Cable Jointing Manual

Jointing Procedures

Module 18

Concentric Cables

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Revision Log

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Changes made	New Combined Module. Replaces Cable Jointing Instructions and Procedures in Central Networks West Underground Cable Jointing Manual:- CJI 11.40; CJI 11.41; CJP390; CJP391; CJP392; CJP393; CJP530.	

CONTENTS

1. Cable Descriptions and Terminology

Concentric cables come in several forms; these descriptions are to provide a Company wide standard. The annotations found on Company drawings may not reflect these descriptions as local terminology may vary.

Single Concentric – Single phase core with a concentric neutral made up of either copper strands or tapes

Twin Concentric – Two phase core conductors with a concentric neutral made up of either copper strands or tapes.

Three Phase Concentric – Three phase core conductors with a concentric neutral made up of either copper strands or tapes (not to be confused with triple concentric, HV Calendar-Waters cable or HV cables with Board of Trade tapes).

Triple Concentric – One central phase core, one concentric phase and a concentric neutral. The concentric layers are made up of either copper strands or tapes (Two phase cable)

HV Board of Trade – Bare copper tapes directly below the lead sheath

HV Calendar-Waters – Belt papers under the lead sheath below which are copper tapes that are **individually insulated** from each other using papers or cotton fabric tape.

2. General

- Twin / Single Phase Concentric – When cutting a Single Phase Concentric core always check by removing papers that the cable is single phase. Some Twin Concentric cables have phase conductors that are semicircular and held together with belt papers – these look identical to single phase core insulation and if cut together will result in a phase to phase short circuit.

- Always use live working techniques and PPE - even if the cable is isolated.

- If you are unsure stop and get assistance from your supervisor.

3. Removing the Armours, Lead Sheath, Belt Papers and Opening Concentric Neutrals

Remove armours and bedding, fit earth bond and remove the lead sheath in accordance with Module 1and 2). Wearing insulated gloves remove the belt paper one at a time until the concentric wires / tapes are exposed. Test these conductors to ensure that they are not live. **If the concentric wires / tapes are found to be live go to paragraph 8.** Lay the braid over the wires / tapes and secure in position with roll springs as shown in the photo. Twist the spring to tighten using hand pressure	 
Lift the wires / tapes using a small cable wedge and cut strand at a time using side cutters. Do not damage the underlying belt papers. Form the wires / tapes into a conductor and apply a tape binder to terminate the next layer of belt papers against.	
Connect the neutral / earth of the service cable and the wires / tapes of the main into the extended connector. Make the earth connections onto the lead sheath in accordance with Module 6 and bond the lead sheath to the service slides of the connector using 50mm earth wire. Remove the temporary neutral bond and braid.	

4. Isolation

At this point if it is known that the cable been worked on is Triple Concentric it must be isolated. Single, Twin and Three Phase Concentric can be jointed live.

5. Removing the Inner Belt Papers

As there is often confusion with the terminology on our network drawings there is always a possibility that Triple Concentric may be incorrectly labelled as Single, Twin or Three Phase Concentric, for this reason the following method must be used to remove the inner layers of belt papers

1. Fully shroud **all** exposed neutral, earths and lead sheaths
2. Using a plastic hack knife scrape and unwrap one layer of paper at a time until the belts are removed.
3. If copper wires / tapes start to become visible **stop and isolate** the cable.

6. Connecting onto the Phases of Single, Twin and Three Phase Concentric

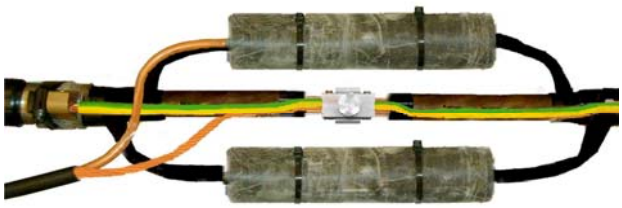
Once the core insulation has been exposed the cable can be jointed as standard PILC cable, using mechanical connectors (Module 6)

7. Connecting onto the Phases of Triple Concentric – When the outer concentric layer is the Neutral

Having tested to prove that the concentric phase is not live the wires / tapes can be lifted with a small wedge and cut using side cutters. No damage should be done to the core insulation below. The strands are then formed into a core, insulated with 6 layers of non-adhesive tape and jointed back together using an extended connector. The phase of the service is then connected via the service slide.	
Apply an insulation wrap over the phase connector and secure using cable ties. The cable can now be re-energised and the cut-out tested (Module 12). Once tested the outer joint box can be fitted (Module 8)	

8. Connecting onto Triple Concentric – When the outer concentric layers are Phase conductors

When it is discovered that the outer concentric layer is live the cable **must** be isolated and all exposed earth conductor must then be shrouded. The concentric phase can be lifted with a wedge, cut with side cutters, formed into a core and be insulated with 6 layers of non adhesive tape. End caps must then be fitted. The next layer of wires / tapes can then be exposed and formed in a similar way. With the concentric conductors fully shrouded and fitted with end caps, the centre core can be exposed. The cable can now be re-energised and tested to identify the neutral conductor.	
Once the neutral has been identified the cable must be isolated before any connections are made. The neutral connection is then made (module 6) and bonded to the lead sheath. All neutral earth metalwork must be re-shrouded before any of the phases are exposed. The phase connections can then be made using extended connectors and service slides. Once made and insulated with wraps the temporary shrouding can be removed from the neutral / earth.	

Before fitting the outer box (Module 8) the cable must be re-energised to allow the cut-out to be tested (Module 12)	
Where the inner concentric layer is identified as the neutral the connections can be made in a similar way as Paragraph 7, however all jointing must be carried out under isolation with the cable treated as live.	