WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE : OS4A/2

Relating to The Location, Identification and Proving Dead of Underground Cables

This document specifies the techniques and procedures to be followed for locating, identifying and proving **Dead** underground cables.

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Implementation Date: **August 2016**

Approved by:

Lee Wallace
Safety & Training Manager

Date: 10th August 2016.

Implementation Plan.

- **Introduction**
  This document specifies the techniques and procedures to be followed for locating, identifying and proving **Dead** underground cables.

- **Main Changes**
  Section 1.3 and 1.4 are added to include the considerations required at the design/ planning stage of work.
  Section 1.9 refers to ST:CA14A and new Appendix C regarding the use of cable sniffer fault locators to locate faulty cables and for use at the point of excavation.
  Appendix A is revised

- **Impact of Changes**
  These changes document the requirements to include considerations regarding cable identification at the design/ planning stage of a project as per existing company practice.
  Additional guidance is provided regarding the use of cable sniffer fault locators to determine the fault position on underground cables.

- **Implementation Actions**
  Team Managers Shall brief all their relevant staff of the changes in this document and Shall issue them with a new flow chart diagram (Appendix A) and label showing Appendix C.

- **Implementation Timetable**
  This policy Shall be implemented with immediate effect

Document Revision & Review Table		
Date	**Comments**	**Author**
August 2016	• Section 1.3 and 1.4 are added to include the considerations required at the design/ planning stage of work. • Section 1.9 references ST:CA14A and Appendix C regarding use of cable sniffers to locate faulty cables. • Appendix A has been revised to provide more clarity	Steven Pinkerton-Clark
4th August 2014	• Typographical corrections and references updated throughout. • Section 2.1 - clarification has been added to prohibit the use of reciprocating saws on cables that are not proved dead • Section 2.4 has been extended to allow the use of an **Approved LV** cable identification tool. • Section 2.10 added to include reference to guidance at Appendix A. • Clarification has been provided at 3.1, 3.4 and 3.6 around the requirement to signal inject and spike HV cables • Section 5.4 inserted referring to spiking of cables on private networks. • Appendix A - inserted a flow chart and guidance for identifying **LV** cables. • Appendix B – inserted a draft of indemnity letter for spiking unidentified cables on private networks.	Steven Pinkerton-Clark
Nov 2013	• Document reviewed	Paul Woodward

1.0 CABLE LOCATION AND EXCAVATION

1.1 Serious injuries can result from the explosive effects and associated fire or flames when an electricity cable or joint faults. Cable damage may already be present or be caused during excavation by penetration with a sharp object or crushing. It is important that all work in the vicinity of cables at all voltages is carried out such as to reduce the risk of injury to the minimum.

1.2 Guidance on the general safety procedures for excavating in the vicinity of all utility services is given in HSE guidance note HS(G)47 and WPD Standard Technique relating to excavating and shoring is ST:HS14B.

1.3 For planned work the presence of underground cables in the working area Shall be identified at the design stage with the planner/ designer recording them on the Risk Register. They Shall also ensure that all relevant plans (geographic and schematic) are provided in the scheme file and that allowance is made for sufficient ground to be excavated.

1.4 The person responsible for delivery of the scheme/ project Shall ensure that the job instruction and any Work Instructions issued to a contractor identifies the presence of all adjacent cables and considers what additional resources may be required to positively identify the correct cable at the point of work, i.e. Approved LV cable identifier or attendance of an SAP in accordance with the Cable Identification flowchart in Appendix A.

1.5 Before excavation commences, accurate and up-to-date mains records Shall be consulted to determine the route and where shown the depth of all cables in the vicinity of the excavation. Location devices Shall be used to confirm the records. Where possible, the cable locations Shall be marked on the ground.

1.6 Before and during excavation, location devices Shall be used to confirm the proximity of cables. Careful manual excavation Shall be used in close proximity to any cables.

1.7 Sufficient ground Shall be excavated to enable the correct cable to be identified.

1.8 Excavation on a suspect or faulty **Live Low Voltage** cable Shall only be carried out a safe distance from a known fault or damage location such that no person present is placed at risk of injury. The safe distance Shall be determined from site conditions and take account of any measures that can be put in place to control the hazard.

