Overhead transmission lines
Stay anchor termination for stayed supports

Introduction
These guidelines describe the requirements on stay anchor termination for stayed overhead transmission lines structures according to SvK TR 05-03E and cover design and inspection. The guidelines intend to guarantee satisfactory performance of conductors during the calculated technical lifetime of the overhead line and shall be used at purchasing of conductors.

This English text is to be regarded as a translation of the Swedish guideline. The Swedish text and the interpretation thereof shall govern the contract and the legal relations between parties.
<table>
<thead>
<tr>
<th>Notes</th>
<th>Change notes</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First issue</td>
<td>20 / 05 / 2016</td>
</tr>
</tbody>
</table>

---
5 Type test

5.1 General

5.2 Dimensions

5.3 Thickness of zinc coating

5.4 Mechanical and electrical strength

5.4.1 U-bolt

5.4.2 Wedge

5.4.3 Insulating bushing

5.4.4 Stay anchor termination

6 Sample test

6.1 General

6.2 Dimensions

6.3 Thickness of zinc coating

6.4 Mechanical strength

7 Routine test

7.1 Mechanical routine test

7.2 Visual examination

8 Certificate of delivery

8.1 General

8.2 Documentation

8.2.1 Assembly drawing

8.2.2 Description

8.2.3 Quality system

8.2.4 Type test report

8.2.5 Sample test report

8.2.6 Inspection documents

8.2.7 Installation instructions

9 Installation

10 Tables
10.1 Table 1 Stay anchor termination, size and mechanical requirements ...................................................................................... 17
10.2 Table 2 U-bolts, Dimensions ................................................................................................................................. 18
10.3 Table 3 U-bolts, Test loads ............................................................................................................................... 18
10.4 Table 4 Insulating bushing, Test loads .................................................................................................................. 19

11 Figures ................................................................................................................................................................................. 20

11.1 Figure 1 Stay anchor termination, single respectively double stay wires ................................................................................................................................ 20
11.2 Figure 2 U-bolts, Dimensions ............................................................................................................................. 20
11.3 Figure 3 U-bolt, Bending test ............................................................................................................................... 21
11.4 Figure 4 Wedge, Bending test ............................................................................................................................. 21
11.5 Figure 5 Wedge house, Routine test .................................................................................................................... 21
1 References

Note that standards, regulations etc. which are referred to in these guidelines are subject to continuous change and can be withdrawn, revised or replaced. The contractor shall immediately inform the client of such changes.

SS 424 06 29 Overhead line material – Insulating bushing
SS 424 11 51 Overhead line material – U-bolts for anchor clamp
SS-EN 1562 Founding – Malleable cast iron
SS-EN 1563 Founding – Spheroidal graphite cast iron
SS-EN 10025-3 Hot rolled products of structural steels – Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
SS-EN 10204 Metallic products – Types of inspection documents
SS-EN 20898-2 Mechanical properties of fasteners - Part 2: Nuts with specified proof load values - Coarse thread
SS-EN 50341 Overhead electrical lines exceeding AC 45 kV
SS-EN ISO 898-1 Mechanical properties of fasteners made of carbon steel and alloy steel -- Part 1: Bolts, screws and studs
SS-EN ISO 1461 Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods
SS-EN ISO 4017 Hexagon head screws – Product grades A and B
SS-EN ISO 4032 Hexagon nuts, style 1 – Product grades A and B
SS-EN ISO 9001 Quality management systems – Requirements
SS-EN ISO 10684 Fasteners – Hot dip galvanized coatings
SS ISO 272 Fasteners -- Hexagon products – Widths across flats
SS ISO 965-4 ISO general purpose metric screw threads – Tolerances – Part 4: Limits of sizes for hot-dip galvanized external screw threads
2 Scope

These guidelines describe the requirements on stay anchor termination for overhead transmission line supports according to SvK TR 05-03E and cover design and inspection. The guidelines intend to guarantee satisfactory performance of conductors during the calculated technical lifetime of the overhead line and shall be used at purchasing of conductors.

