

Electricity Specification 400A3

Issue 4 May 2022

Mechanical Stay Anchors for Wood Pole Overhead Lines



Amendment Summary

| ISSUE NO. DATE | DESCRIPTION |
|-----------------------------------|---|
| Issue 3 07/09/21 | <p>New template applied throughout.</p> <p>Prepared by: D M Talbot</p> <p>Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director</p> |
| Issue 4 May 22 | <p>Drawing I-420-1.07-003 modified to show stay rod / turnbuckle arrangement. Description of anchor in Section 6.3.2 amended accordingly.</p> <p>Prepared by: D M Talbot</p> <p>Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, DSO Director.</p> |

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1 Introduction

This Specification comprises general and technical requirements for mechanical stay anchors used on the electricity distribution network (Network) owned by Electricity North West Limited, as Distribution Licensee.

2 Scope

This Specification covers the supply of mechanical stay anchors, including stay rods, for use with the wood pole overhead line stays described in CP420 Part 1 Chapter 07.

Traditional wooden stay blocks to ENA TS 43-91 are specified in ES400W2 (with other wooden items).

Concrete stay blocks to ENA TS 43-91 shall not be installed on the Network.

3 Definitions

| | |
|-------------------------|---|
| Approval | Sanction by the Electricity North West Overhead Line Circuits Policy Manager that specified criteria have been satisfied |
| Contract | The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement. |
| Contractor | The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West. |
| ENA TS | Energy Networks Association Technical Specification. |
| Holding Capacity | The maximum load that can be applied to an anchor before the anchor starts to pull out – see the type test in this Specification. |
| Specification | The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract. |
| Sub-Contractor | Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Overhead Line Circuits Policy Manager, and the legal representatives, successors and assigns of such person. |
| Supplier | Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor. |
| Tender | An offer in writing to execute work or supply goods at a fixed price. |

Tenderer

The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a Tender.

4 General Requirements for Approvals and Testing

4.1 Product not to be Changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Overhead Line Circuits Policy Manager, and receipt of a written agreement to the proposed change from the Electricity North West Overhead Line Circuits Policy Manager.

4.2 Electricity North West Technical Approval

The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.

Alternatively, technical reports and other data may be submitted that the Tenderer considers will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Overhead Line Circuits Policy Manager but will not be unreasonably withheld.

Approval shall be 'factory specific' and is not transferable to another factory without the written Approval of the Electricity North West Overhead Line Circuits Policy Manager.

The Supplier and product shall comply with all the relevant requirements of Electricity North West document CP311.

4.3 Quality Assurance

The Tenderer shall confirm whether or not Approval is held in accordance with a quality assurance scheme accredited under ISO 9000. If not, the Tenderer shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.

The right is reserved for the repeat of such tests, from time to time, that the Electricity North West Overhead Line Circuits Policy Manager may deem to be reasonably necessary to demonstrate continued compliance with the Specification.

The Tenderer shall submit, with the Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, fitness for installation and service.

The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Overhead Line Circuits Policy Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Overhead Line Circuits Policy Manager will confirm the requirement for samples at the time of Tendering.

The right is reserved for inspections to be made of Tenderer's facilities, from time to time, as deemed reasonably necessary by the Electricity North West Overhead Line Circuits Policy Manager to ensure compliance with this Specification and any Contract of which it forms a part.

The Tenderer shall submit, with the Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with the Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that it is to remain confidential, and the Electricity North West Overhead Line Circuits Policy Manager will, if requested, confirm agreement to this prior to receipt of the information.

4.5 Identification Markings

The Tenderer shall submit, with the Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Policy Manager and shall in all cases include the Electricity North West approved description and commodity code number.

The Tenderer shall submit, with the Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Policy Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 45 years.

4.7 Product Conformity

Preference will be given to those Suppliers who can provide suitable product conformity certification to a recognised or specified standard, or an equivalent certification.

4.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in [Appendix B](#). Failure to complete these declaration sheets may result in an unacceptable bid.