1.9 Where a cable sniffer fault locator is used to locate a cable fault the procedures set out in Appendix C and ST:CA14A Shall be followed. To rule out false readings caused by gasses travelling along underground voids or ducting, the sniffer Shall be used at the proposed point of excavation to confirm no gas is present before digging starts.

1.10 If fault location techniques have proved inconclusive then the cable Shall be made **Dead** prior to or during excavation.

2.0 IDENTIFICATION AND PROVING DEAD - LOW VOLTAGE (LV) CABLES

2.1 **LV** cables Shall be identified from mains records and treated as **Live** until proved **Dead** at or near the point of work. Safe access to the cable cores for proving **Dead** Shall be at such points as **LV** feeder pillars or cabinets, link distribution boxes, cut-outs and pole-mounted fuses. The cable Shall then be visibly traced to the point of work. If no such access is available near the point of work the cable Shall be opened using **Approved Live Working** techniques, reciprocating saws and similar tools Shall not be used for this purpose.

2.2 Any cable warning device (e.g. tiles or tape) or the type of armouring Shall NOT be used to identify an **LV** cable. Positive visual indication that the cable is **LV** Shall be from one or more of the following methods:

- The presence of an **LV** service, street lighting or mains joint on the cable.
- Recognition that the cable is a CONSAC, WAVECON or CNE type with a PVC oversheath clearly embossed '600/1000v'.
- Where only two cables are present, both having been exposed, and the other cable clearly identified as a Red CAS or EPR type **HV** cable.

2.3 Where there may be discrepancies with records and no other means of positive indication can be achieved, or there is any other reason to doubt that a cable is **LV** work Shall not proceed and further advice Shall be sought.

2.4 Where doubt exists as to the correct identification of cables, other techniques such as the use of a WPD **Approved LV** cable identifying tool, electrical injection or spiking may be required.

2.5 Where more than one cable has been exposed at a work site, the cable to be worked on Shall be marked with adhesive tape immediately following identification.

2.6 When proving **Dead** on an **LV** cable with a separate street lighting core (5-core cables) the source of control of the street lighting core Shall be identified and effectively isolated. Where practicable, a **Caution Notice** Shall be fixed.

2.7 Following a careful written risk assessment of the hazards and consequences; a suspect damaged or faulty **LV** cable may be opened using **Approved Live Working** techniques away from the point of damage to carry out tests or cut cores. This assessment Shall indicate whether all or part of the work may proceed with the cable **Live** and detail the work method and precautions to be taken. All work on **Dead** faulty, or suspect faulty cables will be in accordance with the Distribution Safety Rules.

2.8 Only **Approved** voltage testing devices Shall be used to prove **Dead**.

2.9 No assumption Shall be made that any **LV** cable with exposed **Conductors** (whether from damage or otherwise) is **Dead**.

2.10 Attached at Appendix A is a flow chart and checklist of actions to be used as a guide to aid in the correct identification of **LV** underground cables.

3.0 IDENTIFICATION AND PROVING DEAD - HIGH VOLTAGE (HV) CABLES

3.1 **HV** cables Shall be identified from mains records and confirmed by electrical injection tests except:

(a) Where a cable is exposed over its whole length from the point of work to an already identified point such as a switch or pole box and can be physically traced over that length.

(b) Where it is not reasonably practicable to carry out electrical injection tests, only one **HV** cable is known to be present in the locality and all other cables have been exposed and positively identified as **LV.**

3.2 In circumstances where identification of a particular cable by electrical injection is not practicable (e.g. when the cable is terminated in a stop-end joint) every effort Shall be made to expose and identify all adjacent cables from mains records before the cable is spiked. When records are inadequate it may be necessary to use electrical injection or sheath induction tests on these cables.

3.3 When more than one cable (**HV** or **LV**) is visible at a work site the cable to be worked on Shall be marked with adhesive tape immediately after it has been identified and before any work takes place.

3.4 When a **HV** cable has been identified to be worked on, in all circumstances other than those set out in section 6 below or if it is fluid filled, it Shall be proved **Dead** before work commences; normally by spiking with an Acvoke cable spiking gun.

