Titel

Technical Requirements for hot dip galvanizing of steel for overhead lines and substations

INNEHÅLLSFÖRTECKNING

1 General

1.1 Scope

These requirements apply to hot dip galvanizing of steel for overhead lines and outdoor substations.

The steel refered to is:

1. Rolled steel section, eg. L-section, sheet, round bar, I-section
2. Forged steel parts, eg. socket tongue, shackle, rock eyebolt
3. Threaded steel parts

Cast iron parts and malleable iron castings are not included.

1.2 Standards and regulations

The following standards for coating thickness, procedure and testing shall be met. If the information in these technical requirements varies from the standards, then the technical requirements take precedence.

SS-EN ISO 8501-3:2007	Behandling av stålytor före beläggning med färg eller liknande produkter Del3: Förbehandlingsgrader för svetsar, kanter och andra områden med defekter.
SS-EN ISO 1461:2009	Hot dip galvanized coatings on fabricated iron and steel articles- Specifications and test methods.
SS-EN ISO 10684:2004	Fasteners-Hot dip galvanized coatings
SS-EN ISO 2178	Non magnetic coatings on magnetic substrates-Measurement of coating thickness-Magnetic method.
SS-EN ISO 1463:2004	Measurement of coating thickness-Microscopical method.
SS-EN 50423	Overhead electrical lines exceeding AC 1 kV up to and including 45 kV (AC)
SS-EN 50341	Overhead electrical lines exceeding AC 45 kV
SS-EN 10021:2007	General technical delivery requirements for iron and steel products.

SS 20130	Sampling procedures and tables for inspection by attributes.

2 Changes compared to earlier version

These requirements replaces NTK-0004-24, ” Technical requirements for hot dip galvanizing of steel for overhead lines and substations”.

3 Technical demands

3.1 General

All steel parts for overhead lines and outdoor substations shall be hot dip galvanized unless otherwise specified in the design drawings.

3.2 Pretreatment

All steel to be galvanized or provided with another coating must in terms of welds, edges, steel defects, etc meet the pretreatment level P3 according to EN ISO 8501-3:2007.

3.3 Coating thickness

All steel which shall be hot dip galvanized, is given a zinc coating with thicknesses as shown below.

For SS-standardized material the thickness should conform to respective SS-standards.

The stipulations for coating thickness are based on measurements obtained by magnetic method using a reluctance-type instrument in accordance with SS-ISO 2178. Pure zinc and non-magnetic iron zinc alloy are defined as protective coating. (It should be noted that this gives a greater thickness of zinc than when regard is paid only to zinc weight – about 10-20% with silicone killed steel).

Category 1 mean 215 µm, min 190 µm
(class Fe/Zn 215 t≥6 in SS-EN ISO 1461:2009)

Applies to parts of rolled steel section, regardless of the thickness of the material, for installation in soil or water.

Exception: For the HE-type of base girder applies until further notice, because of low steel quality, a coating thickness of mean 140 µm, min 110 µm.
E.g. Frame members and diagonals of L-section, ground rod of L-section.

Category 2 mean 140 µm, min 115 µm

Applies to parts of rolled steel section for frame members and diagonals with a thickness exceeding 5 mm designed for overhead use in conjunction with lattice towers.

E.g. Frame members and diagonals of L-section.

Category 3 mean 115 µm, min 100 µm
(class Fe/Zn 115 t≥6 in SS-EN ISO 1461:2009)

Applies to parts of rolled steel section for overhead use with exception of Category 2 above.

E.g. Crossarm of U-section, flat section, support of VKR-section, rock eyebolts, blade dowels.

Category 4 mean 70 µm, min 60 µm
(class Fe/Zn 115 stål ≤1-<3 in SS-EN ISO 1461:2009)

Applies mainly to forged parts for overhead use.

E.g. Fittings for insulator strings.

Category 5 nominal 45 µm, min 45 µm
(SS-EN ISO 10684)

Applies to steel parts with external threads.