5 Requirements for Type and Routine Testing

The Electricity North West Overhead Line Circuits Manager shall set out the requirement of the following tests to be carried out by the Supplier at the Supplier's cost.

5.1 Requirement for Type Tests at Suppliers Premises

These are a series of one-off type tests, which are carried out to ensure the satisfactory performance of the product design, under extremes of operating stresses, and of endurance, as may be appropriate, to be determined by the Electricity North West Overhead Line Circuits Manager.

These may or may not be destructive tests.

5.2 Requirement for Routine Tests at the Supplier's Premises

These tests may be required to be carried out on every individual unit or component, as specified, or at some regular frequency to be determined by the Electricity North West Overhead Line Circuits Manager.

The results of these tests may be required to be supplied to Electricity North West with each unit purchased or retained for inspection, at a period to be determined by the Electricity North West Overhead Line Circuits Manager.

6 Technical Requirements

6.1 General

Stay anchors shall meet the general requirements of ENA TS 43-91, and each type of anchor shall be compatible with the appropriate stay type described in Electricity North West's CP420 Part 1 Chapter 07. The required mechanical strengths and holding capacities of the stay types are given in the following sub-sections, followed by brief descriptions of the mechanical anchor types currently used on the Network. A schedule of current mechanical stay anchors is included in [Appendix A](#). Any new type of stay anchor shall pass the type test detailed in [Section 6.4](#).

The drawings and figures included in this Specification are for illustration only and shall not be used to indicate any preferred item type or manufacturer.

Preferably, new stay anchors shall incorporate a method of post-installation proof loading/testing.

If the new stay anchor comprises part of a new stay arrangement – i.e. one not covered in CP420 Part 1 Chapter 07 – the stay arrangement shall meet the requirements of ENA TS 43-91, and the stay anchor shall pass the type test detailed in [Section 6.4](#).

Method of installation and installation equipment shall also be specified, including any special equipment or materials required. Installation equipment shall meet relevant approved standards (e.g. EN or BS).

6.2 Mechanical Strength and Holding Capacities of Stay Types

The stay types listed below in Table 1 are fully specified in CP420 Part 1 Chapter 07. The minimum failure load (mechanical) of each type of anchor shall be as specified in [Table 1](#).

The Holding Capacity (see Definitions) shall be as calculated from the type test results below. The Holding Capacity of a stay anchor assembly shall be as specified in [Table 1](#).

The Supplier shall state the Minimum Failure Load (MFL) and the Holding Capacity of each type of anchor system supplied.

Table 1 Stay Anchors – MFLs and Holding Capacities

| Stay Type | Usage | Stay Anchor Assembly | |
|--------------------------|---|----------------------|--|
| | | MFL (kN) | Holding Capacity |
| ENA TS 43-30 Group 1 | Light duty LV and service lines only. | Greater than 28* | The same as MFL in the previous column |
| Light Duty Stay (Type 1) | LV overhead line structures and light duty 6.6/11kV overhead line structures, e.g. BS1320, ENA TS 43-10 and any historical light duty company specific derivations. This type of stay is the equivalent of a Group 2 stay as per ENA TS 43-30. | 65 | |
| Heavy Duty Stay (Type 2) | LV, 6.6/11kV and 33kV overhead line structures. | 110 | |
| 132kV Trident (Type 2) | 132kV Trident overhead line structures. | 110 | |

* This figure is the minimum failure load of the light duty stay plate.

The above failure loads incorporate a factor-of-safety of 2.5.

Bespoke (one-off) requirements may be required from time-to-time. These shall be specified as required by the Overhead Line Circuits Manager.

6.3 Types of Mechanical Stay Anchor Currently used on the Network

6.3.1 General

It is permissible to use more than one stay to meet the requirements of [Table 1](#) above, as in the case of the load lock anchor system below. Any such requirement shall be clearly stated by the Supplier.