3.5 The **Distribution Control Engineer** Shall be contacted immediately before and immediately after the operation of the spiking gun. The spiking gun Shall not be removed until the **Distribution Control Engineer** and field operator are satisfied that it is safe to do so.

3.6 When a cable is to be cut close to the plumb of an already identified cable box or pole termination at which the cable is **Earthed** the spiking may be dispensed with. Where such a cut is being made on a cable connected to a free standing switch, all cables connected to that switch Shall be identified before the cut is made.

3.7 No assumption Shall be made that any **HV** cable with exposed **Conductors**, whether from damage or otherwise, is **Dead**.

4.0 IDENTIFICATION - TRANSFORMER NEUTRAL CABLES

4.1 In certain Primary Substations the 33/11kV transformers share common earthing equipment with the neutral cables connected to selection isolators. In such cases a special procedure will be required to positively identify the transformer neutral cables. Signal injection will not be effective and as neutral cables are normally volt-free, spiking the cable or closing the earthing isolators to the solid earth position will not positively identify the cable or prove that it is safe to work on.

4.2 The transformer neutral cable(s) may be identified by physically tracing them PROVIDED the correct earthing isolator for the transformer can be positively identified. If this has not been done previously, the correct isolator Shall be proved by means of the test set out in paragraph 4.3 below:

4.3 To prove the correct earthing isolator:

- Isolate and earth the transformer in the normal way.
- Close the transformer neutral isolator to solid earth.
- Issue a **Sanction-for-Test**.
- Prove **Dead** and insert **HV** test prods into the feeder spouts of the transformer 11kV circuit breaker.
- Perform an earth continuity test on any phase from the transformer 11kV circuit breaker spouts through the transformer windings to the earthing isolator. A low reading should be observed due only to the resistance of the transformer windings.
- Open the transformer neutral isolator.
- Repeat the continuity test. If the correct isolator has been operated the test will show infinite resistance.
- Close the neutral isolator, remove the test prods, re-apply the **Citcuit Main Earth** through the 11kV CB and cancel the **Sanction-for-Test**.

4.4 Where the neutral isolator has been positively identified, the neutral cable Shall be physically traced to the intended point of work either from the transformer or the neutral isolator. Spiking Shall NOT be used as a means of proving that the cable is safe to work on.

5.0 ADDITIONAL PRECAUTIONS - WORKING ON PRIVATE NETWORKS

5.1 No relaxation of the procedures within this standard technique are permitted when WPD staff work on private networks. WPD records and any private records Shall be consulted to assist with cable identification.

5.2 Additional hazards associated with private networks include:

(a) advice from third parties as to the identification of private or WPD cables may be suspect and should be confirmed by **Approved** procedures

(b) private cable records may be non-existent or unreliable

(c) WPD cables, both **HV** and **LV**, may co-exist alongside private cables on private property.

(d) cable types, not familiar to WPD staff, may be encountered.

5.3 All work on private **HV** networks Shall be carried out in accordance with the appropriate WPD rules and procedures.

5.4 On occasions WPD staff are requested by third parties to prove unidentified cables **Dead** by spiking. There is generally no statutory obligation on WPD to carry this out and there may be risks associated with this, such as serious injury and/or damage to equipment and assets. Before carrying out any such spiking activities, and where the requestor is acting on behalf of a company, WPD staff Shall obtain a signature from the requestor, on a letter of indemnity as shown in Appendix B. If the request to spike a cable is received from an individual further advice Shall be sought from the Safety Team.

6.0 IDENTIFICATION OF HIGH VOLTAGE CABLES - WORKING ON THE SHEATH ONLY

6.1 The following procedure applies when work is only required to take place on the serving, armour or sheath of 6.6, 11, 33 and 132kV cables without access to the insulation covering the C**onductor**s. In this context sleeves, plumbs and joint seals are considered to be part of the cable sheath.

6.2 If removal of the cable sheath or joint sleeve is required then operations Shall be carried out in accordance with section 3.0 above and Distribution Safety Rule 5.9.

6.3 This procedure permits the re-plumbing of joints, maintenance of 33kV barrier joints and similar work. It Shall also permit minor repairs to cable sheaths, but if the repair is required as a result of third party contact the work Shall only proceed after a careful examination of the cable and a risk assessment by a **Senior Authorised Person.**

Procedure

6.4 Identification will take place as in 3.0 above except that the cable will not be spiked. The **Sanction-for-Test** will be endorsed "only injection tests for identification purposes are to be carried out".

