

1. SCOPE

This section of the Live Working Manual details the procedures to be followed when **Live** changes of **Low Voltage** cut-outs are to be carried out and also the installation of a Temporary Service Loop. The removal of a Temporary Service Loop does not constitute **Live** working and therefore does not require a **Live** working authorisation, however for completeness, the steps for removal of a Temporary Service Loop are included within this document. The procedures apply the principles established by the ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition, in particular, PSSI 12 – Low Voltage Apparatus, to achieve **Safety from the System**.


2. ISSUE RECORD

This is a **Reference** document. The current version is held on the Energy Networks Intranet Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No	Author	Amendment Details
January 2003	3	C. Sherry	Addition Of Procedure WL1.52
November 2009	4	C. Sherry / J. Livie	Modified WL1.59 (inclusion of earth conductor)
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3. ISSUE AUTHORITY

Author	Owner	Issue Authority
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4. REVIEW

This is a **Reference** document which has a 5 year retention period after which a reminder will be issued to review and extend retention or archive. The proposed revision date can be found in the Live Working Manual Document Index, DOC-00-236.

5. DISTRIBUTION

This document is part of the Live Working Manual maintained by Document Control and has a maintained distribution list.

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7. RELATED DOCUMENTS

ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition
SMS-11-013 (Asbestos)
OPSAF-12-061 (LWM 2.6 – Low Voltage Mains / Service Continuity and Polarity Testing)
EART-01-002 (Low Voltage Earthing Policy)

8. DEFINITIONS

Terms printed in bold type are as defined in the ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition.

9. GENERAL

- 9.1 **Live** changes of **Low Voltage** cut-outs will only be permitted in accordance with procedures detailed in this document.
- 9.2 Installation of **Approved** Temporary Service Loops will only be permitted in accordance with the procedures detailed in this document.
- 9.3 All work shall be carried out using **Approved** insulated tools, insulated shrouding, test equipment, PPE, insulated rubber gloves and insulated mats where appropriate.
- 9.4 Before work commences, all metalwork in close proximity to the **Live** conductors to be worked upon shall be shrouded to prevent flashover. This may, dependent on the installation, include the cable and cut-out.
- 9.5 Ensure the work area is controlled before work commences and that any items that could fall on top of the cut-out, while it is being changed, are removed.
- 9.6 Unless otherwise instructed, ensure that any replacement cut-out maintains the existing earthing arrangements when completed (i.e. SNE/CNE/TT maintained).
- 9.7 Work on the following SHALL ALWAYS BE CARRIED OUT WITH THE CIRCUIT NOT **LIVE**.
- a) Rubber-insulated service cables.
 - b) Paper-insulated concentric service cables.
 - c) Glass-fronted metal-clad cut-outs.
 - d) Units in which the bare busbars connect fuse carriers together across the box. These include units containing multiple internal components which may fall loose during dismantlement.
 - e) Units with sweated lugs which have reduced clearances within the crutch chamber due to short core lengths.
 - f) Units showing signs of distress or interference to such an extent as to be a hazard.
 - g) Any unit for which the service cable is obviously damaged or deteriorated to such an extent as to be a hazard.
 - h) Any three-phase cut-out not made up of three separate single-phase fuse units.

10. SAFE WORKING WITH ASBESTOS

It is known that some types of metal-clad cut-out contain small amounts of asbestos. Further information is contained in SMS-11-013 (Asbestos).

11. APPROVED TEMPORARY SERVICE LOOP

A Temporary Service Loop is a length of single-phase cable (typical length 25m) and RCD designed specifically for the purpose of providing a temporary supply between cut-outs. Such a device is the Restore manufactured by Kelvatek and/or similar **Approved** device for the same purpose.

Temporary Service Loops may be installed to restore supply to a premise off supply without undue delay. The Temporary Service Loop shall not be connected into a cut-out containing asbestos.

12. PROCEDURES

The following table has been included to give guidance on which procedure is applicable for which set of circumstances.

