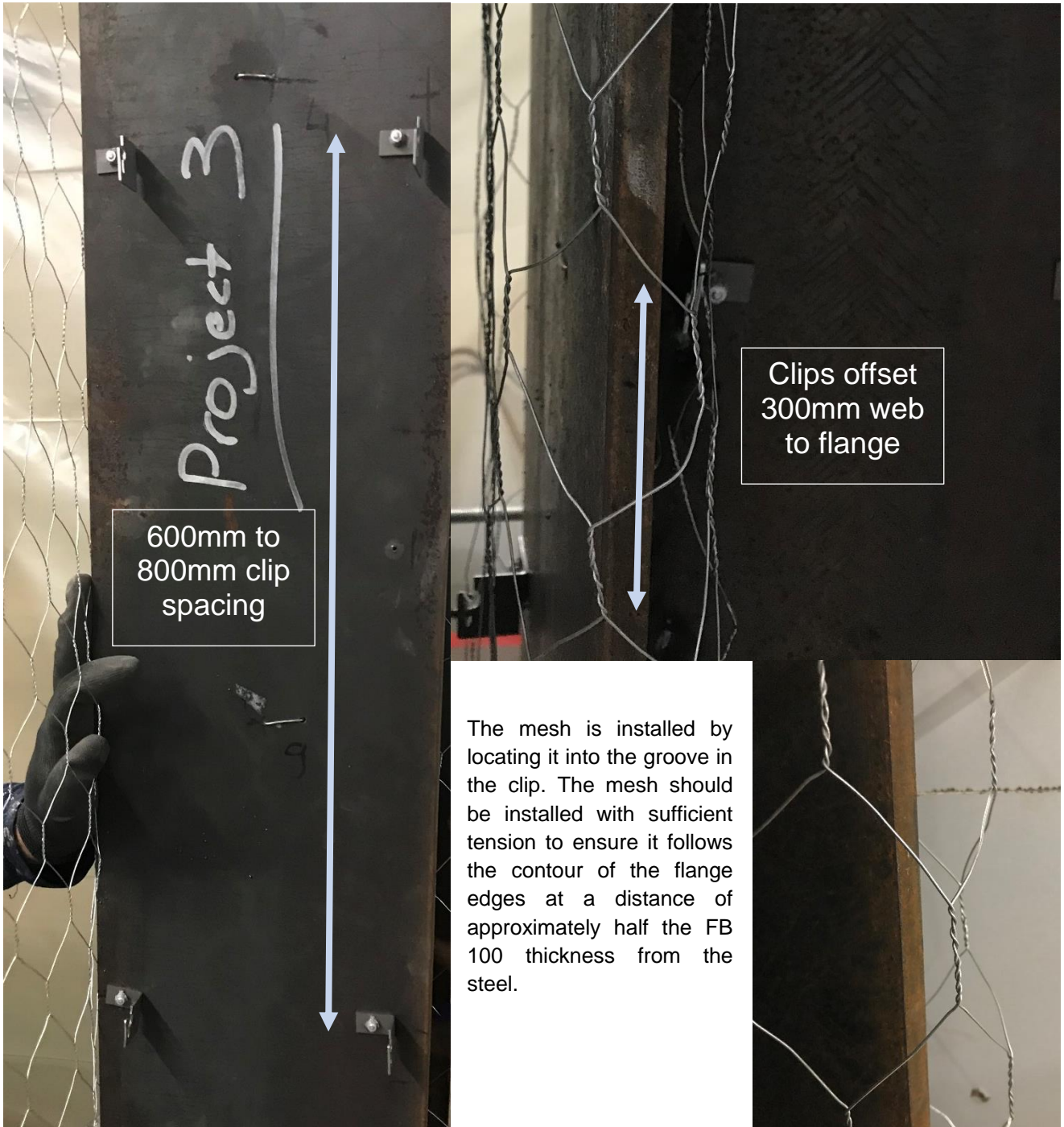


For fastening to steel  
X-S 14 B3 MX





Mesh retaining clips are installed at nominal 600mm to 800mm centres with two clips (one each edge) on each flange soffit and one clip in the web of the column offset by 300mm from the clips on the flange.





## 2.4 Spray Equipment

FireMaster FB 100 is supplied to site as a dry powder in standard sized 20 kg bags. It is mixed with water in a spray machine and the wet mix is then pumped through tubing to a spray nozzle where it is mixed with compressed air at the exit of the nozzle and sprayed into place.