6.5 All cables present at the point of work Shall be exposed and each cable and joint identified from records by the **Senior Authorised Person** in charge of the work.

6.6 The **Senior Authorised Person** Shall confirm the identity of the cable to be worked on at the point of work by means of electrical injection applied between cores.

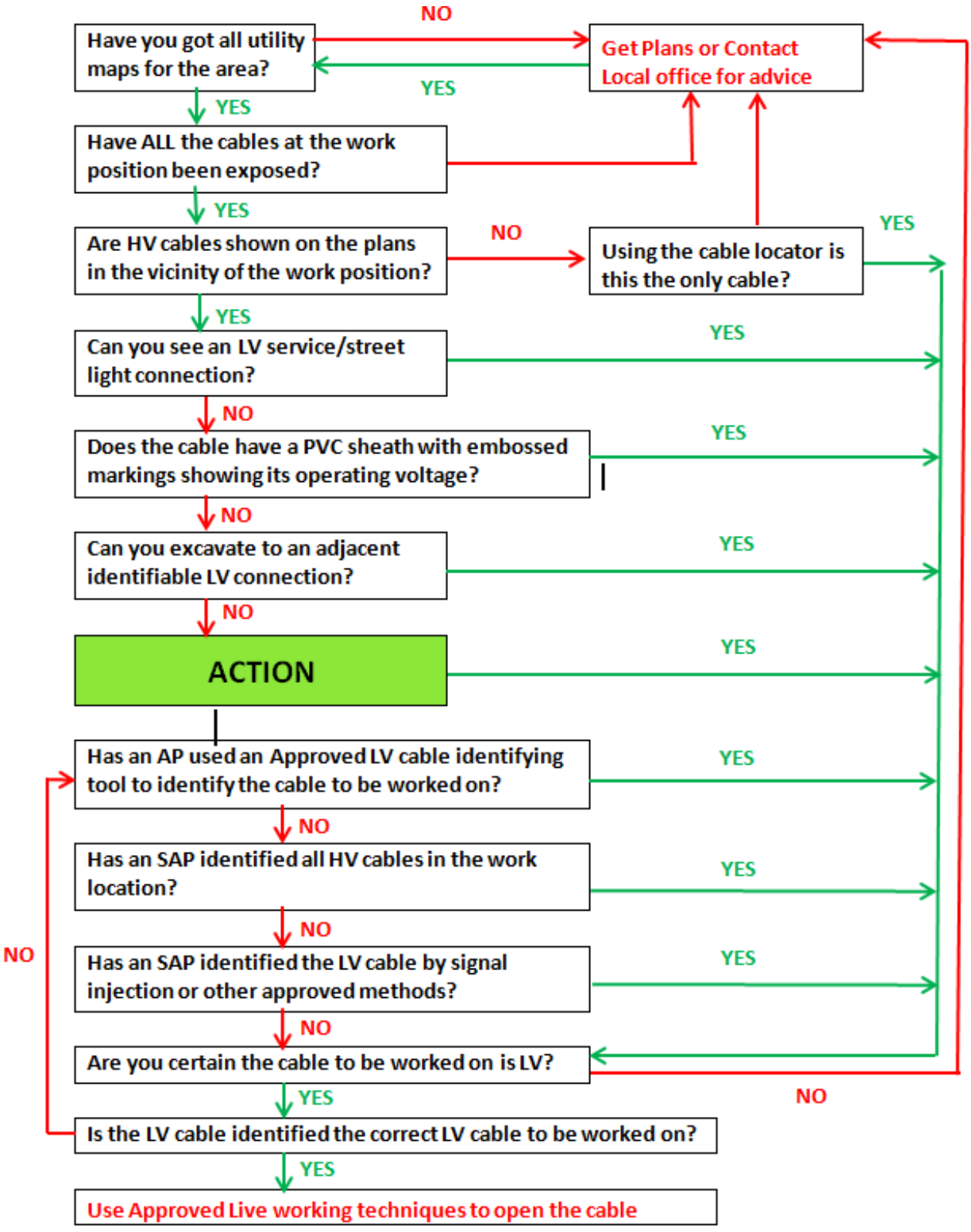
6.7 The cable to be worked on Shall be marked with coloured tape by the **SAP,** or other **Person** acting under their **Personal Supervision,** on each side of the point of work.