	Sealing Chamber	Cable Type	WL - 1.50	WL - 1.51	WL - 1.52
Insulated Cut-Out	Compound Filled	Plastic	N/A	N/A	N/A
		PILC	No	Yes	No
	Non Compound Filled	Plastic	Yes	No	No
		PILC	No	Yes Only if crutch is sealed and held firm with compound and tape from a previous installation	No
Metal-Clad Cut-Out	Compound Filled	Plastic	N/A	N/A	N/A
		PILC	No	Yes	No
	Non Compound Filled	Plastic	N/A	N/A	N/A
		PILC	No	No	No
ISCO Metal-Clad Cut-Outs	Compound Filled	Plastic	N/A	N/A	N/A
		PILC	No	No	Yes

NOTE:

- Three phase cut-outs may only be changed **Live** if the phase units can be removed and re-terminated individually.
- Cut-outs terminating PILC cable may only be changed **Live** if a sealing chamber is fitted and filled with compound or the cores at the crutch of the cable are sealed and held firm by compound and tape from a previous installation.

12.1 Procedure WL-1.50 – Changing Insulated Cut-Outs on Plastic Cables



Example of insulated cut-out that can be changed using this procedure

Single and three-phase insulated cut-outs which are not filled with bitumen compound and are made off on plastic insulated service cables may be changed **Live** in accordance with the following procedure.

Step 1 Examine the cut-out and associated service equipment for any signs of distress. Where there is evidence of distress, carry out a risk assessment to determine if this procedure can still be carried out with the service **Live**. If in doubt, make the service cable not **Live** before proceeding with the cut-out change.

Step 2 If the work can proceed, confirm correct polarity at a convenient socket and switch off the customer's load.

Note: Before opening the cut-out, ensure that the appropriate PPE is used.

Step 3 Remove the fuse carrier(s) and/or link(s) from the phase and neutral units respectively.

Step 4 Test for correct polarity and, where appropriate, phase rotation at the incoming supply terminals as detailed in OPSAF-12-061 (LWM 2.6).

Step 5 Identify and mark the phases and neutral meter tails then remove from the cut-out and temporarily insulate the meter tails using **Approved** insulated end caps.

Note: If the meter tails are to be up-rated, replace and re-mark them one at a time.

Step 6 Remove or screen any earth connections or earth wires in the vicinity of the fuse units to prevent flashover.

Step 7 Work on only one core at a time. Screen cores not being worked on or leave the appropriate connection cover and empty fuse carrier in position to screen the conductors.

Step 8 Disconnect the first cable core from the cut-out and temporarily insulate.

Step 9 Repeat Steps 7 and 8 for the remaining cores.

Step 10 Remove the cut-out from the backboard.

Step 11 Install the new cut-out taking care to expose and connect only one core at a time. Immediately after a core is connected it shall be screened or the appropriate connection covers and fuse carrier fitted.

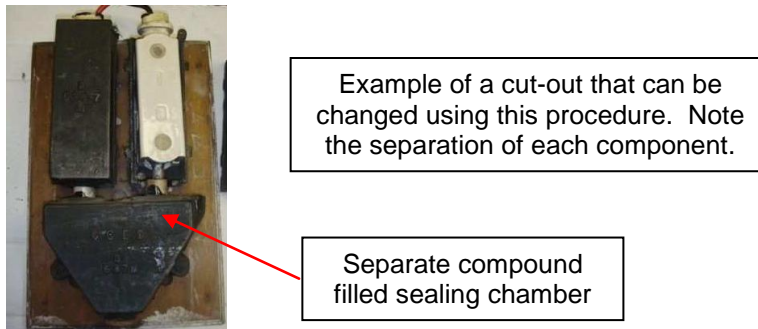
Step 12 Test for correct supply polarity, earth loop impedance and, where appropriate, correct phase rotation as detailed in OPSAF-12-061 (LWM 2.6).

Step 13 Ensure all earth connections removed in Step 6 are reconnected correctly.

Step 14 Reconnect customer meter tails and restore supply on completion of the work. Confirm correct polarity at the same socket as in Step 2 above.

12.2 Procedure WL-1.51 – Changing Cut-Outs on PILC Cable

Single and three-phase **LV** cut-outs on PILC cables may be changed under this procedure. In the case of metal-clad cut-outs the fuse units, neutral block and compound filled sealing chamber must be separate items.



All other metal-clad cut-out types shall be changed under WL-1.52 (ISCO style cut-outs) or changed not **Live**. See photograph in WL-1.52.

Some cut-outs contain asbestos and shall be handled and disposed of in accordance with the **Approved** procedure as detailed in SMS-11-013 (Asbestos).

Single and three-phase metal-clad or insulated cut-outs which are compound filled and/or are made off on PILC service cables shall be replaced with WT Henley series 5 cut-outs or other **Approved** reversible cut-outs.