6.3.2 Auger Stay Rod System

The auger system consists of a screw base, to take a stay rod, with either single or twin helices welded to a square stub. 07/06/22

Drawing I-420-1.07-003 shows the installation arrangement for the auger stay rod system.

NOTE: that the manually installed screw-in stay anchor to ENA TS 43-91, Drawing 439105, is no longer approved for use on Electricity North West's overhead line network.

6.3.3 Load Locking Stay Anchor System

The load locking system, shown in Drawing I-420-1.07-004, consists of a cast earth anchor connected to wire tendon. A tendon, which is attached to the anchor, is used to load lock the anchor by means of a portable load locking jack which applies an upward force to attach the stay to the tendon. The main disadvantage of this system is that the effective area of the anchor is less than that of an equivalent wooden block. The risk of pull-out is therefore greater, making load lock and proof-testing the anchor essential.

Tests have indicated that in cases where traditional load locking anchors are used as light duty stays (see Table 1), one of the following requirements needs to be met:

- If a single anchor is to be used, a 3m tendon is required.

The 3m tendon shall be identified by a red band around the eye. Suitable hand-held installation equipment and a suitable load locking unit shall also be provided.

- Alternatively, two traditional load locking anchors (with 2m tendons) may be installed provided they are a minimum of 2m apart if splayed, or 1m apart if installed in tandem. (Splayed is preferred to tandem.)

Only load locking stay anchor systems that have adequate earthing (i.e. electrical connection between the tendon and the stay wire via flying lead) shall be used.

Additionally, the tendon shall incorporate a turnbuckle (not shown in the drawing). The turnbuckle shall form part of the anchor for the purpose of testing and meeting the requirements of [Appendix A](#).

6.3.4 Rock Anchor

The rock anchor system, as shown in Drawing I-420-1.07-006, is suitable for use in solid rock. Rock anchors expand and wedge against solid walls of rock. Once a rock anchor is expanded, the harder the pull on the rod, the tighter it wedges.

There are two grades of rock anchor that are currently used. Each grade is available in two lengths. These are:

- Heavy (25mm / 1") 1346mm / 53" or 1828mm / 72" length.
- Light (19mm / ³/₄") 762mm / 30" or 1524mm / 60" length

6.4 Type Test

6.4.1 General

A statistically significant number of stay anchors of one type shall be subjected to the appropriate Holding Capacity test below (either ground anchor or rock anchor).

The stay anchors shall be installed using the equipment, materials and method specified by the Supplier for the installation of that stay (i.e. during stay installation as part of overhead line work). Note that if part of a stay anchor assembly breaks before the required Holding Capacity is reached, that stay anchor has failed the type test.

These measurements shall be used to calculate the Holding Capacity of the stay anchor type. The error in this value shall also be quoted.

6.4.2 Holding Capacity of Ground Anchors (other than Rock Anchors)

A pull-out test shall be carried out in sand of density 1595kg/m³, which is considered to be representative of average worst ground conditions, with an angle between stay and pole of 45 degrees.

A suitable pull-out device shall be connected to the above ground fitting of the stay anchor. The pull-out device shall incorporate an approved load or pressure measuring gauge. Proof of calibration of the measuring gauge shall be provided (and proof of conversion factor in the case of a pressure gauge).

The point at which the stay enters the ground shall be marked, e.g. by wrapping tape around the stay at that point.

The load shall be increased slowly until the anchor begins to pull out (i.e. the marker tape has visibly moved). This value shall be recorded as the Holding Capacity. To confirm that pull out is occurring, continue to pull out the anchor for a total of 20cm. Note that the pull out rate shall be gradual enough for the measured load to remain constant (or noticeably decrease as the anchor shears through the ground).

If an anchor appears to have snagged on an underground structure (indicated by a rapid increase in measured load after pull-out has commenced), the test shall be stopped and the result discounted.

6.4.3 Holding Capacity of Rock Anchors

Rock anchors shall be proof-tested in rock of an agreed type to an agreed load using suitably calibrated and approved equipment.

