# PPG STEELGUARD® 652

## Application guidelines

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## Application Guidelines

### 1.0 INTRODUCTION

The purpose of these guidelines is to ensure consistent and correct application) of PPG STEELGUARD 652 water based intumescent coating. For the safe handling and use, reference must also be made to both the latest Product Data and Material Safety Data Sheets.

STEELGUARD 652 is internationally tested and certified and whilst this document is not intended as a source for the determination of loadings or other specification criteria, such information is available to design architects and engineers on request.

The information contained in this document is based upon independent test data, comprehensive research and field experience, and 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.

### 2.0 SURFACE PREPARATION AND PRIMING

#### 2.1 Conditions of Steelwork Prior to Surface Pre-treatment

Prior to blast cleaning the steelwork shall be prepared to ISO 8501-3 St 3 / SSPC SP3 minimum.

#### 2.2 Blast Cleaning of Steel Substrates

The standard required for abrasive blasting is according to ISO 8501-01 / SSPC. Immediately prior to painting, the minimum acceptable standard will be ISO ST / SSPC St 3. ISO 8501-3 Sa 2½ / SSPC SP10 is recommended for maximum system lifetime.

The blast profile (Rz) must be in accordance with product Data Sheet and / or Product Data Sheet recommendations. Blasting abrasive shall be clean, dry, sharp angular, free of clay, salt, oil and other foreign matter. Abrasive other than steel or iron grit shall not be recycled. Recycled abrasives shall be replaced at a rate necessary to maintain a sharp angular profile within the range specified for the product being applied over the blasted surface. Moisture content for abrasives delivered in bags shall not exceed 0.5% by weight. The conductivity of abrasives prior to treatment should not be higher than 300 µm/cm (see Information Sheet 1491). After blasting and immediately prior to coating, the blasting dust and abrasives shall be removed by using high-pressure air blow-off and followed by vacuum cleaning.

Prior to application of the intumescent, the condition of the primed substrate must be checked on arrival at site, with any damage made good and touched up with the relevant primer.

#### 2.3 Galvanized Steel

Galvanizing should be considered as a special type of surface treatment that requires extra care and attention in its preparation prior to the application of STEELGUARD 652.

Ensure the galvanized surface is correctly applied and fit for purpose.

The galvanizing process onto structural steel can result in either a dull matt grey finish, which is most common for heavy weight steel, or to less of an extent, glossy, spangled, metallic silver finish on lightweight sections. On exposure to moisture/ weather, zinc salt formation will start to form on their surfaces at varying rates depending on conditions to form a tough layer which can be tightly adhered to the galvanized zinc layer. The galvanizing process may also leave behind oil/grease on the surface. It is important that ALL contamination is removed prior to any coating application for this we recommend the use of Prep 88 with the assistance of abrasive pads such as Scotchbrite to remove stubborn, often invisible, salt contamination, rinsing after with fresh clean water and allow to dry before proceeding.

PPG only recommend sweep blasting as pre-treatment of galvanized steel prior to the application of our STEELGUARD 652.

Once you have achieved a clean, dry and sound galvanized substrate:

- Sweep blast surface to provide adequate profile and remove any stubborn contamination. **NB:** finish may not resemble a bright silver but a darker shade, it is advised that the visual standard of surface preparation is agreed upon prior to commencement of work.
- Apply a mist coat of the selected primer, thinned 25 to 30% by volume with Thinner 91-92 to seal the surface.
- Apply by airless spray a full coat of selected primer to full PDS thickness.

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### 2.4 Cast Iron

Although not as widely used today as structural elements, cast iron may be found in many historic buildings during restoration work. It is not possible to cover all surface preparation scenarios; therefore, each project must be considered individually. It is likely that the cast iron will have been coated with multiple layers of various paints, some of which may be lead-containing, so relevant safety precautions must be taken to remove these. Cast iron is a porous material with pores likely contaminated with, for example, salts - therefore additional care should be taken.

Once you have achieved a clean, dry and sound cast-iron substrate:

- Sweep blast surface to provide adequate profile and remove any stubborn contamination. **NB:** finish may not resemble a bright silver but a darker shade, it is advised that the visual standard of surface preparation is agreed upon prior to commencement of work.
- Apply a mist coat of the selected primer, thinned 25 to 30% by volume with Thinner 91-92 to seal the surface.
- Apply by airless spray a full coat of selected primer to full PDS thickness.

## 3.0 APPLICATION

### 3.1 Storage of Materials

The storage temperature for STEELGUARD 652 should be between 5-30°C (41-86°F). Water based products must always be protected from frost and freezing temperatures.

### 3.2 General Environmental Conditions

The surface temperatures should be in the range of 10-40°C (50-104°F) and at least 3°C (5ºF) above the dew point. The maximum relative humidity shall not exceed 80% during application and drying. For primers and topcoats, please refer to the relevant product data sheets.

