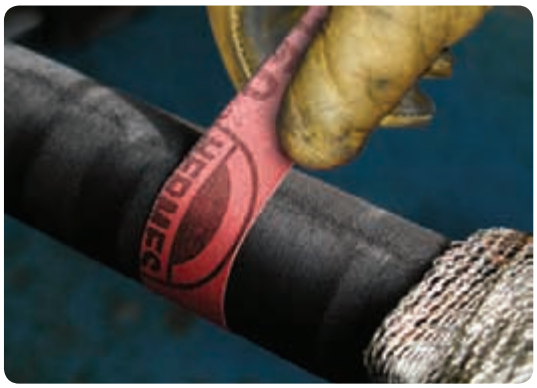
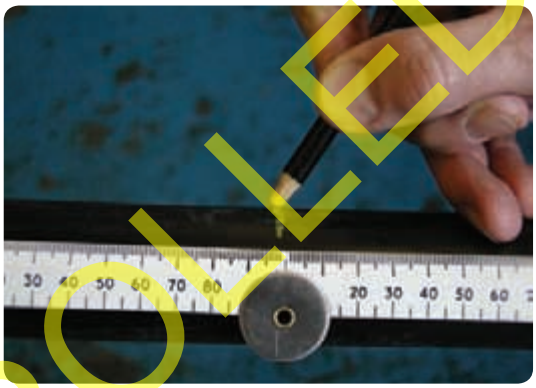
3 STANDARD PROCEDURES FOR PREPARING 33KV CABLES

3.1 Single-Core Copper Wire Screened Polymeric Cables

3.1.1 Removing the Outer Sheath

- Clean and abrade the outer sheath with an approved abrasive paper for 150mm beyond the sheath removal point. Mark the removal point of the outer sheath as indicated on the relevant jointing instruction using a Chinagraph pencil.
- For cables with semi-conducting outer sheaths, either graphite or an extruded layer, extra care should be taken to ensure that all traces of conductive material are removed.





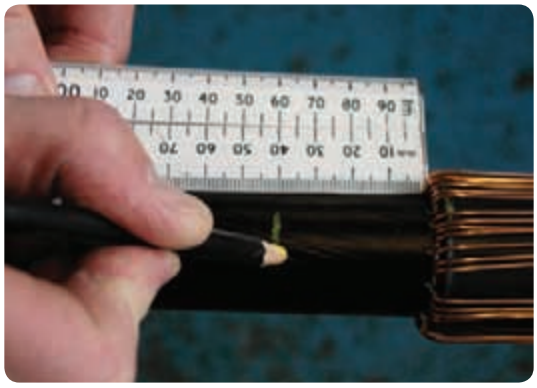
- Use an approved tool to remove the sheath. check the tool cutting wheel is set to the correct depth to avoid damaging the copper wire screens below.
- Starting at the removal point make a circular cut around the cable. Cut along the cable to the position of the sheath removal point, and remove the sheath.

- Remove the fabric or plastic tape wrap from the screen wire using an approved knife, taking care not to damage the copper wires below.

- Unwind the copper wires and lay them back along the over sheath in the position required by the joint being made and secure with PVC tape. If preparing for a termination a length of red mastic sealing tape should be applied to the outer sheath following the appropriate instruction.

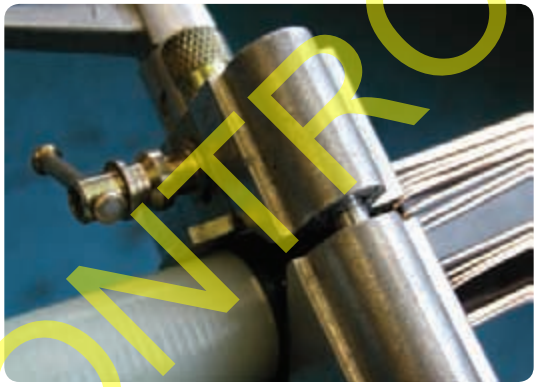
3.1.2 Removing the Bonded Polymeric Screen

- The approved bonded screen stripping tool can be used to leave various lengths of black insulation screen from the outer sheath cut. This measurement varies depending upon the type of joint:
- Single-Core straight joints = 40mm.
- Single-Core branch joints = 80mm.
- Trifurcating joints = 100mm.
- Pot ends = 80mm.
- Single-Core terminations = 40mm.



- Smear a thin coating of Silicone grease over the conducting screen layer. Starting at the open end of the cable, set the tool to the correct cutting depth so that the entire screen is removed with only the minimum amount of insulation. It is essential that the core is as straight as possible for this operation otherwise traces of the screen may be left behind.

- Continue turning the tool until it butts up against the stop position (dependant on the screen termination point) and continue to turn the tool until a smooth right angled taper is produced. Test the tool firstly on the overlap section of the core if required.