6.8 The **Senior Authorised Person** Shall issue A **Limitation of Access** and give **Personal Supervision** to the commencement of the work. The **Limitation of Access** Shall state "there Shall be no interference with the screen or insulation of the cable cores".

6.9 The **Sanction-for-Test** Shall not be cancelled until the **Limitation of Access** is cancelled on completion of the work.

6.10 Where appropriate, work Shall be carried out in accordance with AP12 of the Distribution Safety Rules.

PROCEDURE FOR LOW VOLTAGE CABLE IDENTIFICATION (Revision 1)



REMEMBER, IF IN DOUBT, STOP AND ASK FOR ADVICE

APPENDIX A

PROCEDURE FOR LOW VOLTAGE CABLE IDENTIFICATION.

Application.

- Incidents have occurred where "HIGH VOLTAGE" underground cables have been incorrectly assumed as "LOW VOLTAGE" cables. These incidents could have led to a serious injury or a fatality.

- It is important that procedures are followed which will prevent any such incidents and that any cable is positively identified before work can begin. Positive identification requires the type of cable to be established beyond doubt.

- The procedure for identification of underground cables is detailed in ST:OS4A.

- Throughout Western Power Distribution regions there are types of HIGH VOLTAGE cables which could be mistaken for LOW VOLTAGE cables.

- Typical of these HIGH VOLTAGE cables are PILCSTA (Paper Insulated, Lead Covered, Steel Tape Armoured) and plain lead covered cables. Also 33kV Polymeric single core cables can resemble a Wavecon cable.

Procedure:

Whilst every effort is made to ensure that cable records are accurate, site conditions can change without our knowledge and consequently records are not totally reliable. In order to ensure safety of persons and the safety of the electricity system, records should only be used as a guide and the following points should be observed:-

- Positively identify all cables prior to work commencing to ensure that cables energised at HIGH VOLTAGE could not be mistaken for LOW VOLTAGE.

- In order to positively identify LOW VOLTAGE cables, the procedures detailed in the chart overleaf and ST:OS4A Shall be followed.

- Check records to ensure all cables on site are shown. It is possible that not all cables have been recorded and will not be shown on our records.

- There may be cables present that are not owned by WPD, these may belong to other parties such as: Private systems, National Grid circuits, Street lighting authority circuits, Telecoms and cable TV circuits

If there is any doubt, a Senior Authorised Person Shall attend site and decide how positive identification can be achieved.

Always check details to confirm cable type as you proceed with each stage of the jointing process.

APPENDIX B

TO BE TYPED ON WESTERN POWER DISTRIBUTION HEADED PAPER

[Address]

[Date]

Dear

Request to prove cable Dead by spiking ("Cable Spiking")

Further to the letter of request dated [DATE] from [FULL NAME OF COMPANY] (the "Company") this letter is to confirm the terms upon which Western Power Distribution [Regional Licence Area] ("WPD") will carry out the Cable Spiking to the cable you have identified (the "Cable") at the site identified on the attached plan ("the Site").

In consideration of WPD agreeing to carry out the Cable Spiking, the Company agrees as follows:

1. **Searches -** Prior to WPD carrying out the Cable Spiking the Company will undertake all relevant searches and use all reasonable endeavours to determine the owner of the Cable and notify WPD of the same.

2. **Payment -** The Company shall pay a charge of [£NNN] to WPD in respect of the Cable Spiking. Payment will be made prior to the Cable Spiking being carried out.

3. **Liability**

3.1 The Company acknowledges that WPD is carrying out the Cable Spiking at the Company's sole request and that spiking of cables carries a risk of death, injury and damage to property.

3.2 The Company agrees to be solely responsible for the safety of all persons and property present on or near to the Site when the Cable Spiking is carried out and, subject to paragraph 3.3. below, the Company assumes all liability for loss, damage, death or injury caused to:
(a) the Company and its employees, agents, contractors and sub-contractors;
(b) WPD and its employees, agents, contractors and sub-contractors; or
(c) any third parties present at or near to the Site, whether or not the Company is aware of or has authorised such presence.

