

Företag	Ersätter tidigare dokument	Dokumentid	Utgåva
E.ON Elnät Sverige AB	NTK-0004-23	D13-0024671	1.0
Organisation	Giltig fr o m	Giltig t o m	
Anläggning	2016-10-03		
Dokumentansvarig	Sekretessklass	Godkänt av	
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Titel

## Technical Requirements for supporting steel structures

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## 1 General

### 1.1 Scope

These requirements apply to manufacturing, inspection and delivery of supporting steel structures for overhead lines and substations.

Therequirements applies to the system voltages 12-145 kV, nominal frequency of 50 Hz, and for indoor or outdoor installation.

These requirements are a translation to the Swedish requirements D10-0015655. If the content of this document differs from the Swedish version, the Swedish requirements shall prevail.

### 1.2 Standards and regulations

The following standards and regulations shall be met. If the information in these technical requirements varies from the standards below, then the technical requirements take precedence.

SS-EN 50341	Overhead electrical lines exceeding AC 1 kV
SS-EN 1993	Eurocode 3, Design of steelstructures
SS-EN 1090-2	Execution of steel structures and aluminium structures – Part 2: Technical requirements for steelstructures
SS-ISO 273	Fasteners-Clearence holes for bolts and screws.
SS-ISO 2768-1	General tolerances-Part 1: Tolerances for linear and angular dimensions without individual tolerance indications.
SS-EN ISO 13920	Welding-General tolerances for welded constructions Dimensions for length and angles-Shape and position.
SS-EN 10 021:2007	General technical delivery requirements for iron and steel products.
SS-EN ISO 3834-3:2005	Quality requirements for fusion welding of metallic Materials – Part 3: Standard quality requirements

SS-EN ISO 9013 Thermal cutting – Classification of thermal cuts - Geometrical product specification and quality tolerances

### 1.3 Designations of older steel

Older design drawings for E.ON Elnät Sverige refers to steel grades according to Swedish Standard.

From 1990 the designations are according to the European standard EN 10025.

Below is a translation table from older designations.

Översättningstabell för konstruktionsstål

Designation	Older designation	
After 1993 EN 10025:1990 + A1:1993	Between 1990-1993 EN 10025:1990	Before 1990 According to Swedish Standard
S 235 JRG2	Fe 360 BFN	1311-00,1312-00
S 275 JR	Fe 430 B	1412-00
S 355 JR	Fe 510 B	2172-00
S 355 JO	Fe 510 C	2132-01

## 2 Changes compared to previous version

Any changes in the document are marked with lines on the right side.

## 3 Technical demands

### 3.1 General

Execution class EXC2 according to Table B3 in SS-EN 1090-2:2008+ A1: 2011, Appendix B

Welding shall be according to demands in SS-EN-ISO 3834-3:2005

Thermal cutting: Field 4 according SS-EN-ISO 9013 is valid for the quality of thermal cuts

Bolted joints Class A according to SS-EN 1993, part 1-8 Table 3.2

### 3.2 Material

Steel should have the quality prescribed in the drawing.

Inspection of material and testing shall be in accordance with Chapter 12 of SS-EN 1090-2:2008 + A1:2011.

Marking shall be in accordance with Chapter 9 of SS-EN 1090-2:2008 + A1:2011.

### 3.3 Bolted joints

Steel construction screw SB 8.8 M with metric threads shall be used unless otherwise is specified in the design drawings.

Making of holes, according to SS-EN 50341 Chapter 7.3.8 clause "Resistance of connections", with addition:

- steel thickness > 13 mm shall be drilled
- steel thickness ≤ 13 mm shall be drilled or punched

Diameters of bolt holes shall be in accordance with clause 3.4.4.

### 3.4 Dimensions and tolerances

#### 3.4.1 Welded constructions

Tolerance class A according to SS-EN ISO 13920 applies unless otherwise is specified in the design drawings.

#### 3.4.2 Bolted constructions

Tolerance class "very coarse" according to SS-ISO 2768-1 applies unless otherwise is specified in the design drawings.

#### 3.4.3 Straightness of bar

The initial deflection of a bar in a finished construction shall not exceed 1/600 of its ideal buckling length at measurements under no load condition.

#### 3.4.4 Diameters of bolt holes

Within the validity field of SS-EN 1993 applies hole series "medium" according to SS-ISO 273.

	Diameter of hole (mm)
M12	13,5
M16	17,5
M20	22,0
M24	26,0

Tolerance + 0,15 mm

The above given dimensions are valid before coating and unless otherwise is specified in the design drawings.

### 3.5 Hot dip galvanizing

Hot dip galvanizing shall be made in accordance with E.ON:s Technical Requirements for "Hot dip galvanizing of steel". Category of zinc coating shall be given in the design drawings.

## 4 Manufacturing and inspection

### 4.1 Applicable regulations

SS-EN 1090 - 2

### 4.2 Inspection

Manufacturers (sellers) make inspection and see continuously that the above given regulations are followed.

The customer reserve his right to get free admission to the manufacturers (sellers) workshops to make certain inspection.

### 4.3 Marking

If no special marking instructions are given then the following marking instructions shall apply.

- As a rule, steel constructions consisting of only a small number of parts and where mix-up of the parts not can be done, do not have to have an assembly marking. In other cases all parts should be marked.
- Marking shall be done prior to the coating procedure with punched figures and letters, clearly readable also after the coating procedure. Parts of a construction intended for erection in soil or water shall be marked with the letter “U” after the ordinary marking.
- Drawing showing the marking shall be made up by the manufacturer and be sent to the customer if nothing else is given.

## 5 Delivery

### 5.1 Packaging

Unassembled smaller parts shall be well packaged. Unassembled sectional steel bars shall be bundled and bars belonging together shall if possible be put in the same bundle. If necessary intermediate wooden spacers should be used between the bars and between the bundles. Parts for tubular steel poles shall be well packaged to avoid damages during loading, transportation and unloading. Intermediate spacers should also be used so that loading and unloading can be done with a fork-lift truck without causing any damage to the goods.

## 5.2 Marking of packaging

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

## 5.3 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 the members are bent or that the zinc coating is damaged.

When stacking goods on a lorry or a 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.

## 6 Assembly

### 6.1 General

The assembly shall be performed in accordance with the relevant instructions so that damage to the surface coating and structural distortions do not occur. During the assembly, the steel shall not be in contact with ground, acidic wood or similar.

### 6.2 Bolted connections

Bolts shall be installed with the nut on the outer side of the tower leg and at the underside in the crossarm. The bolted connection shall always be tightened by turning the nut. It is not allowed to turn the bolt.

After assembly, the nuts shall be locked by damaging the threads protruding the nut with two punch marks.

If nothing else is mentioned in the drawing the bolted joints shall be tightened in accordance with the torques given in the table below.

<u>Boltdimension</u>	<u>Tightening torque (Nm)</u>
M12	70
M16	140
M20	270
M22	360

M24

460