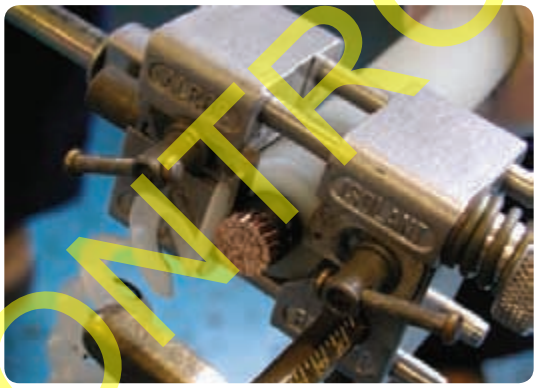


- The insulation now requires polishing smooth with an appropriate aluminium oxide grit paper (minimum 150 grade) until smooth and free of ridges. To finish this process, reverse the paper and 'buff up' with the smooth side.

- Clean and degrease the insulation with an approved solvent wipe to remove all traces of any remaining loose material. Always wipe from the open core end towards the screen wires to avoid contaminating the insulation with carbon from the remaining screen.

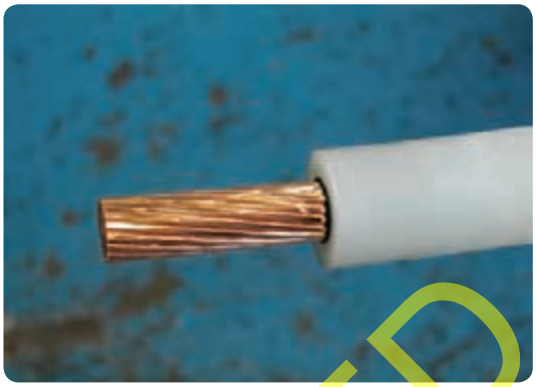
3.1.3 Removing the Polymeric Insulation

- Use the approved Alroc tool and set the 'stop gauge' to the connector insertion depth.
- Position the tool at the open core end and adjust the blade to the required depth; just deep enough so the blade does not damage the conductor.



- Rotate the tool along the core using the spiral cut setting until the stop gauge prevents it from moving any further.

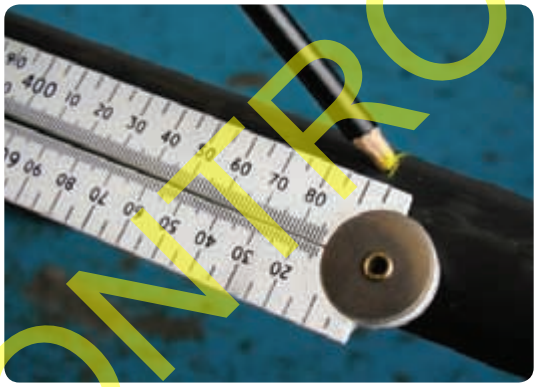
- Remove the tool and the insulation spiral. Carefully remove the remaining conductor screen using an approved knife.



3.2 Single-Core Lead Covered Cables

3.2.1 Removing the Outer Serving or Sheath

- Mark the position of the serving or sheath termination as indicated on the relevant jointing instruction.



- Make a circular cut at this mark using an appropriate approved tool. Check that the cut is only three quarters through the sheath thickness.

- Now make a lengthwise cut along the sheath towards the sheath cut position taking care not to damage the underlying lead sheath.

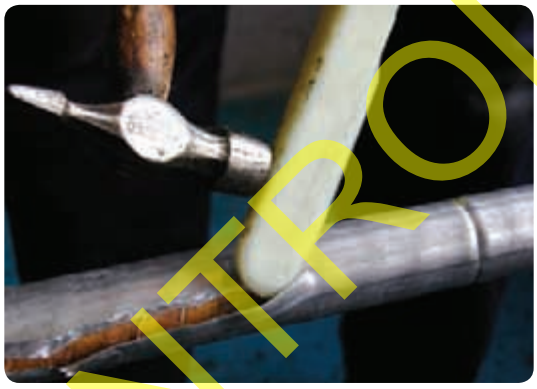
- Lift the edge of the sheath and unwrap along its length, tearing off at the circular cut point. The use of a gas torch may assist this operation if necessary.

3.2.2 Removing the Lead Sheath

- Clean and degrease the lead sheath using the approved solvent wipes. Mark the lead sheath at the removal point as indicated on the relevant jointing instruction using a Chinagraph pencil.

- Use an approved hack knife to make an indented circular cut around the lead sheath, taking care to only cut part way through the sheath.

- Cut the lead sheath across from the open cable end to the circular cut. Use an appropriate approved hack knife. Take care not to damage the Copper Woven tape below.



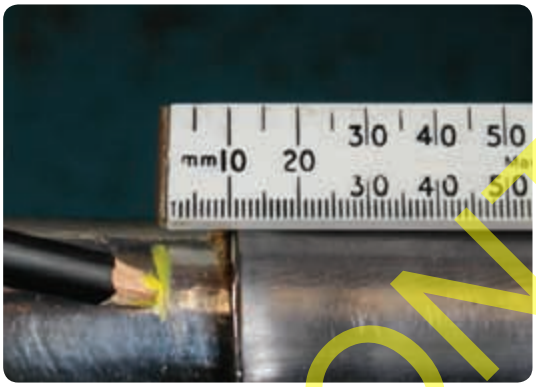
- Open the lead sheath up along the length of the cut and carefully unwrap the lead sheath against the ring cut.

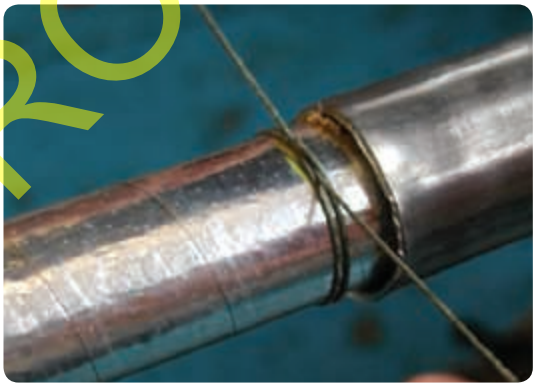
3.2.3 Removing the Copper Woven Tape (CWT)

- Unwind the CWT and carefully remove it by cutting it against the lead sheath edge with an approved knife to leave a smooth finish.

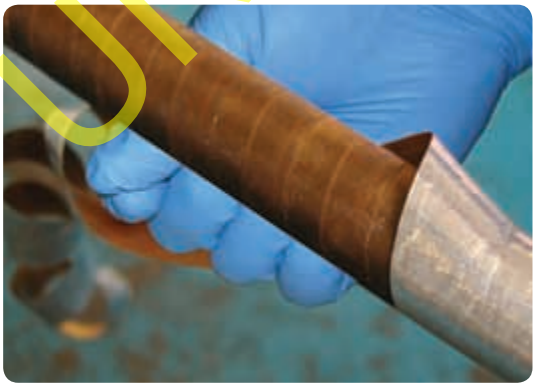
3.2.4 Removing the Insulation Screen

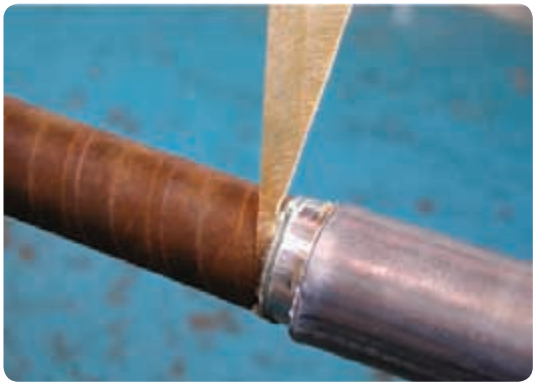
- Mark the screen papers with a Chinagraph pencil at the removal point indicated in the relevant jointing instruction. Tie a twine binder around the screen at this point.





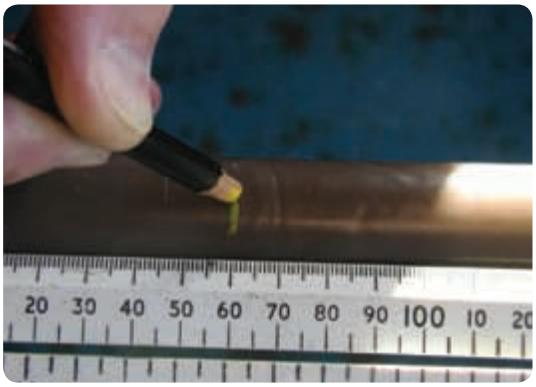
- Unwrap the screen carefully to the termination point and remove it by neatly tearing against the twine binder. Remove any carbon paper below the screen to the same termination position, followed by two of the insulation papers.





3.2.5 Removing the Insulation Papers

- Only remove the papers after fitting the barrier tubing as described in section 4.1.1. Mark the insulation papers at the point of removal as indicated in the appropriate jointing instruction. Using an approved sharp knife, cut around the core through the papers and clear barrier tube taking care not to damage the conductor below.



- Remove the clear barrier tube by pulling towards the end with a gentle twisting movement.
- Unwrap the papers up to the cut position and tear off neatly against the barrier tube edge.

- Clean any surplus compound from the cable conductor with an approved solvent wipe.

3.3 Three-Core Paper Insulated Cables

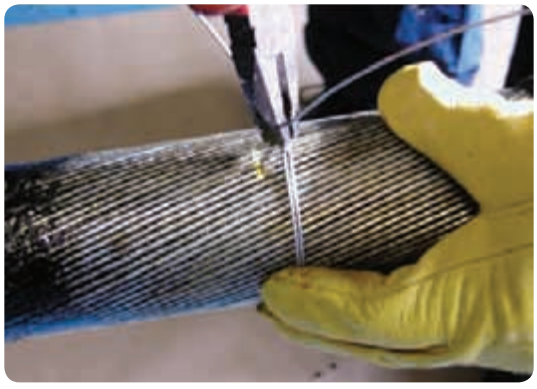
3.3.1 Removing the Outer Hessian Serving or (PE) Sheath

- Mark the position of the serving or sheath termination as indicated on the relevant jointing instruction.
- Wear suitable gloves while removing the serving. Place a wire binder around the serving at the removal point and score in front of the binder using an approved knife.

- Remove the serving with the approved knife and heat from a gas torch if required or in the case of a polyethylene sheath use the approved tool for this operation.

3.3.2 Removing the Steel Wire Armour

- Place a wire binder around the armour wires at the point of removal as indicated in the relevant jointing instruction.



- Using an approved saw, make a circular cut around the armours at the binder position. Cut through only half the width of the armour to avoid damaging the lead sheath below.

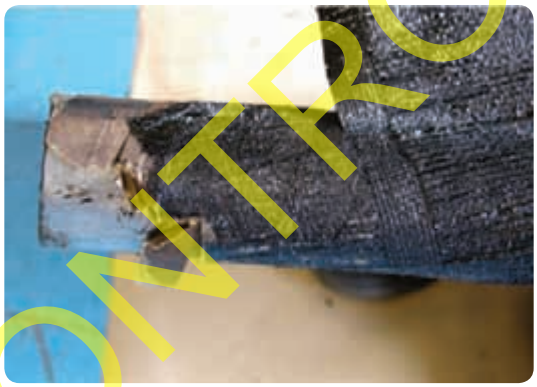
- Wear suitable gloves while removing the armour. Lift and unwrap the armour wires a few at a time and break them off against the binder by bending them backwards and forwards.

- Remove the binder and lift the armours with a hack knife so they are 90° to the cable. Clean off all traces of bitumen from the wires using a gas torch and approved solvent wipes.

3.3.3 Removing the Inner Bitumen Layer

- Wear suitable gloves for this operation. Score around the inner bedding layers with an approved knife adjacent to the vertical armours taking great care not to score into the underlying lead sheath.

- At the open cable end lift the bitumen impregnated textile layer with a knife and unwrap it back to the vertical armour position, tearing it against the score previously made. The use of a gas torch may assist this process.

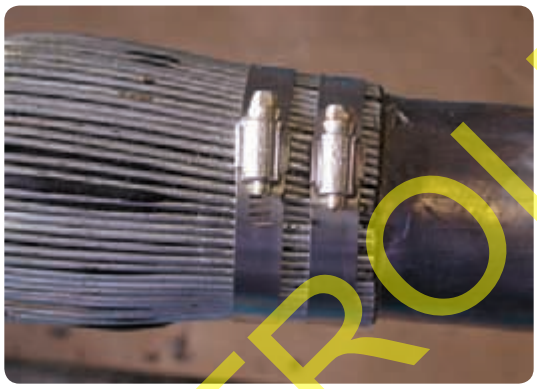


- Apply more heat to the final layer of bitumen on the lead sheath and armours and wipe off any remaining traces of bitumen with approved solvent wipes. The lead sheath and armours should be clean and bright after this process.

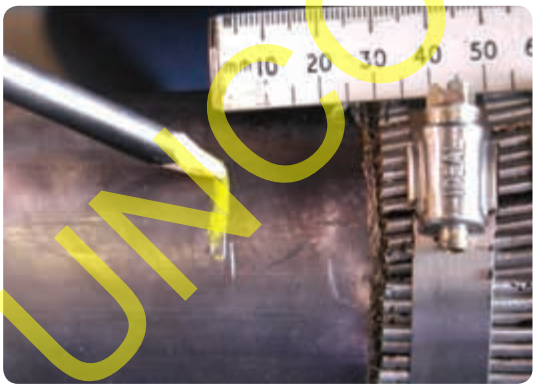
- Apply two wraps of black mastic sealant around the lead sheath butting up against the raised armours.

- Make a mark with a Chinagraph pencil 130mm from the end of the outer sheath. Wrap a length of copper mesh around the lead sheath up to the 130mm mark.

- Lay the armours down over the mastic, ensuring that none are crossed, and secure the armours over the copper mesh area with the two worm drive clips provided.



- Apply a layer of PVC tape to the worm drive clips to cover any sharp edges. Position the armour sealing sleeve 30mm beyond the armour edge and shrink down starting at the lead sheath end before proceeding towards the cable over-sheath.



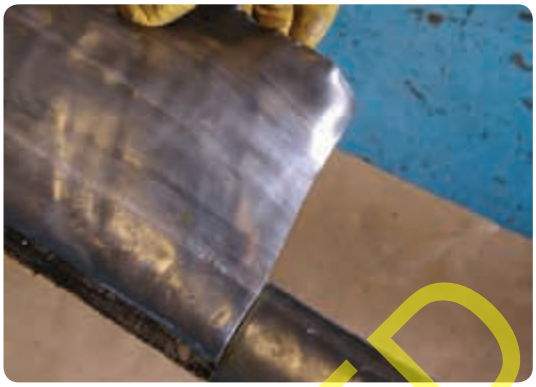
3.3.4 Removing the Lead Sheath

- Clean and degrease the lead sheath using approved solvent wipes. Use a Chinagraph pencil to mark the lead sheath 430mm from the outer sheath as indicated on the relevant jointing instruction.

- Wear suitable gloves for this operation. Use an approved hackknife to make a circular indented ring cut around the lead sheath at the pencil mark, taking care to only cut part way through the sheath.

- From the open cable end, cut the lead sheath longitudinally to the circular cut using the appropriate approved hack knife. Take care not to damage the Copper Woven Tape (CWT) below.

- Open the lead sheath up along the length of the cut and carefully unwrap the lead sheath against the ring cut.



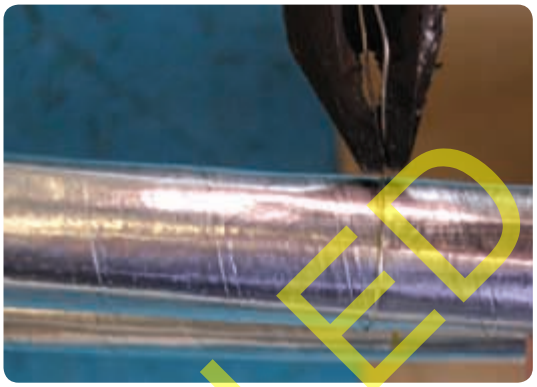
3.3.5 Removing the Copper Woven Tapes (CWT)

- Unwind the CWT and remove the core fillers carefully with the side cutters.

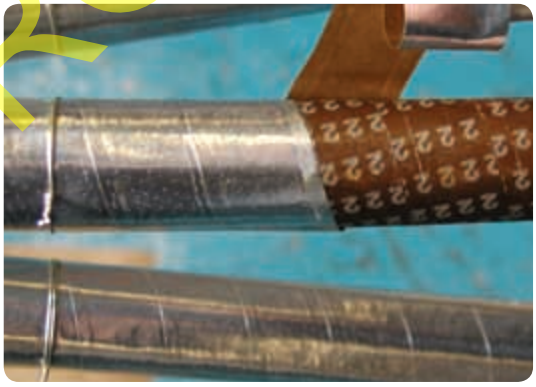
- Rewind the CWT tightly around the cable cores at the crutch position for a distance of 20mm from the lead sheath, then cut and tie off. Remove any surplus tape with insulated side cutters.

3.3.6 Removing the Insulation Screen

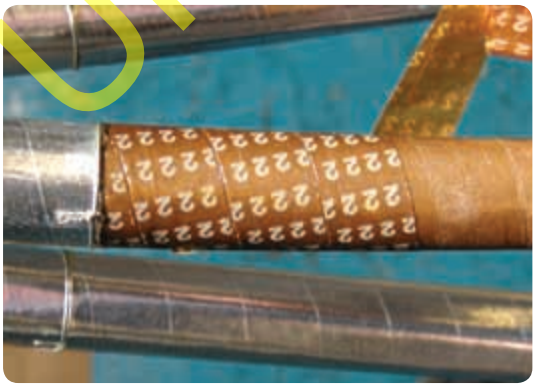
- Using an approved solvent wipe, remove any surplus cable compound from the screened core insulation.
- Mark the screen papers at the removal point indicated in the relevant jointing instruction. Tie a fine wire binder around the screens at this point.



- Carefully unwrap the first 50mm of the screen. Secure the end of the core insulation papers with numbered phase tape matching the numeral paper. Unwind the remainder of the screen to the termination point and remove it by neatly tearing against the applied binder.



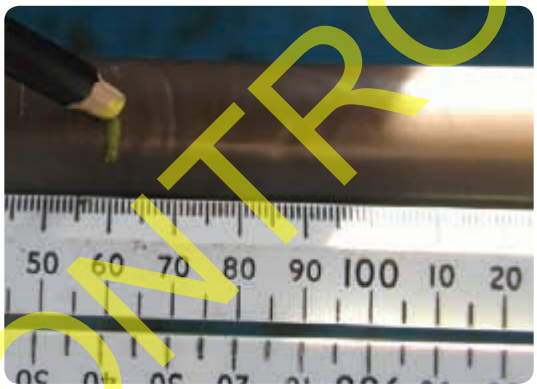
- Remove the numeral paper and one layer of paper below to the same point as the screen papers, using the same method and marking the cores with the matching numbered phase tape.



⚠ **Note:** It is important to mark the cores with the correct phase numbers immediately after each numeral paper is removed.

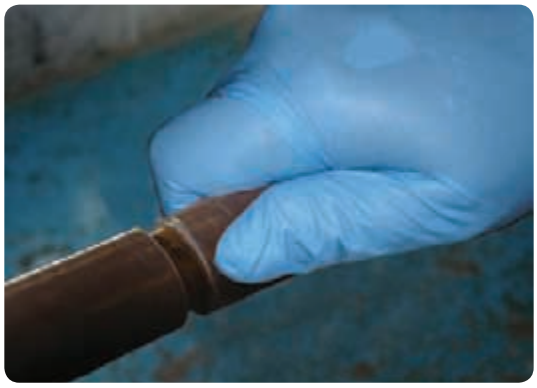
3.3.7 Removing the Insulation Papers

- Only remove the papers after fitting the clear barrier tubes described in section 4.1.3.
- Mark the clear barrier tube over the core papers at the point of removal as indicated in the appropriate jointing instruction.



- Using a sharp knife cut around the core and through the papers taking care not to damage the conductor below.

- Remove the clear barrier tube by pulling towards the end with a gentle twisting movement.



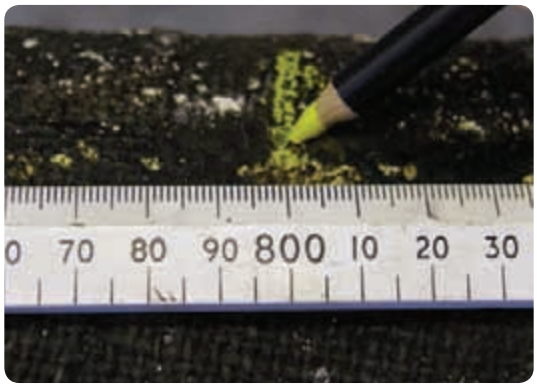
- Rounding of the conductor with water pump or similar pliers will assist this operation and will help prepare the conductor for insertion into the appropriate connector.
- Unwrap the papers to the cut position and tear off against the clear barrier tube edge.

- Clean any surplus compound from the cable conductor with an approved solvent wipe.

3.4 Three-Core HSL Paper Insulated Cables

3.4.1 Removing the Outer Serving or Sheath

- Mark the position of the serving or sheath termination as indicated on the relevant jointing instruction.



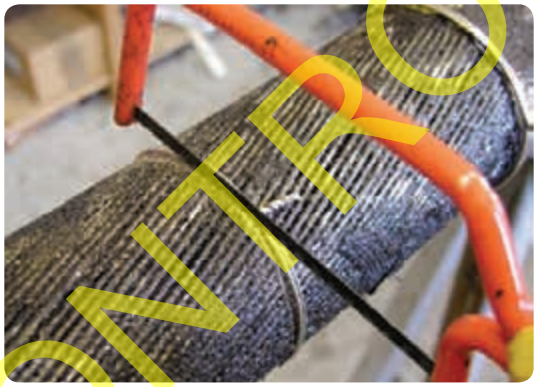
- Wear suitable gloves while removing the serving. Place a wire binder around the serving at the removal point and score in front of the binder using an approved knife.

- Remove the serving with the approved knife and heat from a gas torch if required.

3.4.2 Removing the Steel Wire Armour

- Place a wire binder around the armour wires at the point of removal as indicated in the relevant jointing instruction.

- Using an approved depth guarded or junior saw make a circular cut around the armours at the binder position. Cut through only half the width of the armour to avoid damaging the lead sheaths below.



- Wear suitable gloves while removing the armour. Lift and unwrap the armour wires a few at a time and break them off against the binder by bending them backwards and forwards.

- At the open cable end lift the bitumen impregnated layer with a knife and unwrap it back to the armour cut position. Remove it at this point, taking care not to damage the underlying lead sheaths.

- Remove the binder and lift the armours with an approved hack knife so they are 90° to the cable. Clean off all traces of bitumen from the wires using a gas torch and approved solvent wipes.

3.4.3 Removing the Bitumen Layer

- Open out the three lead sheaths carefully and remove the bitumen/paper layer and fillers from all three sheaths up to the point where the under armour bedding remains.

- Apply more heat to the final layer of bitumen on the lead sheaths and wipe off all traces of bitumen with the approved solvent wipes.

- The lead sheaths should be free from bitumen on completion of this task.

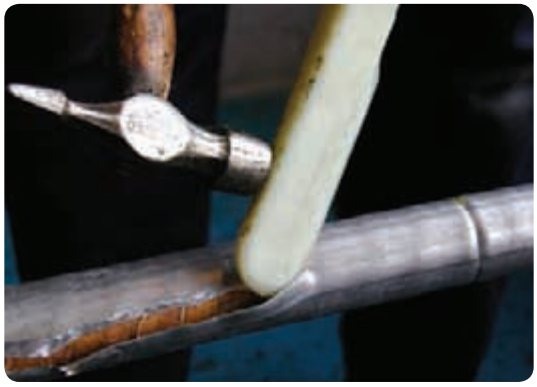
- Build up the remaining inner bedding using the black mastic from the Three-Core transition joint and the HSL module to suit the support ring's inner diameter. Fit the support ring over the build up tape, positioning it 60mm from the uplifted armours.

- Wrap the length of supplied black mastic behind the support ring, butting it against the armours wires. Lay the armours down onto the ring and secure them with a wire binder.

3.4.4 Removing the Lead Sheaths

- Only remove the lead sheaths after firstly following the necessary steps described in section 4.1.5. (HSL module application).
- Clean and degrease the lead sheaths using approved solvent wipes. Use a Chinagraph pencil to mark the lead sheaths at the removal point as indicated on the relevant jointing instruction.
- Use an approved hack knife, make a circular indented ring cut around the lead sheath at the pencil mark, taking care to only cut part way through the sheath.

- Cut the lead sheath across from the open cable end to the circular cut. Use an appropriate approved hack knife. Take care not to damage the Copper Woven tape below.



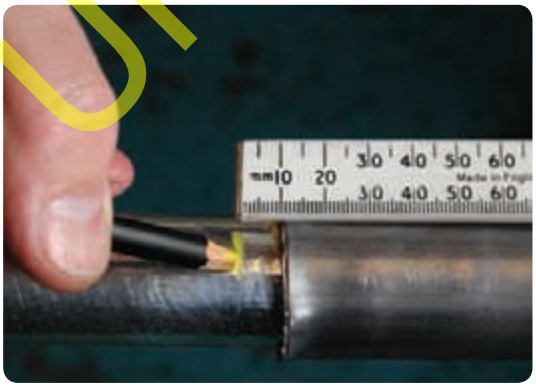
- Open the lead sheath up along the length of the cut and carefully unwrap the lead sheath against the ring cut.

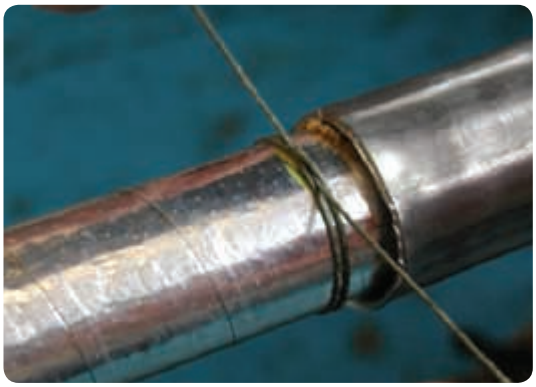
3.4.5 Removing the Copper Woven Tape (CWT)

- Unwind the CWT and carefully remove it by cutting it against the lead sheath edge with an approved knife to leave a smooth finish.

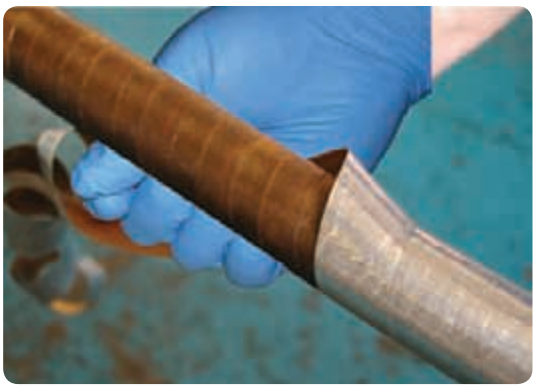
3.4.6 Removing the Insulation Screen

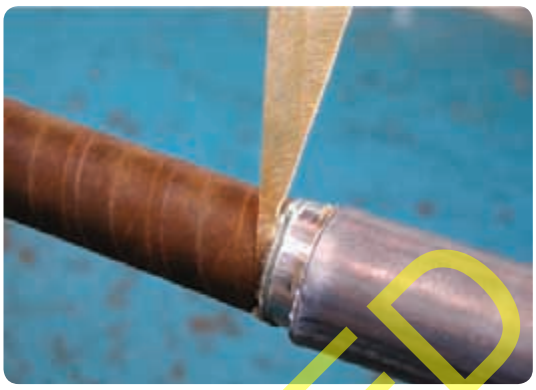
- Mark the screen papers with a Chinagraph pencil at the removal point indicated in the relevant jointing instruction. Tie a twine binder around the screen at this point.





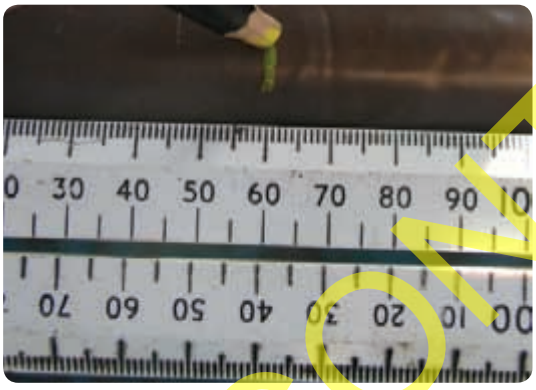
- Unwrap the screen carefully to the termination point and remove it by neatly tearing against the twine binder. Remove any carbon paper below the screen to the same termination position, followed by two of the insulation papers.





3.4.7 Removing the Insulation Papers

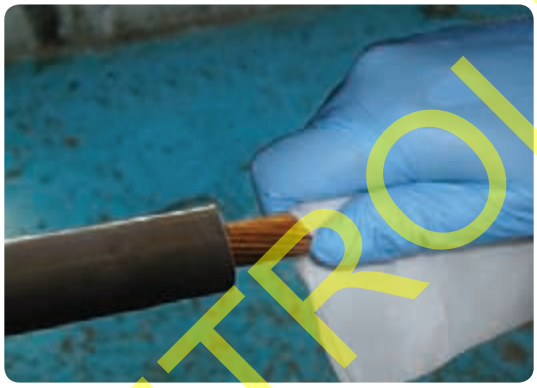
- Only remove the papers after fitting the barrier tubing as described in section 3.1.2. Mark the insulation papers at the point of removal as indicated in the appropriate jointing instruction. Using an approved sharp knife, cut around the core through the papers and clear barrier tube taking care not to damage the conductor below.



- Remove the clear barrier tube by pulling towards the end with a gentle twisting movement.

- Unwrap the papers up to the cut position and tear off neatly against the barrier tube edge.

- Clean any surplus compound from the cable conductor with an approved wipe.

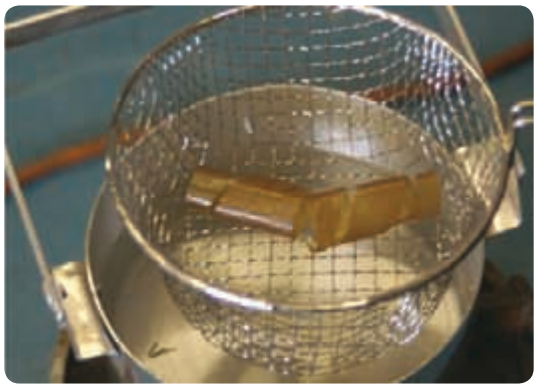


3.5 Moisture Testing on Paper Insulated Cables

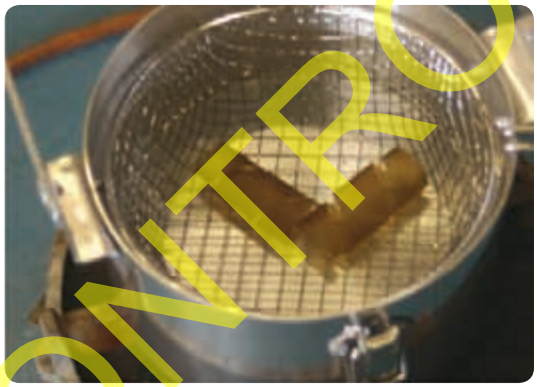
- Full personal protective equipment shall be worn at all times for this test.
- Gently heat the paraffin wax container on a low heat, insert the thermometer through one of the rubber grommets in the top and wait until the wax reaches a temperature of 125°C.

- Always handle the papers to be tested with gloves, as moisture from your hands is enough to give a positive test.
- Lift out the basket and place the paper tapes to be tested in it.

- The samples from the following layers shall be tested:
  - Inner and outer belt papers.
  - Paper or string fillers.
  - Inner and outer core papers.



- Immerse the basket complete with papers in the paraffin wax bath and note the results.
- If there is no reaction from the wax or it froths slightly, the papers are dry and the cable is fit to be jointed.



- If the wax froths excessively and a crackling noise is heard, the papers are wet and the cable should not be jointed.

- Remove the heat from container and leave to cool before moving.
- The wax can be re-used until it starts to discolour and there is no need to dispose of it after each moisture test.