3.3 WPD accepts liability for death or personal injury caused by its negligence and any other liability which cannot by law be limited or excluded. WPD excludes, to the fullest extent permitted by law, all liability for any other injury, loss or damage, howsoever caused, which may be sustained by any third party or by the Company including its employees, agents, contractors and sub-contractors in connection with the Cable Spiking.

4. Indemnity

4.1 The Company agrees to indemnify WPD and each of the other members of the WPD group of companies and their respective officers, directors, employees and agents and to keep each of them fully indemnified at all times from and against all damages or injury to any person or to any property and against all penalties, fines, actions, suits, claims, demands, costs (including, without limitation, reasonable legal costs), losses, charges and expenses arising out of or in connection with the Cable Spiking, including in particular (without limitation) all those arising from, resulting from or connected with:
(a) injury, death or loss of or damage to property caused to WPD or its employees, contractors, sub-contractors or agents (unless caused by the negligence of WPD);
(b) a claim or claims for personal injury, death or loss of or damage to property by any third party (unless caused by the negligence of WPD); or
(c) any damage or loss of functionality caused to the Cable or any other cables located at or near to the Site, whether or not they are electricity cables.

5. Termination - Either party may terminate this letter at any time by written notice to the other party. On termination or expiry of this letter for any reason, paragraphs 2, 3, 4 and 6 will remain in full force and effect. Where WPD chooses to terminate this letter, it shall reimburse any charges paid under paragraph 2 of this letter to the Company.

6. Governing law and jurisdiction - This letter will be governed by and construed in accordance with English law and the parties submit to the exclusive jurisdiction of the English courts.

Please sign below if you accept the terms of this letter.

Yours sincerely

Western Power Distribution [Regional Licence Area] Plc

The terms of this letter have been agreed to by both WPD and the Company and the Company accepts the limitations and liability set out herein. This letter is signed below for and on behalf of the Company by an authorised signatory.

Signed for and on behalf of the Company……

Name:

Designation:

Dated:

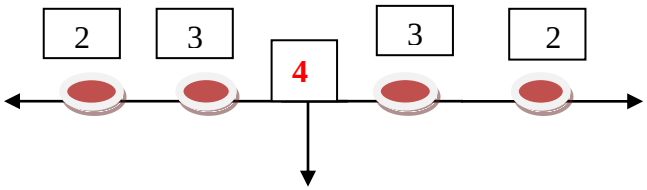
APPENDIX C

GUIDANCE FOR USE OF FAULT LOCATING SNIFFER DEVICE (See also ST:CA14A)

When a fault location is established using a cable sniffer device, a minimum of two readings need to be taken at the point where the initial cut and test excavations are to take place. The readings should reduce from the highest value location to the far end of the joint bays. If there is an increase in the value then further investigation needs to take place.

Sniffer readings are to be carried out and recorded at each excavation location and readings must be equal to or lower than the lowest reading recorded at any other test position - before any ground can be excavated.

'Joint bay (JB) to cut and test'.
Two readings shall be taken here, one to rear of JB and one to front. These readings need to be lower or equal to the lowest reading outside of the JB area.



Highest value 4, reducing at all points towards the joint bays, with the lowest reading at the far side of the joint bay.

'Joint bay (JB) to cut and test'.
Two readings shall be taken here, one to rear of JB and one to front. These readings need to be lower or equal to the lowest reading outside of the JB area.

Indicating the barholes

APPENDIX D

SUPERSEDED DOCUMENTATION

This document supersedes ST:OS4A/1 dated August 2014 which should now be withdrawn.

APPENDIX E

ASSOCIATED DOCUMENTATION

ST:OS6E - Work on Privately owned High Voltage Networks
ST:HS14B - Excavating and Shoring - HSE Guidance Note HS(G)47
ST:OS8H - Operation, Use and Maintenance of the Acvoke Cable Spiking Gun

APPENDIX F

KEY WORDS

Location, Identification, Proving Dead, Excavation, Safe Access, Spiking, Electrical Injection, Acvoke, Private Networks, Sheath.