

# HDG DATASHEET: 4b

## A Guide to Hot Dip Galvanizing to Standard EN ISO 1461 : 2022 [Published October 2024]

The European and International standard covering post-fabrication hot dip galvanizing of steelwork EN ISO 1461 : 2022 Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles – Specifications and Test Methods, covers the galvanizing of steel fabrications, sections and castings in a bath containing molten zinc with a minimum zinc content of 98%. The standard excludes products processed by an automated or semi-automated process such as sheet, wire and tubes.

The key points covered within the standard are:

- Surface requirements of the galvanized coating
- A regime for post-galvanizing inspection for the purposes of quality control
- A degree of uniformity of coating thickness over an article with the emphasis for testing being placed on non-destructive techniques
- Limitations on uncoated areas and areas of damage with details upon their repair
- Information on coating adhesion
- Acceptance criteria
- Declaration of compliance

### Inspection Procedure

Initially a visual inspection is conducted to assess surface finish. The standard then lays down a post-galvanizing inspection regime indicating the minimum number of samples which should be taken for inspection based upon the size of the lot galvanized (Table 1). In addition it also gives guidance upon the number of areas on an individual article from which batches of coating thickness measurements should be taken (Table 2).

No. items in a lot	Minimum No. items in control sample
1 - 3	all
4 - 500	3
501 - 1,200	5
1,201 - 3,200	8
3,201 - 10,000	13
> 10,000	20

Table 1. Control sample size related to lot size

Category	Significant surface area	No. reference areas per article
A	$> 2 \text{ m}^2$	$\geq 3$
B	$> 100 \text{ cm}^2$ or $\leq 2 \text{ m}^2$	$\geq 1$
C	$> 10 \text{ cm}^2$ or $\leq 100 \text{ cm}^2$	1
D	$\leq 10 \text{ cm}^2$	1 on each of the N articles

Where N is the number of articles required to provide a minimum surface area of  $10 \text{ cm}^2$

Table 2. Required number of reference areas for testing

For articles in category A the average coating thickness in each reference area should meet the Average Coating Thickness Requirement. For articles in categories B-D the average coating thickness in each reference area should meet the Local Average Coating Thickness Requirement. The standard encourages coating thickness to be determined by non-destructive methods such as the use of a magnetic coating thickness gauge (ISO 2178) although the Gravimetric Test (ISO 1460) which is a destructive method remains the referee test in cases of dispute.

### Surface Finish

The galvanized coating should be continuous, relatively smooth and free from flux staining on accessible surfaces. The coating does not need to be perfectly smooth and some surface unevenness is permissible. In addition the standard has no aesthetic requirements and consequently variation in coating appearance is permissible. The presence of zinc corrosion products known as wet storage stain which form if the coating becomes damp and is unable to fully dry out is also not grounds for rejection provided the coating meets the relevant local average coating thickness requirement (see Tables 3 and 4).



## Coating Thickness

Coating thickness requirements are given in terms of Local average coating thickness requirements (relating to single reference areas) and Average coating thickness (relating to the whole of the article). In effect this means no areas of an article should have an average coating thickness below the Local average coating thickness requirement while the average thickness over the whole of the article should meet the Average coating thickness. Details of coating thickness requirements are given in Tables 3 and 4.

Article and its thickness	Local average coating thickness	Average coating thickness
> 6 mm	70 µm	85 µm
> 3 mm but ≤ 6 mm	55 µm	70 µm
≥ 1.5 mm but ≤ 3 mm	45 µm	55 µm
< 1.5 mm	35 µm	45 µm
castings > 6 mm	70 µm	80 µm
castings ≤ 6 mm	60 µm	70 µm

Table 3. Minimum coating thickness requirements on samples that are not centrifuged

Article and its thickness	Local average coating thickness	Average coating thickness
Articles with threads		
> 6 mm	40 µm	50 µm
≤ 6 mm	20 µm	25 µm
Other articles		
≥ 3 mm	45 µm	55 µm
< 3 mm	35 µm	45 µm

Table 4. Minimum coating thickness requirements on samples that are centrifuged

## Repair

The standard permits repair of uncoated areas up to 10 cm<sup>2</sup> in size with the total areas for repair not exceeding 0.5% of the article's total surface area. If larger areas are present the article should be regalvanized unless a repair is agreed within the supply chain. The three means of repair are a zinc-rich paint/paste, a low melting point zinc stick and zinc thermal spraying (ISO 2063) with the repair coating being made up to a minimum thickness of 100 µm, unless otherwise agreed because, for example, the galvanized surface is to receive an additional coating. The thickness for the renovated area shall then be the same as the surrounding galvanized coating.

## Coating Adhesion

The standard states that at present no suitable International adhesion test exists for hot dip galvanizing and so where testing is required this should be agreed within the supply chain and reaffirms that such testing is not normally necessary as good adhesion, or more correctly, cohesion, is a characteristic of the coating. The coating should withstand, without peeling or flaking, handling consistent with the nature and thickness of the coating and the normal use of the article, although it should be appreciated that thicker coatings may require more careful handling and that bending after galvanizing is not considered normal handling.

## Acceptance Criteria

If the control sample meets the surface finish and coating thickness requirements of EN ISO 1461 : 2022 then the lot from which the control sample is taken is accepted in total. If a control sample fails to meet coating thickness requirements, then double the original control sample size is taken for testing and if this meets standard requirement then the lot as a whole is accepted. If this second control sample fails to meet standard requirement then the lot is rejected.

Certain steels exhibit ultra-low reactivity during galvanizing and cannot satisfy the minimum coating thickness requirements listed in Table 3. For articles with steel section thicknesses greater than 3 mm, which are produced from steels with compositions ≤0.01% silicon that also have aluminium contents >0.035%, that exhibit ultra-low reactivity during galvanizing and so cannot satisfy the minimum galvanized coating thickness in Table 3, the next lowest category of steel article section thickness given in Column 1 of Table 3 should be applied. In these cases, if a declaration of compliance is provided, it should state this variation including the adjusted minimum average galvanized coating thickness requirement that has been applied to the inspection lot.

## Declaration of compliance

When required, the galvanizer can provide a declaration of compliance (ISO 10474), which confirms that the work processed met the requirements of EN ISO 1461 : 2022.