Approved reversible cut-outs can be dismantled and the neutral and phase connector blocks can be swapped to suit the polarity of the PILC service cable. This ensures that the crutch of the PILC service cable is not disturbed or the cores crossed.

Note: It is important to continually assess the risks as work progresses. If an unacceptable risk arises (e.g. causing damage to the crutch of the cable as the cores are disconnected) then the cable shall be made not **Live** and proven not **Live** before removal.

Step 1 Examine the cut-out and associated service equipment for any signs of distress. Where there is evidence of distress, carry out a risk assessment to determine if this procedure can still be carried out with the service **Live**. If in doubt, make the service cable not **Live** before proceeding with the cut-out change.

Step 2 If the work can proceed, confirm correct polarity at a convenient socket and switch off the customer's load.

Note: Before opening the cut-out, ensure that the appropriate PPE is used.

Step 3 Remove the fuses and/or links from the phase and neutral units respectively.

Step 4 Test for correct polarity and, where appropriate, phase rotation at the incoming supply terminals as detailed in OPSAF-12-061 (LWM 2.6).

Step 5 Identify and mark the phases and neutral meter tails then remove from the cut-out and temporarily insulate the meter tails using **Approved** insulated end caps.

Note: If the meter tails are to be up-rated, replace and re-mark them one at a time.

Step 6 Remove any earth connections or earth wires in the vicinity of the fuse units and screen them to prevent flashover. For metal-clad cut-outs use a test lamp to test between phase and metal casing (no light) and metal casing and earth (no light), to ensure all earths have been removed and no voltage is present on the metal casing.

Note: If casing is still earthed, the phase connections need to be temporarily screened until any internal earth connections have been disconnected.

Step 7 Remove the cable crutch cover and identify and mark the phases, neutral and earth cores of the incoming supply cable.

Note: For metal-clad cut-outs:

This may be achieved by undoing all bolts or screws holding the front and back halves of the sealing chamber together and prising open using an **Approved** insulated Hepnyf or core separator. Remove excess compound from around the cores using an **Approved** Hepnyf or core separator, ensuring sufficient compound is left to form the crutch seal. The phases, neutral and earth cores of the incoming supply cable can now be identified and marked.

Step 8 Work on only one core at a time. Screen cores not being worked on or leave the appropriate connection cover and empty fuse carrier in position to screen the conductors.

Note: For plastic cut-outs containing PILC cables:

In the situation where a metal-clad cut-out has previously been changed for an insulated version leaving the PILC cable with compound between the cores and the cores and crutch taped up to form a seal, after risk assessment, if conductor separation can be controlled, the insulated cut-out can be lifted over the cores and the exposed conductors insulated immediately before control is released.

Step 9 Loosen the securing nut or screw on the first incoming cable core terminal.

Step 10 Unscrew the fuse unit or neutral block from the backboard.

Step 11 Carefully remove the units in turn from the cable cores and temporarily insulate using **Approved** insulated end caps.

Step 12 Tape up and set the cable crutch to receive the new cut-out.

Step 13 Assemble the new cut-out to suit the polarity of the service cable to minimise disturbance to the crutch and to ensure the cores will not be crossed.

Step 14 Working on one core at a time remove the **Approved** insulated end cap from the first phase and fit it into the phase block in the cut-out. Tighten up the screws and fit the cover and empty fuse holder. Repeat step for other phases.

Step 15 Remove the **Approved** insulated end cap from the neutral core and fit the neutral block. Fit the neutral block to the cut-out. Ensure the screws are tightened and fit the neutral cover and sealing chamber.

Step 16 Where there is a requirement to provide an earth, make off an earth connection as detailed in procedure WL-1.53.

Step 17 Test for correct supply polarity, earth loop impedance and, where appropriate, correct phase rotation as detailed in OPSAF-12-061 (LWM 2.6).

Step 18 Ensure all earth connections removed in Step 6 are reconnected correctly.

Step 19 Reconnect the customer meter tails and restore customer's supply on completion of the work. Confirm correct polarity at the same socket as in Step 2 above.

12.3 Procedure WL-1.52 – Changing Single-Phase ISCO Style Metal-Clad Cut-Outs



Example of an ISCO style cut-out, ISCO being the manufacturer's name.

ISCO style cut-outs are those constructed of a solid back plate on which separate fuse and neutral units are mounted and which also forms the back of the sealing chamber.