3 Definition

For definitions see Figure 1

4 Description

4.1 Stay anchor termination
Load taking devise consisting of a U-bolt with wedge-house and wedge for termination of one or two steel stay wires according to SvK TR 05-04E intended for staying overhead line supports.
4.2 Requirements

4.2.1 General
Stay anchor termination shall be able to withstand the mechanical stresses which can occur during transport, handling and installation at temperatures as low as −40°C as well as the mechanical stresses which can occur during the technical lifetime of the overhead line at temperatures from -50°C to +50°C.

4.2.2 Marking
Fittings shall be marked with raised or indented / stamped characters with a minimum height of 3 mm as follows:

- Trademark of the manufacturer
- Type or catalogue number
- Quality marking on bolts and nuts in accordance with SS-EN ISO 898-1 and SS-EN 20898-2.
- Year of manufacture

4.3 Material

4.3.1 U-bolt
The U-bolt shall be of steel in accordance with SS-EN 10025-3 (S355N) and hot dip galvanized. The thickness of the zinc coating shall meet the requirements for Fe/Zn 215 according to SS-EN ISO 1461 National Annex NA. The threaded parts shall be in accordance with SS-ISO 965-4 and be hot dip galvanized in accordance with SS-EN ISO 10684. Maximum distance of 5d (where d is the U-bolt diameter) from the end of the threads may have a thickness of the zinc equal to the thickness for the threads. U-bolts 16x300, 20x350, 20x425, 24x425, 27x245, 33x425 and 36x800 shall be considered as entirely threaded.

The impact strength of the forged steel shall be at minimum of 27 J at 0°C when tested in accordance with SS-EN 10045-1.

The U-bolt shall be bended at a temperature of 850 to 1000 °C.

The rupture strength $R_m$ for test specimens taken from the manufactured part shall not exceed 700 MPa.

4.3.2 Wedge house
The wedge house shall be of forged steel according to SS-EN 10025-3 alternatively of malleable iron according to SS-EN 1562 or spheroidal graphite iron according to SS-
EN 1563 and hot dip galvanised. The thickness of the zinc coating shall meet the requirements according to SS-EN ISO 1461 (80 µm).

4.3.3 Wedge
The wedge shall be of forged steel according to SS-EN 10025-3 alternatively of malleable iron according to SS-EN 1562 or spheroidal graphite iron according to SS-EN 1563 and hot dip galvanised. The thickness of the zinc coating shall meet the requirements according to SS-EN ISO 1461 (80 µm).

4.3.4 Stud
The stud shall be of forged steel according to SS-EN 10025-3 alternatively of malleable iron according to SS-EN 1562 or spheroidal graphite iron according to SS-EN 1563 and hot dip galvanised. The thickness of the zinc coating shall meet the requirements for Fe/Zn 215 according to SS-EN ISO 1461 National Annex NA.

4.3.5 Insulating bushing
The insulating bushing shall be of back polycarbonate (PC) and heat treated with forced air circulation during 60 to 75 minutes at 120°C. See SS 424 06-29.

4.3.6 Bolt and nut
Bolt and nut shall be of hot dip galvanised steel with a strength according to SS-EN ISO 898-1 respectively SS-EN 20898-2.

4.3.7 Washer
Washer shall be of hot dip galvanised steel according to SS-ISO 7091.

4.4 Design

4.4.1 Stay anchor termination
The stay anchor termination, see Figure 1, shall consist of a U-bolt with two nuts, one as jam nut, on each leg and a wedge joint consisting of a wedge house and a wedge to terminate the stay wire/wires in the stay anchor termination. Some types shall be equipped with a stud in order to reduce the permanent deformations at working load. Stay anchor U-bolt for twin stay wires shall be designed in that way each stay wire will be terminated with separate wedges. The stay anchor termination shall at request also include insulation by insulating bushings between the wedge house and the U-bolt in order to prevent electrical contact between stay wire and ground. When insulating bushings are included it shall be a plain washer between the nut and the bushing. The stay anchor termination shall be designed in the way that the stay wire do not need to be bend around the wedge and that the mechanical loaded part of the stay is centric positioned between the legs of the U-bolt and that the slack part of the wire pass outwards the U-bolt. Sizes see Table 1.
4.4.2 U-bolt
The U-bolt shall meet the requirements according to SS 424 11 51 and have dimensions in accordance with Table 2.

