

INSPECTION OF INTUMESCENT COATINGS

Equipment required: Coating thickness meter such as Elcometer 456

1. Thickness measurement using coating thickness meter

Primer thickness may be determined either after application in shop, or on site prior to commencement of application of the intumescent basecoat. Method of measurement should be as described in 2. below

Allowing for the thickness of primer applied, the total dry film coating thickness of the intumescent basecoat should be determined prior to the application of any specified protective/decorative topcoat(s). Measurement at this stage will more easily facilitate any subsequent corrections which may prove necessary.

If the total intumescent dry film coating thickness, allowing for the underlying primer, is found to be within specified tolerances, application of the next coat (usually a decorative and/or protective coat) can proceed.

Indentation of the coating by the measuring instrument probe indicates insufficient hardness of the coating and measurements should be deferred. However, if programming requires coating to proceed urgently, by agreement with the specifier a shim of known thickness can be used to spread the load of the probe tip on the coated surface, allowing measurement to proceed before the coating has fully hardened. The dry film thickness of coating and shim together can then be measured and the shim value deducted to give the coating thickness.

The protective/decorative coating thickness is difficult to measure due to the variance in thickness of the underlying coats and its usual relative low thickness. However, the thickness may be important to ensure the longevity of the system. Application within the specified tolerances is best ensured by careful monitoring of material usage and the elimination of surface defect prior to application.

When taking dry film thickness readings, it is recommended that no readings are taken within 25mm of the edge of an I section or within 25mm of the join of flange to web of an I section.

Taking the above into account, readings should be taken randomly over the remaining areas of the section with a frequency as described in 2. below.

2. Frequency of measurement

Sections should be measured in accordance with the following guidelines:

(i) 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.

(ii) Square and Rectangular Hollow Sections and Angles:

Two readings per metre length on each face.

(iii) Circular Hollow Sections:

Eight readings per metre length evenly spread around the section.

(iv) Where members are less than 2m in length, three sets of 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 given by (i), (ii) or (iii) above, as appropriate.

3. Film Thickness Surveys

In an ideal situation, every steel member in a construction would be measured in accordance with the above frequency guidelines, to provide a comprehensive picture of the fire protection of the completed work. Ideally also, such dry film thickness surveys should be carried out by an independent third party.

In practice, third party verification of thicknesses may not be called for in the specification, so the 'responsible person' must either commission such a survey or rely on data provided by the applicator for assurance that adequate thickness has been applied. Third party certification of applicators includes an assessment of their competence to carry out film thickness checks on their work, and involves continual assessment of their application standards and records.

The responsible person may therefore accept the data provided by certificated contractors as evidence of satisfactory coating thickness, where no independent survey has been carried out.

However, the question then arises as to what constitutes an acceptable film thickness survey. On a major construction project, measuring every steel member in accordance with the above guidelines would be extremely difficult if not impossible, bearing in mind the pressures of the build programme (often requiring steelwork to be clad-in or hidden behind ducting etc as soon as the coating has been applied) and the need for the coatings to become hard dry before meaningful readings can be taken. ISO19840:2012 recognises the need for thickness surveys to be practicable, and so relates the frequency of measurement to the area coated, with reduced frequency on larger areas. Unfortunately, the same logic is more difficult to apply to structures consisting of a large number of relatively small and complex elements.

Some compromise must therefore be agreed when setting out the criteria for an intumescent survey on site. These criteria should always be defined in the specification, to avoid uncertainty later.

Whether carried out by an independent third party at completion of application or by the contractor on an ongoing basis, the following guidelines for setting out a film thickness survey would be recommended:

- The contractor must provide suitable and adequate means of access, including to difficult and / or partially inaccessible areas. It is therefore important that surveys are scheduled when the fullest possible access is still available on site.
- All equipment used must be correctly calibrated, and if more than one party is carrying out thickness checks, agreement regarding calibration of all instruments must be reached before commencing.
- At least 10% of steel sections should be measured in accordance with the frequency set out in 2. above. These should include a representative mix of section sizes, and difficult access sections as well as those that are easiest to access.
- All other sections should be measured with reduced frequency, unless the detailed survey (of 10% of sections) identifies a recurrent problem of thickness.
- If the detailed survey reveals a trend of unacceptable thickness, this should be taken into account when planning the remainder of the survey.
- In the worst case scenario, a full and detailed survey according to 2. above may be required.
- If certain faces of the sections are repeatedly found to be unacceptable (e.g. top flange or one face known to be difficult to access), the remainder of the survey should include detailed measurements of that face as well as random measurements of other faces.
- Where no unacceptable trends are identified, the remainder of the survey should consist of random readings taken at a frequency of 4-5 readings per metre length.
- Unacceptable low areas should be marked up for remedial coating by the inspector.

4. Acceptance criteria

The coating thickness acceptance criteria shall be as follows, assuming that the specified thickness is a nominal value:

- (i) The average dry film thickness applied to each element shall be greater than or equal to the specified nominal value.
- (ii) The average measured dry film thickness on any face of any member shall not be less than 80% of the specified nominal value.
- (iii) Dry film thickness values less than 80% of the specified nominal value are acceptable, provided that such values are isolated and that no more than 10% of the readings on a member are less than 80% of the specified nominal value.

Where any single thickness reading is found to be less than 80% of the specified nominal value, a further two, or where possible three, readings shall be taken within 150 to 300 mm 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.

- (iv) All dry film thicknesses shall be at least 50% of the nominal value.