

Identification of LV Cables

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Revision Record

Issue	Date	Review by	Prepared by	Details
3.0	Dec 2009	Dec 2010	Don Challis	Reviewed without change to concept but clarification of detail
3.1	21/12/09	Dec 2010	Don Challis	Revise 8.10 - Elimination of HV Cables
3.2	21/4/10	Dec 2010	Nicola Saunders	Number changed from HSS 40 002 to DSR 01 018. No other changes.
3.3	01/11/10	31/12/10	J Arnold	Document Rebranded
4.0	19/05/11	09/05/14	Don Challis	Reviewed with changes, especially to Sections 8.8 & 8.13, after incidents where the single cable on plan method was inadequate.

1.0 Introduction and purpose

There is a significant risk of opening a high voltage cable in error during low voltage jointing work. As any high voltage cable is likely to be live there is a high risk of injury from electric shock or burns.

Cable manufacturers have used the same construction for both LV and HV cables and the voltage of a cable cannot be identified from the type of armour.

Cable records are often unclear or inaccurate.

This procedure describes how to positively identify low voltage cables before they are opened. This positive identification will significantly reduce the probability of opening a live HV cable.

It does not attempt to reduce the severity of any injuries that may happen if a live HV cable is opened. Jointers are expected to open cables with care and to follow the jointing procedures, including using appropriate PPE.

2.0 Scope

- The procedure applies to any person working on any network owned or operated by UK Power Networks.
- The procedure applies to all work where it is intended to remove the cable sheath and expose the insulation on a low voltage cable that has not been proved dead at the point of work.
- Excavation around all cables and additional precautions when working near defective cables is covered in DSR 01 014.

3.0 Objective

To reduce the probability of opening live HV cables.

4.0 References

National Distribution Safety Rules

Cable Jointing Manual

DSR 01 014 Excavating near electricity cables

COP 00 005 Putting People to Work within Network Operations

HSS 40 045 Basic Requirements for Live working on LV Apparatus

GTRA JLV-03 LV Jointing (including cable identification, stripping and preparation)

5.0 Definitions

Positive identification

Identification using one or more of the methods detailed in this procedure.

Exposed cable

For the purposes of this procedure a cable is exposed when any identification instrument can be moved around the whole circumference of the cable being tested and along the cable a sufficient distance to detect the lay of the cores.

Cable Identification marker tape

A sticky back silver foil tape that wraps around the cable and is then stuck together at the ends. It states on the tape that "This cable has been identified as an LV cable". If the two ends are peeled apart, the word "Void" appears on the surface of the tape.

Approved signal device

A device that will inject a signal into a live LV cable and is suitable for cable identification.

6.0 Responsibilities

Work issuer

The person who issues the work has the responsibility to ensure that all relevant plans and information are given to the person in charge of the work on site. This must include checking for EHV and other cables and arranging for plans of these cables to be provided.

Person in charge of work on site

This person has the responsibility to ensure that the cable is positively identified before the insulation is exposed

7.0 Records

A record of the method of identification used shall be kept in the job file.

8.0 Process detail

8.1 For planned work LV cable identification shall start at the design stage.

Designers must produce details of how an LV cable is going to be identified in line with one of the four approved methods detailed in this procedure. This information must be passed to the delivery team.

8.2 Task Instructions, Cable Plans and Records

- Anybody carrying out planned jointing work should have a written task instruction.
- Each task instruction shall:
 - State which approved method of LV cable identification is to be used
 - Include adequate plans to 1:500 scale, or of a similar level of detail. These plans should include all cables, irrespective of voltage, that are recorded to be in the work area, together with associated sections.
 - Include relevant LV schematic diagrams showing source supply points, open points and stop ends.
 - Include all other relevant information such as plans of any power cables that do not belong to UK Power Networks but are known to be in the work area.

8.3 Cable Avoidance Tools

- Cable Avoidance Tools (CATs) shall **not** be used to identify cables. They can only be used to locate cables in conjunction with cable plans and records.
- Operatives should always "sweep" the area of work with a CAT to confirm that all cables at the work location have been exposed in the joint hole. Where possible this sweep should extend at least 2 metres either side of the centre line of the joint hole.