4.4.3 Wedge house
The steel wire groove in the wedge house shall be adapted to actual wire diameter according to SvK TR-05-04E and be free from irregularities and sharp edges. The wedges sliding surface in the wedge house shall be free from irregularities and sharp edges. The zinc coating at the sliding surfaces shall be free from crystalline zinc.

4.4.4 Wedge
The steel wire groove in the wedge shall be adapted to actual wire diameter according to SvK TR-05-04E and be free from irregularities and sharp edges. The wedges sliding surface shall be free from irregularities and sharp edges. The zinc coating at the sliding surfaces shall be free from crystalline zinc.

The wedge shall be equipped with an eye with a threaded hole for a clamping screw in order to secure the wedge to the stay wire. The clamping screw shall have appropriate size in relation to the actual stay wire diameter.

The wedges sliding surface shall be treated with friction reducing lacquer.

4.4.5 Stud
The stud shall be adapted to suite in the space between the U-bolt legs and partly encompass the legs and also have a supporting length of at least equal to the diameter of the leg.

4.4.6 Insulating bushing
The insulating bushing shall be adapted to the actual diameter of the U-bolt and the U-bolt holes in the wedge house and have such length that the air-gap between the wedge house and the U-bolt will be greater than 2 mm.

4.4.7 Bolt and nut
Bolt and nut shall be in accordance with SS-EN ISO 4014 respectively SS-EN ISO 4032 and have widths across flats according to SS-ISO 272.

4.5 Mechanical requirements

4.5.1 Stay anchor termination
The stay anchor termination shall without breakage sustain the actual stay wire breaking load according to SvK TR 05-04. Breakage of the stay wire shall not occur before the 90% of the wires real breaking load.
4.5.2 U-bolt
The U-bolt shall meet the requirements according to SS 424 11 51 and have dimensions according to table 2.

Threaded part with one nut shall withstand the tension loads according to Table 3.

The legs shall after rapid ageing at 150 °C in 30 minutes could be separated in that way the angle between the legs will be 60° without any cracks or breakage occurs. See Figure 3.

4.5.3 Wedge
Threads in the wedge shall withstand a torque equal to 110% of the torque given by the manufacturer for the clamping screw in the installation instruction without permanent deformation or breakage.

The wedge shall withstand a bending of 20° angle without that any cracks or breakage occur. See Figure 4.

4.5.4 Insulating bushing
The insulating bushing shall withstand a load of 110% of the working load without breaking. See Table 4.

4.6 Electrical requirements

4.6.1 Insulating bushing
The insulating bushing shall at a load in accordance with Clause 4.5.4 withstand a voltage of 3 kV.

5 Type test

5.1 General
Unless otherwise agreed upon the type test shall be in accordance with Clauses 5.1-5.4 on three test samples. The test shall be performed in such a way that the method and equipment do not affect the result. The test certificate shall not be older than 10 years. All integral parts in the tested samples shall be from the same manufacturer and manufacturing plant as the delivery in question.
5.2 Dimensions
This test intends to check that the stay anchor termination fulfils the requirements in accordance with Clause 4.4 and that they are also in accordance with the manufacturers drawing regarding dimensions.

5.3 Thickness of zinc coating
This test shall be performed in accordance with SS ISO 2178 and SS-EN ISO 1461. Each sample shall be subject to, depending on size, 3 to 10 measurements. The points of measurement shall be evenly and randomly distributed over the entire sample surface.

The minimum and average layer thickness requirements in accordance with Clause 4.3 shall be fulfilled.

5.4 Mechanical and electrical strength

5.4.1 U-bolt
This test intends to verify that the U-bolt fulfil the requirements in accordance with Clause 4.5.2

One of the U-bolts legs with one nut installed so much that the free end of the threads is equal to one thread diameter shall be tensile tested. A tensile load in accordance with Table 3 shall be achieved before breakage or rupture in the threads.

The U-bolt shall be rapid aged at 150 °C in 30 minutes and after that clamped in a vice in that way the jaws rest against the bend, see Figure 3, and then the other leg shall be bend away in that such manner that the angle between the legs will be 60°. Cracks in or breakage of the U-bolt shall not occur.