This procedure has been written to enable suitably trained and authorised craftpersons to change ISCO style single-phase cut-outs and replace them with WT Henley series 5 cut-outs or other **Approved** reversible cut-outs.

Approved reversible cut-outs can be dismantled and the neutral and phase connector blocks can be swapped to suit the polarity of the PILC service cable. This ensures that the crutch of the PILC service cable is not disturbed by crossing cores.

The ISCO style single-phase metal-clad cut-out may contain asbestos which shall be handled and disposed of in accordance with the **Approved** procedure as detailed in SMS-11-013 (Asbestos).

Note: It is important to continually assess the risks as work progresses. If an unacceptable risk arises (e.g. causing damage to the crutch of the cable as the cores are disconnected) then the cable shall be made not **Live** and proven not **Live** before removal.

Step 1 Examine the cut-out and associated service equipment for any signs of distress. Where there is evidence of distress, carry out a risk assessment to determine if this procedure can still be carried out with the service **Live**. If in doubt, make the service cable not **Live** before proceeding with the cut-out change.

Step 2 If the work can proceed, confirm correct polarity at a convenient socket and switch off the customer's load.

Note: Before opening the cut-out, ensure that the appropriate PPE is used.

Step 3 Remove front cover, fuses and phase barriers/separators from the **Live** and neutral units respectively.

Step 4 Test for correct supply polarity as detailed in OPSAF-12-061 (LWM 2.6).

Step 5 Identify and mark the phase and neutral meter tails then remove from the cut-out and temporarily insulate the meter tails using **Approved** insulated end caps.

Note: If the meter tails are to be up-rated, replace and re-mark them one at a time.

Step 6 Remove or screen any earth connections or earth wires in the vicinity of the fuse units to prevent flashover. Using a test lamp, test between phase and metal casing (no light) and metal casing and earth (no light), to ensure all earths have been removed and no voltage is present on the metal casing.

Note: If an earth is present on the casing then the phase connections needs to be temporarily screened until any internal earth connections have been disconnected.

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- Step 7 Unscrew all bolts or screws holding the front pouring plate and separate the plate from the compound using an **Approved** insulated Hepnyf or core separator.
- Note: At this point disconnect any internal earth connections if present and retest to ensure no voltage between phase and metal casing and metal casing and earth before continuing.
- Step 8 Unscrew the two porcelain fuse carriers from the back plate using an **Approved** insulated screwdriver.
- Step 9 Hold the back plate with one hand to stop it from falling. Gently tap the iron back plate to release it from the compound. Remove the back plate.
- Step 10 Work on only one core at a time. Remove the porcelain carrier and shroud the core with **Approved** insulated end cap.
- Step 11 Remove excess compound from around the cores using an **Approved** Hepnyf or core separator. Ensure enough compound is left to form the crutch seal.
- Step 12 For each core in turn, identify and using phase identification tape, tape up from the crutch to where the **Approved** insulated end cap starts. Reset the cores into position for new cut-out.
- Step 13 Assemble the new cut-out to suit the polarity of the service cable to minimise disturbance to the crutch and to ensure the cores will not be crossed.
- Step 14 Remove the **Approved** insulated end caps from the phase core and fit into the phase block of cut-out. Tighten up the screws and fit the covers and empty fuse holder.
- Step 15 Remove the **Approved** insulated end cap from the neutral core and fit it into the neutral block of the cut-out. Ensure the screws are tightened and fit the neutral cover.
- Step 16 Fit the sealing chamber.
- Step 17 Where there is a requirement to provide an earth, make off an earth connection as detailed in procedure WL-1.53.
- Step 18 Test for correct supply polarity, earth loop impedance and, where appropriate, correct phase rotation as detailed in OPSAF-12-061 (LWM 2.6).
- Step 19 Ensure all earth connections removed in Step 6 are reconnected correctly.
- Step 20 Reconnect the customer meter tails and restore supply to the customer. Confirm correct polarity at the same socket as in Step 2 above.

12.4 Procedure WL-1.53 – Fitting Mechanical Earth Bonds on PILC Service Cables

This procedure has been written to enable suitably trained and authorised staff to fit mechanical earth bonds to the lead sheaths of PILC service cables beneath the cut-out position.