This printed document is valid at 24/05/2011, check after this date for validity.

8.4 Cable Identification Methods

There are only four approved methods of identifying an LV cable. One or more of these methods shall be used to positively identify the cable before starting work on it:

- Positive electrical identification using an approved signal device (See 8.5)
- 600V/1000V Plastic embossed outer sheath of a cable (See 8.6)
- Locating a service joint on the required LV mains cable (See 8.7)
- Single cable in the vicinity (See 8.8)

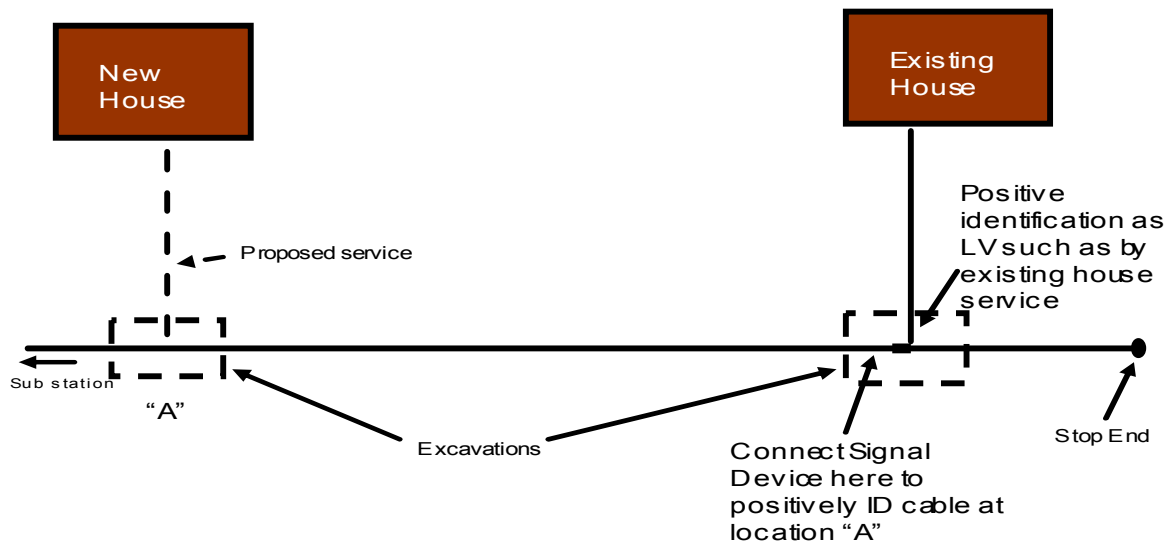
8.5 Positive electrical Identification using an approved signal device

- The signal transmitter should be connected between two phases of the cable to be tested. This is to avoid signals in the neutral and earth that could transfer to the sheath or armour of adjacent HV cables.
- If there is more than one cable in the vicinity then all cables must be exposed in the joint hole. The signal detection/listening device should be applied to each cable in turn. A number of errors have occurred when it is thought that there is a good signal but it is subsequently found that there is a stronger signal in another cable.
- The cable detector should be moved along each cable to detect the lay of the cores. There is a risk of error if the detector is only moved around the cable under test. A rise and fall may be detected which is actually due to the change in the distance from a nearby cable.
- When the correct cable has been identified the cable should be marked using cable identification marker tape, which may be signed and dated. All other cables should be checked to ensure no old markers are present.
- When using a Grumbler it may be necessary to remove steel tape armour where the armour shields the signal from the detector. Careful removal of the tape armours is permitted.

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If the LV cable to be worked upon finishes at a stop end there may not be a suitable point to connect the transmitter beyond the point where it is hoped to confirm identification. If there is no suitable link box or three phase cut-out then the transmitter can be connected by opening the same LV cable at a convenient point beyond the work location. This point must have been proven to be on an LV cable by one of the other approved identification methods.

The identified LV cable should be opened using approved practices. The crocodile clips on the ends of the signalling device leads can then be applied to two phase conductors. Two cores must not be exposed at the same time and as soon as one crocodile clip is connected to the conductor, it must be insulated using a joint connector insulating patch.