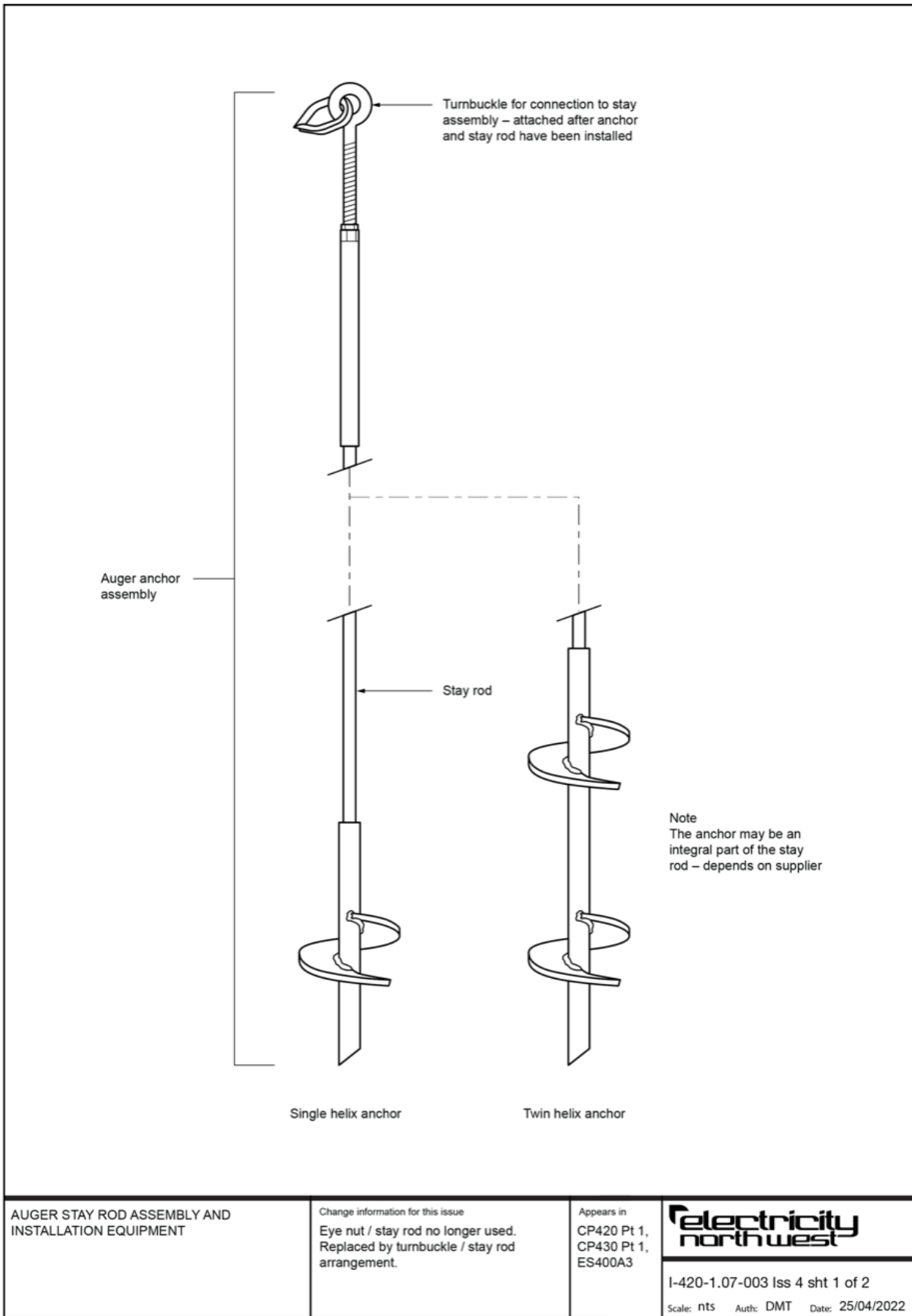
If break-through occurs during a test, that test shall be discounted.