- Step 1 Examine the cut-out and associated service equipment for any signs of distress. Where there is evidence of distress, carry out a risk assessment to determine if this procedure can still be carried out. If in doubt, ensure identified issues are rectified before proceeding.
- Step 2 If the work can proceed, switch off the customer's load.
- Step 3 Remove the fuse(s) and link from **Live** and neutral units respectively.
- Step 4 If required, strip back the cable armours to expose the lead sheath then clean and degrease the cable armours and lead sheath. Complete an earth loop impedance test as detailed in OPSAF-12-061 (LWM 2.6). If values obtained are outside acceptable limits do not provide customer with an earth connection and report to your supervisor. (For further guidance see EART-01-002 – Low Voltage Earthing Policy).
- Step 5 Fit the **Approved** mechanical earth bond kit as detailed in the manufacturer's installation instructions.
- Step 6 Ensure the warning label is clearly visible.
- Step 7 Neatly set the copper earth wire to the earth termination block.
- Step 8 Strip back the earth wire insulation and connect into the earth terminal block.
- Step 9 Complete an earth loop impedance test as detailed in OPSAF-12-061 (LWM 2.6) to confirm installed value.
- Step 10 Connect the customer's earth (where this is ready for connection) and fit the protective cover to the earth termination block.
- Step 11 Restore customer's supply on completion of the work.

12.5 Procedure WL-1.59 – Installation of Temporary Service Loop between Cut-Outs

This procedure details the installation of a temporary single-phase service connection to restore customer supplies from an alternative, healthy cut-out pending repairs to the permanent supply cable. This currently utilises a Kelvatek Restore 'temporary loop' service cable and 30 mA RCD pre-assembled (or a similar **Approved** device). The installation shall provide electrical and mechanical protection and be adequately rated for load and fault conditions and **Approved** for the purpose intended. The temporary loop shall be fitted with a connector block at the end of each core to facilitate connection by not having to break out an additional port in an existing cut-out. This removes the need to secure the additional port on completion.

The temporary service cable, under normal circumstances, should not be left in place for a period greater than 72 hours.

An installation diagram is included at the end of this procedure.

The removal of a temporary service loop does not constitute **Live** working and therefore does not require a **Live** working authorisation, however for completeness, the steps for removal are included within this procedure.

Site Inspection

Step 1 A temporary loop will normally be installed between neighbouring properties. The safety of the public shall be considered prior to installation and a risk assessment shall be carried out on site. This will take into consideration the weatherproofing, security and condition of the premises involved. The route which the cable will take shall be such that the public will not be put in **Danger**. Agreement from both occupants is required before proceeding.

Confirm that the cut-out from which the temporary supply is to be taken shows no signs of distress. If there is any sign of distress, do not proceed.

Ensure that supply is present and of correct voltage, polarity and that the earth loop impedance is within limits as detailed in OPSAF-12-061 (LWM 2.6). Confirm correct polarity at a convenient socket.

Isolation of Faulty Cable at Property Off Supply

- Step 2 Examine cut-out for any sign of distress and throughout the process continually update risk assessment as necessary. If there is evidence of distress, do not attempt to carry out any work.
- Step 3 Switch the customer's main switch(es) to the 'OFF' position.
- Step 4 Isolate the customer's supply by removing the main fuse and then remove the neutral cover.
- Step 5 Test the incoming supply to confirm not **Live**.
- Step 6 Mark polarity and remove meter tails from cut-out and temporarily insulate.
- Step 7 Disconnect the service cable earth from the installation earth connection and insulate.
- Step 8 Protect the cut-out top entry ports from interference.
- Step 9 Remove fuse from carrier.
- Step 10 Replace the neutral cover and empty fuse carrier.
- Step 11 Seal the cut-out.
- Step 12 Secure three connector blocks onto the meter board and connect to the load terminals and earth wire of the temporary cable. Post a **Danger Notice**.

Step 13 Connect the meter tails into the connector blocks ensuring correct polarity, check all meter connections are secure and seal the connector blocks. Make a connection from the installation earth to the earth connector block, leaving intact all existing bonding connections.

Step 14 Secure the end of the temporary cable to the meter board or an alternative position.

Laying of Temporary Cable

Step 15 Lay the cable along the chosen route and mark with **Danger Notices** at regular intervals and at all points of potential hazards. Precautions shall be taken to control any trip hazards and sufficient slack cable left to allow any exterior doors to open and close if letter boxes have been used as the entry/exit points. Any excess cable shall not be coiled up but laid in parallel with the existing run to reduce heating effects.