8.6 600/1000V Plastic embossed outer sheath of a cable

If an LV cable has a black plastic embossed outer sheath which has the embossing 600/1000V clearly visible on the sheath, this can be used as positive identification. Care must be taken to ensure that the embossing states 600/1000V as EHV cables can have black plastic embossed outer sheaths.

When the required cable has been positively identified by this method it is not necessary to expose other cables for identification.

8.7 Digging back and locating a service joint on the LV mains cable

If a signal device or embossed markings cannot be used for identification, the LV cable to be worked upon must be exposed along its length until a service joint is exposed. To be positively identified as a service joint the service cable exiting the joint shall be exposed and clearly seen as going from the joint to either a house boundary or to street furniture.

Careful examination of the cable plans must also be undertaken to ensure that no small section HV cables are present in the area.

Exposure of an LV plastic joint mould is not positive identification because LV joint moulds have been used to repair HV cable sheaths.

The cable between the identified service joint and the point of work must be fully exposed such that a running noose may be pulled between the two points.

Excavation for cable identification can stop when the required cable has been positively identified by this method.

If there is any doubt whether the found joint is an LV joint then seek advice.

8.8 Single cable in the vicinity

This method shall only be used where there can be no doubt that the exposed cable is actually a low voltage cable.

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One example is a rural area where the high voltage system is completely overhead and it is known that the only underground cables are low voltage. Another example would be a housing estate with only low voltage cables and where any HV cables are known to be well away from and in a different road to the proposed work.

Due to the possibility of errors in plans it shall not apply where a high voltage cable is shown to be running down the other side of the road to the proposed LV opening.

It is important that full plans are available as it would be misleading if LV only plans are provided.

A cable may be positively identified as a LV cable if all of the following apply:

- Complete cable plans and sections only show one cable in the vicinity
- the plans clearly show this to be an LV cable
- there are no other cables exposed in the excavation
- a thorough “CAT sweep” of the work area has revealed no other cables
- the excavated cable is in the position and depth indicated on the plan

When using this method of LV cable identification, plans showing the source substation HV cable routes must be available on site. Relevant plans of EHV cables and of any other power cables including, where known, those not belonging to UK Power Networks must also be made available to the operative.

If any other cables not on the plans are exposed, or the plans show an abandoned cable, one of the other methods of identification must be adopted.

8.9 Escalation Process

If any person is unable to positively identify an LV cable, for whatever reason, the operative must stop work immediately and contact a suitably qualified, competent and experienced person to confirm positive identification.

8.10 Elimination of HV cables

If none of the approved methods above can be used to positively identify the LV cable, all adjacent HV cables must be switched out and positively identified to eliminate them. Because of the risk of unrecorded cables, or cables not owned by UK Power Networks, this does not positively identify any remaining cables as being LV. However in some circumstances it may be considered an appropriate method of reducing the risk of opening an HV cable.

8.11 Spiking LV Cables

If none of the above options are able to be applied, and a cable cannot be positively identified as LV, the only option left is for all of the cables to be de-energised and to spike the cable to be worked on. Control must be informed immediately before and after the cable is spiked.

8.12 Precautions When Stripping Cable (Indicators)

Having positively identified an LV cable there are other indications that may give a degree of confidence or alarm. It is recommended that even though the cable will have

been positively identified a jointer should always look for the following indicators during the cable stripping process:

- Underneath the outer Hessian or lead sheath there is sometimes a marker ribbon that states whether the cable is LV or HV. This is not present on all cables.
- Having removed the lead sheath, the jointer should always check the amount of layers of belt papers that are removed. LV cables normally have between 7 and 10 layers, HV have 20 to 30 layers.
- Having removed the belt papers, count the number of cores. Are you expecting 3 cores? Are there 3 core LV cables or 4 or 5 core HV cables in the area?
- The above are only indications and are not to be used as positive identification. If you find that a cable has an indicator that is something you are not expecting, stop work and seek advise/further clarification.

8.13 Process Flow Chart