5.4.2 Wedge
This test intends to verify that the wedge fulfil the requirements in accordance with Clause 4.5.3

The clamping screw shall be installed in the threaded eye of the wedge and a steel bar with approximately the same diameter as the stay wire in question shall be located in the wire groove. The clamping screw shall be turned with a torque equal to 110% of the torque stated in the deliverer’s installation instruction. Breakage shall not occur and the screw shall after reloading be easy to turn by the fingers.

The wedge shall be checked in respect of deformation, see Figure 4. The wedge shall be placed centrically on the sliding surface at two round bars with a distance of 80 mm between the bars. A load shall then be applied by a sphere with a diameter of approxi-
approximately 0.6 times the conductor diameter in the wire groove in order to bend the wedge. No cracks shall occur before an angle of 20° has been received.

5.4.3 Insulating bushing
This test intends to verify that the insulation bushing fulfil the requirements in accordance with Clause 4.5.4 and 4.6.

The insulating bushing shall be installed in a steel casing with a hole of the same dimension and shape as the u-bolt holes in the wedge house. The appurtenant washer shall be located on top of the bushing and a hex-head steel screw of the same dimension as the U-bolt shall be put into the insulating bushing after which it shall be loaded with a force in accordance with Clause 4.5.4. Then shall a voltage in accordance with Clause 4.6 be applied between the steel casing and the steel screw. No any electrical breakdown shall occur.

5.4.4 Stay anchor termination
This test intends to verify that the stay anchor termination fulfil the requirements in accordance with Clause 4.5.1.

At the test a breaking load tested stay wire shall be used and the obtained breaking load value shall be used for the comparison with the values received from the stay anchor termination.

The test shall be performed in a tensile testing machine. The sample length, between end terminations, shall be at least 400 times the stay wire diameter but not less than 5 metre. A shorter length may be agreed between the manufacturer and purchaser.

The test sample shall be loaded to 2% of the rated tensile strength (RTS) and the position of the wedge versus the wedge house and the stay wire shall be recorded as well as the distance between the legs of the U-bolt. Then the load shall be increased to 10% RTS and the position of the wedge and distance between legs are recorded. This procedure shall be repeated in steps of 10% RTS up to 60% RTS after that the load shall be increased until breakage occur. All recorded values as well as the breaking load value shall be given in the test report.

The sliding motion of the wedge versus the stay wire shall be less than 2mm at 50% RTS. Breakage shall not occur before 90% of that for the stay wire tested breaking load value.
6 Sample test

6.1 General
Sample tests are carried out by the manufacturer on stay anchor termination selected at random from the lot to be supplied.

Test samples shall be supplied by the manufacturer free of charge to the client and shall not be included in the lot to be supplied.

The size of the test samples are indicated in the table below.

<table>
<thead>
<tr>
<th>Lot size</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>N ≤ 200</td>
<td>Subject to agreement</td>
</tr>
<tr>
<td>300 &lt; N ≤ 2000</td>
<td>4</td>
</tr>
<tr>
<td>2000 &lt; N ≤ 5000</td>
<td>8</td>
</tr>
<tr>
<td>5000 &lt; N ≤ 10000</td>
<td>12</td>
</tr>
</tbody>
</table>

The samples shall be subject to testing in accordance with Clauses 6.2 to 6.4. Stay anchor termination which have been submitted for test shall be discarded.

The manufacture shall inform the client when sample tests will be made.

Records from the sample tests shall be filed by the manufacturer and be shown to the client on request. In the case where any component does not comply with the requirements, re-testing shall be performed as below.

If only one stay anchor termination or part thereof fails to comply with the sample test requirement, a new sample equal to twice the quantity originally submitted for that test shall be subject to re-testing. The re-testing shall comprise the test or tests in which failure occurred.

If two or more stay anchor termination, or parts thereof, fail to comply with any of the sample tests, or if any failure occurs during re-testing, the complete lot shall be considered not to comply with the requirements.

Provided that the cause of the failure can be clearly identified, the manufacturer may sort the lot to eliminate all the stay anchor termination with this defect. The sorted lot shall then be resubmitted for sample testing. The number then selected shall be three times the first quantity chosen for the test. The re-testing shall comprise the test or tests in which failure occurred in the original test.

If any stay anchor termination, or part thereof of the sorted lot, fails during this re-testing, the complete lot shall be considered as not complying with the requirements.

6.2 Dimensions
The test shall be performed in accordance with Clause 5.2.
6.3 Thickness of zinc coating
The test shall be performed in accordance with Clause 5.3.

6.4 Mechanical strength
The test shall be performed in accordance with Clause 5.4 except the electrical test.

7 Routine test

7.1 Mechanical routine test
Each wedge house manufactured of malleable or spheroidal graphite iron shall be mechanically tested. A mechanical load of 55% of the actual stay wires rated tensile strength (RTS) shall be applied at the wedge house, see Figure 5.

Wedge house that indicate permanent deformation or cracks shall be discarded.

7.2 Visual examination
Each wedge house and wedge shall be examined regards the sliding surfaces and wire grooves. Irregularities, sharp edges and crystalline zinc are not accepted.

8 Certificate of delivery

8.1 General
The client shall, according to these guidelines, approve the stay anchor termination before delivery. For approval the manufacturer shall show that the stay anchor termination conforms to the guidelines.

The manufacturer shall provide documentation in accordance with clauses 4.8.2.1 - 8.2.7 for approval.

The approval of drawings by the client does not release the manufacturer from his obligation regarding the stay anchor termination complying with the guidelines.

All documentation shall be written in Swedish or English.

8.2 Documentation
General requirements for documentation see SvK TG 8.
8.2.1 Assembly drawing
The assembly drawing shall have a minimum of two views at an appropriate scale in accordance with ISO 5455. On the drawing shall be given:

- Type and/or catalogue number
- Principal dimensions
- The dimensions of the conductor groove with tolerances
- All marking
- Weight
- List of materials

8.2.2 Description
Description of the manufacturing process.

8.2.3 Quality system
Quality system in accordance with EN ISO 9001.

8.2.4 Type test report
Type test report according to Clause 5.

8.2.5 Sample test report
Sample test report according to Clause 6.

8.2.6 Inspection documents
Inspection documents according to SS-EN 10204 shall be enclosed to each delivery.

8.2.7 Installation instructions
Installation instructions shall be written in Swedish or English and include necessary figures.

9 Installation

The installation shall be in accordance with the manufacturers installation instruction.
10 Tables

10.1 Table 1 Stay anchor termination, size and mechanical requirements

<table>
<thead>
<tr>
<th>Intended for</th>
<th>Work load</th>
<th>Breaking load</th>
<th>Test load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay wire area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>min mm²</td>
<td>max mm²</td>
<td>Stud</td>
<td>kN</td>
</tr>
<tr>
<td>Single stay wire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>16</td>
<td>–</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>24</td>
<td>–</td>
</tr>
<tr>
<td>185</td>
<td>284</td>
<td>27</td>
<td>Yes</td>
</tr>
<tr>
<td>Double stay wires</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>20</td>
<td>Yes</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>24</td>
<td>Yes</td>
</tr>
<tr>
<td>142</td>
<td>–</td>
<td>27</td>
<td>Yes</td>
</tr>
<tr>
<td>185</td>
<td>–</td>
<td>33</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### 10.2 Table 2 U-bolts, Dimensions

<table>
<thead>
<tr>
<th>Intended for</th>
<th>Single stay wire area</th>
<th>Double stay wires area</th>
<th>Size</th>
<th>Thread</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>min mm²</td>
<td>max mm²</td>
<td>min mm²</td>
<td>max mm²</td>
<td>mm x mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 300</td>
<td>M16</td>
<td>300 ± 5</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 800</td>
<td>M16</td>
<td>800 ±10</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 1300</td>
<td>M16</td>
<td>1300 ±10</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 1800</td>
<td>M16</td>
<td>1800 ±10</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 2300</td>
<td>M16</td>
<td>2300 ±15</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 2800</td>
<td>M16</td>
<td>2800 ±15</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 3300</td>
<td>M16</td>
<td>3300 ±20</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>25</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>16 x 3800</td>
<td>M16</td>
<td>3800 ±20</td>
<td>200</td>
<td>50 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>-</td>
<td>-</td>
<td>20 x 350</td>
<td>M20</td>
<td>350 ± 5</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 425</td>
<td>M20</td>
<td>425 ± 5</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 800</td>
<td>M20</td>
<td>800 ±10</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 1300</td>
<td>M20</td>
<td>1300 ±10</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 1800</td>
<td>M20</td>
<td>1800 ±10</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 2300</td>
<td>M20</td>
<td>2300 ±15</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 2800</td>
<td>M20</td>
<td>2800 ±15</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 3300</td>
<td>M20</td>
<td>3300 ±20</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>68</td>
<td>105</td>
<td>25</td>
<td>68</td>
<td>20 x 3800</td>
<td>M20</td>
<td>3800 ±20</td>
<td>200</td>
<td>60 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 425</td>
<td>M24</td>
<td>425 ± 5</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 800</td>
<td>M24</td>
<td>800 ±10</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 1300</td>
<td>M24</td>
<td>1300 ±10</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 1800</td>
<td>M24</td>
<td>1800 ±10</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 2300</td>
<td>M24</td>
<td>2300 ±15</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 2800</td>
<td>M24</td>
<td>2800 ±15</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 3300</td>
<td>M24</td>
<td>3300 ±20</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>105</td>
<td>142</td>
<td>68</td>
<td>105</td>
<td>24 x 3800</td>
<td>M24</td>
<td>3800 ±20</td>
<td>250</td>
<td>75 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 425</td>
<td>M27</td>
<td>425 ± 5</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 800</td>
<td>M27</td>
<td>800 ±10</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 1300</td>
<td>M27</td>
<td>1300 ±10</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 1800</td>
<td>M27</td>
<td>1800 ±10</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 2300</td>
<td>M27</td>
<td>2300 ±15</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 2800</td>
<td>M27</td>
<td>2800 ±15</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>165</td>
<td>284</td>
<td>142</td>
<td>-</td>
<td>27 x 3300</td>
<td>M27</td>
<td>3300 ±20</td>
<td>250</td>
<td>90 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 425</td>
<td>M33</td>
<td>500 ±5</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 800</td>
<td>M33</td>
<td>800 ±10</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 1300</td>
<td>M33</td>
<td>1300 ±10</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 1800</td>
<td>M33</td>
<td>1800 ±10</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 2300</td>
<td>M33</td>
<td>2300 ±15</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 2800</td>
<td>M33</td>
<td>2800 ±15</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 3300</td>
<td>M33</td>
<td>3300 ±20</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>33 x 3800</td>
<td>M33</td>
<td>3800 ±20</td>
<td>250</td>
<td>105 ± 1</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>185</td>
<td>-</td>
<td>36 x 800</td>
<td>M36</td>
<td>800 ±10</td>
<td>410</td>
<td>115±5</td>
</tr>
</tbody>
</table>

### 10.3 Table 3 U-bolts, Test loads

<table>
<thead>
<tr>
<th>Size</th>
<th>Test load kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>M16</td>
<td>52</td>
</tr>
<tr>
<td>M20</td>
<td>114</td>
</tr>
<tr>
<td>M24</td>
<td>164</td>
</tr>
<tr>
<td>M27</td>
<td>215</td>
</tr>
<tr>
<td>M33</td>
<td>278</td>
</tr>
<tr>
<td>M36</td>
<td>278</td>
</tr>
</tbody>
</table>

TEKNISKRUTLINDJ 2016-05-20 TR05-14E utg 1
10.4 Table 4 Insulating bushing, Test loads

<table>
<thead>
<tr>
<th>Size</th>
<th>Test load (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M16</td>
<td>26</td>
</tr>
<tr>
<td>M20</td>
<td>51</td>
</tr>
<tr>
<td>M24</td>
<td>79</td>
</tr>
<tr>
<td>M27</td>
<td>107</td>
</tr>
<tr>
<td>M33</td>
<td>139</td>
</tr>
</tbody>
</table>
11 Figures

11.1 Figure 1 Stay anchor termination, single respectively double stay wires

11.2 Figure 2 U-bolts, Dimensions
11.3 Figure 3  U-bolt, Bending test

11.4 Figure 4  Wedge, Bending test

11.5 Figure 5  Wedge house, Routine test