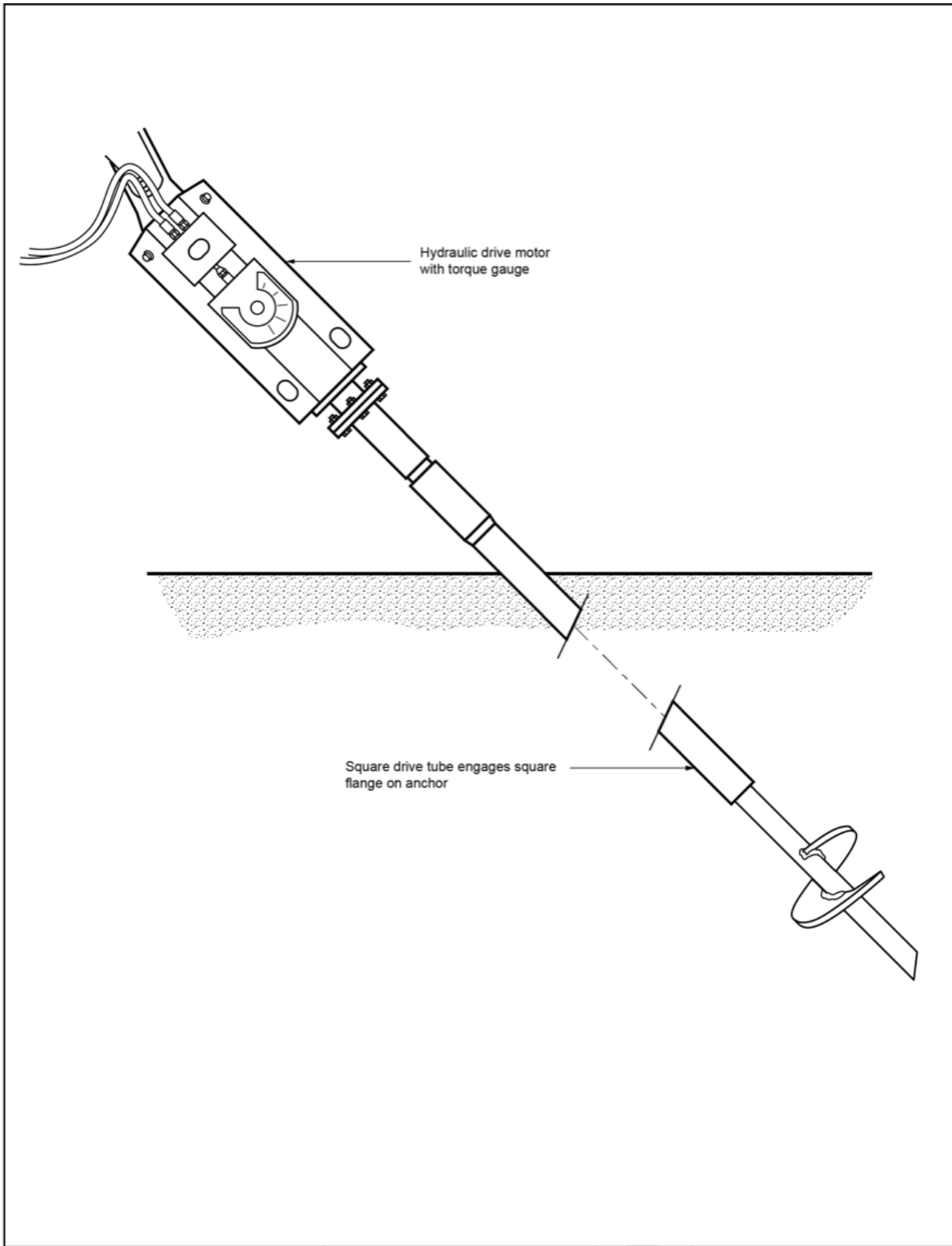
7 Documents Referenced

| DOCUMENTS REFERENCED | |
|--|---|
| Health and Safety at Work Act 1974 | |
| Control of Substances Hazardous to Health Regulations 2002 | |
| Manual Handling Operations Regulations 1992 | |
| BS EN ISO 9000: | Quality management systems. |
| BS EN ISO 14001: 2004: | Environmental management systems. Requirements with guidance for use. |
| ENA TS 43-30: | Low Voltage Overhead Lines on Wood Poles. |
| ENA TS 43-91: | Stay Strands and Stay Fittings for Overhead Lines. |
| CP311: | Equipment Approval Process. |
| CP420 Part 1: | Policy and Practice for Wood Pole Overhead Lines. |
| ES400W2: | Wood Poles and Miscellaneous Wooden Items. |