Spray equipment brands that can be recommended are:

- PFT G4/G5
- PFT ZP 3L



PFT ZP 3L



PFT G4/G5

Other pumps may also be used if demonstrated to be acceptable by Morgan Advanced Materials after a trial installation. The pump must have a mixing chamber in order to allow the complete mixing of FB 100 with the correct quantity of water before the wet mix is pumped through the applicator tube.

## 2.5 Setting up the correct mixture of FB 100 and water

First, ensure the spray machine is set up to deliver the correct consistency of FB 100. Different spray machines may require different ratios of water to FB 100 powder. The correct settings are governed by the viscosity of the wet mix as measured using a “Vicat” floating needle penetrometer.

Each spray machine will require different settings of water flow to obtain the optimum spray consistency. On the PFT G5 machine, a water flow rate of 580 to 590 Litres/min and ratio of 15 to 16 litres of water to 1 kg of FB100 have been found to produce an acceptable consistency.



Take a sample of wet mix from the spray machine and fill a container to a minimum thickness of 60mm. Ensure that the surface of the FB 100 in the container is flat. Place the penetrometer on the surface and unlock the floating needle so that it can penetrate into the wet mix. Observe the distance that the needle has penetrated into the mix from the needle scale. The consistency of the sample is correct when the needle travels a distance of between 25 to 35mm into the sample when the weight is 110g and the diameter of the needle is 10.2mm.

## 2.6 Spray Application Technique

The entire thickness of FB 100 may be installed in one spray pass where practical. “Slumping” of the applied thickness will not occur if one pass is used with the maximum thicknesses given in section 1.3. A primer coat is not required to be used prior to spraying of the FB 100. Spray the FB 100 following the contour of the steel and using a float or trowel, level off the surface to the required thickness periodically. Don’t allow the FB 100 to dry to the extent that the surface cannot be levelled off. The setting time is approximately 30 to 40 minutes after spraying. The ambient temperature during spraying should be maintained between +10°C and +35°C.

The thickness applied should be verified to be the minimum required for the required fire protection period. Check the final thickness is correct every 400-500mm along the installation by using a thickness gauge held at an angle of 90 degrees to the surface. Any small areas requiring extra FB 100 thickness can be finished by applying the material using a trowel.





Although the surface quality after installation can be improved by smoothing using a flat edge, this is not necessary to achieve the fire performance. The surface can be left unfinished after installation.



## 2.7 Quality Assurance during Installation

During each shift a sample of 300mm x 300mm x 50mm thick shall be prepared using the same mix as installed. The sample shall be marked with the date, product code taken from the packaging of the material being installed at the time of sampling and a reference denoting the area where the sampled mix was being installed when the sample was made. From this sample, sections of 50mm x 50mm square shall be taken on which the density will be verified by Morgan Thermal Ceramics to be within the following limits:

Property	Morgan Thermal Ceramics test method	Accepted values
Density (after drying for 24 hrs @ 50 °C)	C-MP-PF 217	595 kg/m <sup>3</sup> minimum

### 3. Post-Installation Procedures

#### 3.1 Inspection and Repair

##### Inspection

Inspect the surface at close distance to check for any large cracks (>2mm), or obvious signs of damage (areas where material is missing or minimum required thickness has not been achieved). Hair-line cracks, as shown below are acceptable as a normal consequence of expansion of the steel substrate.



##### Repair

For any areas requiring repair, the full lining thickness of FireMaster FB100 in that area must be replaced. Care should be taken when removing any faulty area not to damage the material in adjacent areas.

Removal of FB100 can be carried out using a chisel or similar tool. The area to be repaired should be cleaned of all loose material and any other debris and the adjacent undamaged material surrounding the repair area wetted with water before any new FB is installed.

For areas where the retention mesh is installed, the mesh can be removed and new mesh fitted by first installing half of the required FB 100 thickness repair material and then positioning a small piece of mesh into the wet FB 100 and then covering it with the remaining thickness of FB 100.

Minor repairs can be made by trowelling FB into the repair area. Significant repairs should be made by spraying a new lining into place following the original installation procedures. If in doubt about the most appropriate repair method, always contact Morgan Thermal Ceramics for advice.

END OF METHOD STATEMENT