### 3.3 Primer Selection and Application

All primers used in conjunction STEELGUARD 652 MUST be approved by PPG. A list of approved PPG primers can be found in the PPG STEELGUARD APPROVED PRIMER System Sheet or relevant UL263 certification. For the recommended surface preparation, application conditions and overcoating intervals please see the relevant product data sheets.

Should the primer have been supplied by a third party or not be listed on the PPG STEELGUARD APPROVED PRIMER System Sheet, please contact PPG.

#### 3.3.1 Primer Approval

Any unlisted primer to be used with PPG STEELGUARD 652 **MUST** have the approval of PPG. As a minimum the product data sheet and the material safety data sheet will be required to allow for an evaluation. In some cases, a wet sample will be necessary additionally so compatibility can be investigated by laboratory testing prior to an approval.

### 3.4 Intumescent Coating Application

Before the application of the intumescent coating the following conditions shall be met:

- The primer must have been applied in accordance with the relevant product data sheet.
- The primer shall be within its stated overcoating period.
- The primer shall be intact and free from damage and degradation.
- The primer shall be clean, dry and free from any contamination.

The application shall be carried out preferably by airless spray and in accordance with the relevant product data sheet. The dry film thicknesses to be applied depend on the fire scenario, the steel section types, and certification specified for the project. More than one coat may be required to achieve the specified dry film thickness.

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### 3.4.1 Touch-dry Times and Overcoating Intervals

All drying times and overcoating intervals stated in the tables are valid for non-thinned material only. These figures are given as a guide only. Factors such as air movement and humidity must also be considered.

When using the following tables, the highest measured dry film thickness (not the specified dry film thickness) must be usedfor determination of touch dry times and overcoating intervals.

High dry film thicknesses often occur in overlap areas, such as web/flange interfaces.

| Table 1: Touch dry time for PPG STEELGUARD 652 | | | | |
|---|---|---|---|---|
| **DFT** | **Substrate temperature** | | | |
| | 10°C (50°F) | 20°C (68°F) | 30°C (86°F) | 40°C (104°F) |
| Up to 700 µm (28 mils) | 2 hours | 1.5 hours | 45 minutes | 30 minutes |

**Note:** The times stated above are indicative and assume good ventilation and relative humidity below 80%

| Table 2: Overcoating intervals for PPG STEELGUARD 652 with itself | | | | | |
|---|---|---|---|---|---|
| **Overcoating with…** | **Interval** | **10°C (50°F)** | **20°C (68°F)** | **30°C (86°F)** | **40°C (104°F)** |
| **Itself** | Minimum | 4 hours | 3 hours | 2 hours | 1.5 hours |
| | Maximum | Unlimited | Unlimited | Unlimited | Unlimited |

**Notes:**

- The minimum times stated above are indicative and assume good ventilation and relative humidity below 80%.
- Secondary surface pre-treatment may be required to ensure the coating is dry, sound and free from any contamination.

### 3.4.2 Exposure of STEELGUARD 652 Without Topcoat

STEELGUARD 652 does not require any topcoat for certain internal exposure conditions, except for aesthetic reasons – refer to the PPG STEELGUARD APPROVED TOPCOATS System Sheet.

### 3.5 Topcoat Selection and Application

Before the application of the topcoat the following conditions must be met:

- The intumescent coating must have been applied in accordance with the relevant product data sheet.
- The intumescent coating shall be within its stated overcoating period for the maximum dry film thickness achieved on a single member.
- The intumescent coating must have been applied at the specified dry film thickness because the intumescent coating thickness cannot be topped up after the topcoat has been applied.
- The intumescent coating shall be intact and free from damage and degradation.
- The intumescent coating shall be clean, dry and free from any contamination.

All topcoats applied on STEELGUARD 652 must be approved by PPG, applied according to the relevant Product Data Sheet and within the approved dry film thickness range.

A list of approved PPG topcoats can be found on the PPG STEELGUARD APPROVED TOPCOATS System Sheet or UL263 certification.

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| Table 3: Minimum overcoating intervals for PPG STEELGUARD 652 with other approved PPG topcoats | | | | | |
|---|---|---|---|---|---|
| DFT | Number of coats | 10°C (50°F) | 20°C (68°F) | 30°C (86°F) | 40°C (104°F) |
| ≤ 700 µm (28 mils) | 1 | 24 hours | 18 hours | 14 hours | 12 hours |
| 701 – 1250 µm (28-49 mils) | 2 | 24 hours | 18 hours | 14 hours | 12 hours |

**Note:**
- The times stated above are indicative and assume good ventilation and relative humidity below 80%.

### 3.6 Bolted Connections
Correct surface preparation of all areas prior to painting is critical to ensure performance of the coating system and the correct preparation of bolt heads is no exception, however, it is appreciated that abrasive blast cleaning is impractical. All bolts and connectors must be prepared in accordance with the correct PPG coatings specification. Generally, bolts/fasteners are supplied under one of the following conditions:

- Black/self-color bolts – untreated steel bolts
- Zinc-plated bolts – electro zinc plated bolts
- Galvanized bolts – hot-dipped galvanized steel bolts
- Sherardized bolts – zinc coated bolts

Due to the increased mass of steel around connection points, the critical steel failure temperature in these areas (in fire conditions) are normally lower than the rest of the steel structure. The DFT of STEELGUARD 652 applied in these connection areas should however be the same as for the primary member.

### 3.7 Shear Studs
Other than for aesthetic requirements, there is no requirement to repair damage from correctly installed shear studs.

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## 4.0 THICKNESS CONTROL OF THE INTUMESCENT COATING

### 4.1 Wet Film Thickness (WFT) Measurement
Wet film thickness (WFT) measurements shall be taken as necessary during the application using a wet film gauge. WFT measurements indicate the thickness of individual coats. On subsequent coats, care should be taken with single component coatings, as readings may be misleading due to the gauge sinking into a softened previous coat.

### 4.2 Dry Film Thickness (DFT) Measurement – General Guidance
Instruments for dry film thickness (DFT) measurement use the magnetic induction principle. They should have a range appropriate to the specified DFTs and capable of storing data. The instruments shall be calibrated prior to use. DFT readings shall be taken when the intumescent coat is sufficiently hard and dry to prevent the probe indenting the surface. The use of shims placed on the surface to check the DFT of subsequent coats is recommended.

The final DFT applied (allowing for the primer) shall be in accordance with the specification, which supersedes any guidance in this document. For guidance in the absence of detailed specification, the readings should be taken as follows:

I-section, T-sections and channels
Webs two readings per meter length on each face
Outer flanges/Inner flanges two readings per meter length on each face one readings per meter length on each face

Square hollow sections and angles
Two readings per meter length on each face

Circular hollow sections
Eight readings per meter length spread evenly around the section.

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No readings taken within 25mm (1”) of a flange edge or web–flange junction shall be used for the purposes of assessing adequacy.

Where members are less than 2m in length, three sets of readings shall be taken, one at each end and at the center of the member. Each set shall comprise the number of readings on each face given above, as appropriate.

### 4.3 Dry Film Thickness (DFT) Acceptance Criteria

The acceptance criteria should be set out in the project specification & agreed by all parties at the start of the project. For guidance, based on the specified DFT being a nominal value:

a) The average DFT applied to each element shall be greater than or equal to the specified nominal value.
b) The average measured DFT on any face of any member shall not be less than 80% of the specified nominal value.
c) DFT values that are less than 80% of the specified nominal value are acceptable, provided that such values are isolated and that no more than 10% of the readings on a member are less than 80% of the specified nominal value. Where any singlethickness 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 (6-12 mils) 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. In such cases, low thickness areas identified should be brought up to the required thickness before proceeding to the next application stage.
d) All DFT readings should be at least 50% of the nominal value.
e) The average measured DFT of any face of any member should not exceed the certified maximum thickness for the particular shape and orientation of the steel member.

### 4.4 Quality Control

All records should identify the areas inspected with reference to the relevant drawings, and should include:

a) Environmental conditions – air and substrate temperature, relative humidity and dew point.
b) DFT 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.
c) Variations, corrective actions or concessions carried out in relation to environmental conditions or dry film thicknesses.

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### 5.0 TOUCH UP AND REPAIR

**5.1 Damage Back to Bare Steel**

a) Cut out the coating system to 10-20mm (½" – 1") from the damaged area in all directions.
b) Prepare the steel to ISO 8501-1 St 3/ SSPC SP3. The substrate should be dry, sound and free from all contamination and provide asufficient roughness for the specified primer.
c) Apply the primer to the specified DFT. The primer must be approved for use under STEELGUARD 652 and must be suitable for ISO 8501-1 St 3 / SSPC SP3 prepared steel substrates.
d) After curing of the primer, slightly abrade 25-30mm (1 - 1¼") of the surrounding sound coating system to remove the existing topcoat.
e) Reinstate the specified DFT of the original STEELGUARD 652. Take care not to excessively overlap the existing intumescent coating or topcoat.
f) If the intumescent coating had been top coated, overcoat the repaired areas with the original topcoat to the specified DFT, overlapping the sound finish by 50mm (2").

**5.2 Damage to the Intumescent Coating**

a) If the intumescent coating systems had been top coated, remove all loosely adhered topcoat and slightly abrade.
b) Ensure the exposed areas of intumescent coating are sound, dry and clean from any contamination.
c) Reinstate the specified DFT of STEELGUARD 652. Take care not to excessively overlap the existing intumescent coating or topcoat.
d) If the intumescent coating had been top coated, overcoat the repaired areas with the original topcoat to the specified DFT, overlapping the sound finish by 50mm (2 mils).

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### LIMITATION OF LIABILITY

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