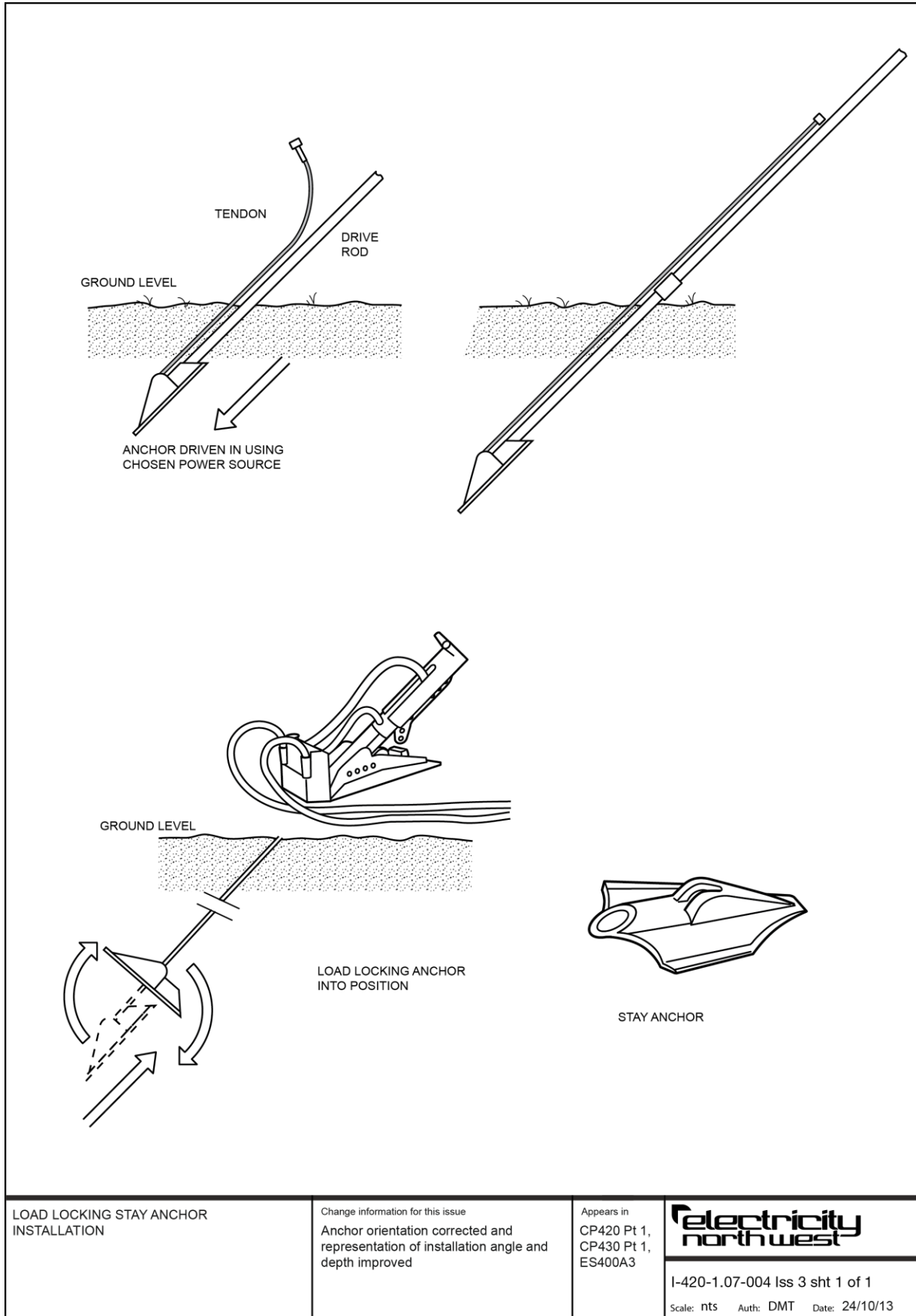
8 Keywords

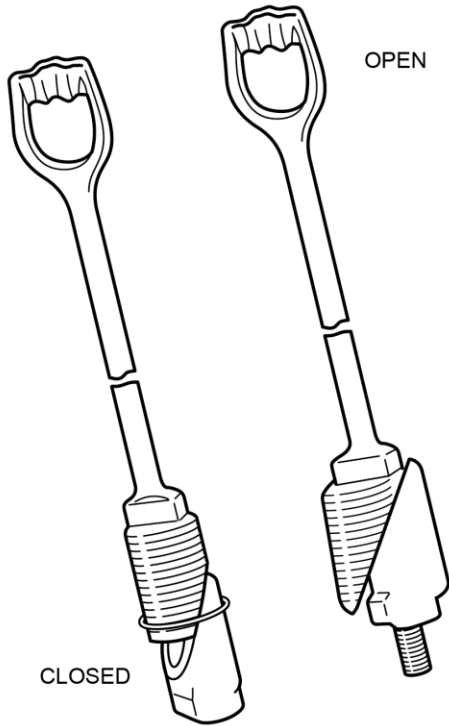
Stay.





| | | | |
|---|--|---|---|
| <p>AUGER STAY ROD ASSEMBLY AND INSTALLATION EQUIPMENT</p> | <p>Change information for this issue Eye nut / stay rod no longer used. Replaced by turnbuckle / stay rod arrangement.</p> | <p>Appears in CP420 Pt 1, CP430 Pt 1, ES400A3</p> | <p>electricity north west</p> <p>I-420-1.07-003 Iss 4 sht 2 of 2 Scale: nts Auth: DMT Date: 25/04/2022</p> |
|---|--|---|---|

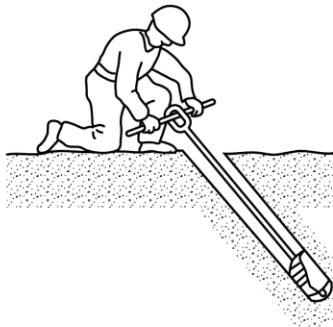




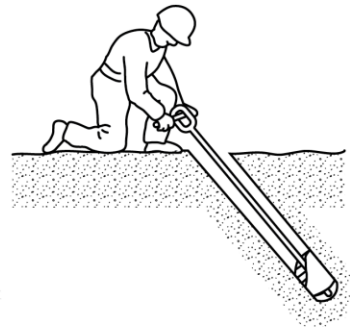
| ROD DIA mm | ROD LENGTH mm | DRILL SIZE |
|---------------|------------------|---------------|
| 19 19 | 762 1524 | 1 7/8" 48mm |
| 25 25 | 1346 1828 | 2 3/8" 60mm |