Exception: For parts which are only threaded on a minor part, eg. eye staylinks and eye staylinks for rock eyebolts, then this zinc thickness applies only to the threaded portion - otherwise the same conditions apply as above.

E.g. U-bolt for crossarm, stirrup bolt, check screw, bolt for steel structures, footsteps.

3.4 Surface quality

Requirements shall be met in accordance with SS-EN ISO 1461:2009.

The zinc coating shall be of uniform thickness and adhere well to the steel surface. Hard zinc accumulations must not occur. There should be no roughness or zinc accumulations of such size that it could impair fitting and joining in holes and on contact surfaces. After treatment it should be possible to screw threaded parts together by hand without any difficulty. There should be no blocking of holes for bolts. Lumps that can be removed by pressure from some hard object and leave

spots with a considerably thinner coating should not occur, nor should there be pores or salt inclusions that are visible to the naked eye. Dark grey spots (not rust coloured) can be tolerated.

Individual scratches on the zinc surface caused during the construction handling can be repaired by application of zinc-rich paint such as “galvanopasta”.

4 Procedure

To fulfill the given demands on the zinc coating silicone killed steel is as a rule required. For steel which shall be hot dip galvanized, a charge analysis report should be presented in accordance with SS-EN 10021. SIS-standardised silicone contents should be kept.

5 Testing and inspection

After galvanizing, the quality, adherence and thickness of the zinc coating should be checked in the manufacturer’s/galvanizer’s workshop in the presence of the customer. The inspection will be done at random on units of all sizes and qualities which are included in the delivery. The customer will choose these test samples at random from the whole batch in accordance with SS 20130.

Number of units supplied of the same design	Eg. at reduced check (Class 1) Random test, number of units
Structural steel, sections, Round bars, sheet:	
< 15	2
16-25	3
26-90	5
91-150	8
151-280	13
281-500	20
501-1200	32
1201-3200	50

Number of units supplied of the same design	Eg. at special check (Class S-2) Random test, number of units

Screws, nuts and other small parts	
< 25	2
26-150	3
151-1200	5
1201-35000	8
35001-	13

The quality and adherence of the zinc coating is tested through ocular inspection and with a hammer. The coating should be sufficiently firm so that it can´t be scraped off with a fingernail after it has been hit with a small nail hammer until small but clear marks appear.

The thickness of the coating should be checked with an instrument, type Elcometer. On each unit the coating thickness is measured at 10 points spaced evenly over all the larger areas of the object. Measuring points must be at least 10 mm from the nearest edge, corner or angle. The measuring conditions in SS-ISO 2178 shall be followed. Calibration can be done with a plane, unplated steel standard of the same quality as the object to be measured.

For smaller steel parts, e.g. round bars, greater accuracy can be obtained by measuring by the microscope method in accordance with SS-ISO1463:2004. The zinc thickness can also be measured directly by using a micrometer on a small test area.

6 Delivery

6.1 Packaging

Unassembled smaller units should be well wrapped and packed. Unassembled sectional bars should be bundled, if possible with bars belonging to the same assembly being in the same bunch. If necessary an intermediate wooden spacer should be used between the bars and between the bundles to decrease the damage. The protective spacer should be used so that loading and unloading can be done with a fork-lift truck without causing any damage to the goods.

6.2 Marking of packaging

The packaging should be clearly marked according to the instructions from the customer.

6.3 Transportation

When loading and unloading, the goods should not be subjected to knocks or blows to such a degree or lifted in such a way that members are bent or that the zinc coating is damaged.

When stacking goods on a lorry or at the storage place, make sure that the members at the bottom are not bent through overloading. Between each layer there should be a row of wooden spacers, placed closely enough to each other to prevent the sections from bending.

The storage place should be plane and the goods stacked in such a way that they do not come into contact with ground, acidic wood or similar.

7 Information from customer

The design drawings should state steel quality and thickness in μm of the zinc coating.

8 Information from supplier

Chemical composition should be shown in the form of a charge analysis report in accordance with SS-EN 10021:2007.

The test report concerning coating thickness measurements should also show if there are any variations from these technical requirements.