Connection of Temporary Loop at Donor Property

Step 16 Fit the Trip-Set connector blocks at a suitable position close to the meter and ensure the RCD is in the OFF position.

Step 17 Switch off the customer's supply and remove the main fuse and neutral cover from cut-out.

Step 18 Mark polarity and remove phase and neutral meter tails one at a time from the cut-out and connect into the Trip-Set connector blocks observing correct polarity.

Step 19 Connect the Trip-Set earth lead into the existing installation earth connector block.

Step 20 Fit temporary tails between the cut-out and the Trip-Set connector blocks for the neutral and phase. Check all connections are secure, again ensuring correct polarity is established.

Step 21 Secure the end of the temporary cable to the meter board or an alternative suitable position.

Step 22 Secure the temporary loop cable from the Trip-Set into the connector blocks (phase and neutral). Ensure the plug-in lead at the RCD unit that goes out to the premises 'off supply' is disconnected.

Step 23 Replace the cut-out fuse and neutral cover.

Test Process

All tests must be successful for the loop to be left in service.

Continuity Monitor for Temporary Loop

Step 24 Switch the RCD on. If operating correctly it will not close as the cable circuit is not complete.

Step 25 If the RCD operates correctly, remove the fuse from the cut-out and connect the temporary cable into the RCD unit using the plug and socket connection.

Step 26 Refit the service fuse.

Trip Test

Step 27 Switch on the RCD and test for correct operation by pressing the trip test button – the RCD should trip. There are two test buttons and it should work for both.

Restoration of Supply and Removal of Temporary Service Loop

Step 28 At the Donor property switch on and close the RCD and secure the restore box in order to prevent re-closure by unauthorised persons should it trip in operation.

Step 29 At the Donor property, close the customer's main switch and confirm correct polarity at a convenient socket and seal the cut-out.

Step 30 At the property to be supplied, close the customer's main switch, test polarity and earth loop impedance at a convenient socket outlet within the installation. The earth loop impedance must be less than 200 ohms.

Step 31 Customers should be supplied with a guidance sheet and appropriate number to contact should any problems arise. Check some appliances function correctly.

The removal of the temporary service loop does not involve any **Live** working and may be completed by a competent **Authorised Person** with a minimum Work Authorisation of WI-1 and Operational Authorisation of OP-3.

Step 32 Check voltage, polarity and earth loop impedance as detailed in OPSAF-12-061 (LWM 2.6) of the repaired service cable prior to proceeding.

At the Donor Property

Step 33 Switch off the customer's main switch, Trip-Set RCD and remove the main service fuse and neutral cover from the cut-out.

Step 34 Remove the temporary tails between the cut-out and the Trip-Set connector blocks. Disconnect the Trip-Set.

Step 35 Remove the meter tails and earth from the Trip-Set connector blocks.

Step 36 Remove the Trip-Set connector blocks from the meter board.

Step 37 Connect the installation meter tails into the cut-out observing correct polarity, check all connections are secure and fit the neutral cover, replace the service fuse and switch on the customer's main switch.

Step 38 Check polarity at the same socket outlet on the customer's installation as in Steps 1 and 29 above and seal the cut-out.

At the Property Supplied by the Temporary Service Loop

Step 39 Switch off the customer's main switch. Remove the Load Set connector block covers and prove not **Live**.

Step 40 Disconnect the meter tails from the top side of the Load Set connector blocks and temporarily insulate.

Step 41 Remove the Load Set connector blocks from the meter board.

Step 42 Connect the meter tails into the cut-out observing correct polarity. Check all connections are secure.

Step 43 Remove the temporary cable earth connection and reconnect the installation earth to the cable earth. Ensure all earthing and bonding connections are left in their original state.

Step 44 Fit the neutral covers, replace the fuse in the carrier, replace the carrier into the cut-out, close the customer's main switch and check polarity at the same socket outlet on the customer's installation as in Step 30 above. If all checks are in order, reseal the cut-out.

Recovery of the Temporary Service Loop

Step 45 Ensure all components of the temporary loop are recovered and protected. Clean cables and place the complete Restore Unit in the protective storage bag. Test the operation of the Restore Unit's RCD using an **Approved** RCD Test Unit to ensure it is operating correctly then return to the appropriate stores.

Installation of “RESTORE” System
(Temporary LV Supply Restoration System With Earth)