DRILL HOLE
ENSURE CORRECT
DIAMETER AND
DEPTH



PUSH ANCHOR INTO HOLE
ENSURE IT GOES FULLY
HOME



TURN ROD TO EXPAND
USING 1220mm
STRAIGHT BAR

EXPANDING ROCK ANCHOR

Change information for this issue
Drawing included in ES400A3

Appears in
CP420 Pt 1,
CP430 Pt 1,
ES400A3

**Electricity
north west**

I-420-1.07-006 Iss 2 sht 1 of 1

Scale: nts Auth: DMT Date: 04/10/12

Appendix A – Schedule of Current Stay Anchors

| Approved Description (for purchasing and product labelling) | CC number | MFL (kN) | Holding Capacity (kN) | Notes |
|---|-----------|-------------|-----------------------------|--|
| Anchor, stay, auger, 8", single helix | 123692 | 110 | 110 | Requires special installation equipment: hydraulically-operated vehicle-mounted drive-motor. Refer to Drawing I-420-1.07-003. |
| Anchor, stay, auger, 10", single helix | 123706 | | | |
| Anchor, stay, auger, 10", twin helix | 123722 | | | |
| Anchor, stay, auger, 12", single helix | 123714 | | | |
| Anchor, stay, load lock, 2m tendon | 121444 | 65 | 35 | Requires special installation equipment: pneumatic hammer; drive rods (with coupling and removal tools); load locking device. Refer to Drawing I-420-1.07-004. |
| Anchor, stay, load lock, 3m tendon | 121445 | 65 | 65 | Requires special installation equipment: pneumatic hammer; drive rods (with coupling and removal tools); load locking device. |
| Anchor, stay, rock, ¾" dia, 30" length, 1¾" bolt | 121517 | 110 | 110 | Requires special installation equipment: suitable drilling equipment; 1220mm straight bar. Refer to Drawing I-420-1.07-006. |
| Anchor, stay, rock, ¾" dia, 60" length, 1¾" bolt | 121525 | | | |
| Anchor, stay, rock, 1" dia, 53" length, 2¼" bolt | 121533 | | | |
| Anchor, stay, rock, 1" dia, 72" length, 2¼" bolt | 121541 | | | |
| Anchor, stay rod, type 2 | 130435 | 110 | 110 | For use with wooden block specified in ES400W2. Stay rods shall be adjustable and in accordance with ENA TS 43-91 Drawing 439101 Type 2 for 7/4.00mm stay wire. |

Appendix B – Conformance Declaration

SECTION-BY-SECTION CONFORMANCE WITH SPECIFICATION

The Tenderer shall declare conformance or otherwise for each product/service or range of products/services, section-by-section, using the following Conformance Declaration Codes.

Conformance Declaration Codes:

| | |
|-------|--|
| N/A = | Clause is not applicable/appropriate to the product/service. |
| C1 = | The product/service conforms fully with the requirements of this clause. |
| C2 = | The product/service conforms partially with the requirements of this clause. |
| C3 = | The product/service does not conform to the requirements of this clause. |
| C4 = | The product/service does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform. |

Manufacturer:

Product/Service Description:

Product/Service Reference:

Name:

Company:

Signature:

SECTION-BY-SECTION CONFORMANCE

| Section | Section Topic | Conformance Declaration Code | Remarks * (must be completed if code is not C1) |
|---------|--|------------------------------|--|
| 4.1 | Product not to be Changed | | |
| 4.2 | Electricity North West Technical Approval | | |
| 4.3 | Quality Assurance | | |
| 4.4 | Formulation | | |
| 4.5 | Identification Markings | | |
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| 5.1 | Requirements for Type Tests at the Supplier's Premises | | |
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| 6.1 | General | | |
| 6.2 | Mechanical Strength and Holding Capacities of Stay Types | | |
| 6.3.1 | General | | |
| 6.3.2 | Auger Stay Rod System | | |

| | | | |
|-------|---------------------------------|--|--|
| 6.3.3 | Load Locking Stay Anchor System | | |
| 6.3.4 | Rock Anchor | | |
| 6.4 | Type Test | | |

* Applicable specifications shall be stated in the Remarks column where alternatives are quoted within a section. The Remarks column shall also be used to indicate cases where the products or services exceed the quoted specifications.

Additional Notes: