

1. SCOPE

This section of the Live Working Manual details the **Approved** procedures to be employed in erecting a new pole into, or in close proximity to, **Live HV** (11kV and below) and **LV** conductors using one of the following methods:

- (a) 180° & 360° *Excavator/Loader* and front mounted *Pole Manipulator* (e.g. Strimech)
- (b) 180° & 360° *Excavator/Loader* using *Sling* on rear bucket
- (c) *Vehicle Mounted Loader* and *Sling*

The removal of old poles once the conductors have been transferred is not covered by this procedure. Once the conductors have been transferred to a new pole and an old pole remains within the **Safety Distance** of **Live HV** conductors, unless **Approved HV Rubber Glove Working** methods are being employed, the overhead line shall be **Isolated** and **Earthed** and a **Permit for Work** issued for removal of the old pole. Refer to OPSAF-10-004 (PSSI 4). In the case of **LV** overhead lines the circuit shall be **Isolated** and **Approved** portable shorts applied as necessary to enable removal of the old pole. Refer to OPSAF-10-012 (PSSI 12).

2. ISSUE RECORD

This is a Reference document. The current version is held on the EN Document Library.

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Issue Date	Issue No	Author	Amendment Details
September 08	4	Rob Edwards	Re-branded and minor editorial changes. Topic in Section original 7.1.10 split into two sections 7.1.10 & 7.1.11
March 2018	5	Kevin Rice Dave Naylor	General update. Greater clarity on acceptable conductor types and pole-mounted apparatus. More guidance on pole shrouding. Minor editorial changes to align with LWM 5.2. Change in vehicle terminology and removal of brand names. Inclusion of minimum weight for 360° <i>Excavators</i> . Change to section numbering Distribution now Section 5 and Section 7 added for Reference and Related Documents.

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
Kevin Rice Health & Safety Consultant	Gary Evans Operational Assurance Manager	Ross Galbraith Health & Safety Director
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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.

5. DISTRIBUTION

This document is part of the Live Working Manual but does not have a maintained distribution list.

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7. REFERENCE AND RELATED DOCUMENTS

OPSAF-01-001 (LWM 1.1) Policy for Live Work on System
OPSAF-10-004 (PSSI 4) - High Voltage Overhead Lines - Work on Phase Conductors
OPSAF-10-012 (PSSI 12) - Low Voltage Apparatus
OPSAF-11-002 - Management Safety Procedures Definitions
OPSAF-12-014 (LWM) 5.2 - HV Overhead Lines - The Hot Stick Method
OHL-14-002 - Location of Underground Services
OHL-15-001 - Excavation and Reinstatement Requirements for Pole and Stay Holes
OHL-16-002 - Pole Erection

8. DEFINITIONS

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

Terms printed in italics are either defined in OPSAF-11-002 Energy Networks Management Safety Procedures Definitions, or are defined below for the purposes of this procedure only.

<i>Controlling Craftsman</i>	- The Authorised craftsman responsible for the supervision of the job.
<i>Excavator</i>	- A 180° or 360° <i>Excavator/loader</i> , weighing 5 tonnes or greater.
<i>Height Restrictor</i>	- An electrical or mechanical device that limits the upward travel of the arm or boom of the lifting machine.
<i>Minimum Safe Working Clearance</i>	The minimum clearance that must be maintained to Live overhead line conductors for the purpose of erecting poles in accordance with the procedures described in this document. Defined in part 9.3.3.
<i>Operator</i>	- The driver of the <i>Excavator</i> or <i>Vehicle Mounted Loader</i> .
<i>Pole Manipulator</i>	- A pole handling attachment manufactured by Strimech, Kinshofer, Roco or similar, which can suitably grip and manipulate the pole during erection.
<i>Sling</i>	- A non-metallic sling of minimum suitable length and appropriate Safe Working Load for the weight of the load being lifted.
<i>Vehicle Mounted Loader</i>	- A lorry fitted with a Hiab crane or similar.

9. SAFETY

The requirements of this section are mandatory whenever a pole is erected into a **Live HV** or **LV** overhead line.

9.1 General

9.1.1 Prior to carrying out all **Live** pole erection operations a risk assessment shall be carried out taking into account the following issues: -

- Whether **Live** work can be justified in accordance with OPSAF-01-001 (LWM 1.1) Policy for **Live** Work on the **System**.

- Access to the site, ground conditions etc.
- Condition of existing poles (including foundations where visible), conductors, staywire, joints and fittings of the span at the new pole position and in the first adjacent spans either side.
- Environmental factors
- Manual handling
- Excavations, risk of collapse / undermining. Requirement for signing and guarding etc .
- Proximity of other overhead lines, underground cables / earth **System** or utility apparatus (e.g. street lighting)
- Third parties
- The risk of conductor clashing during the work

Where risks are identified associated with the issues above, appropriate controls shall be established prior to commencement of work otherwise **Live** work shall not be commenced if the risks cannot be reduced to an acceptable level.

- 9.1.2** The *Controlling Craftsman* shall ensure that no **Persons** shall access the work area throughout the work procedures without first gaining his approval. He shall also control access by others e.g. general public.
- 9.1.3** Pole erection shall NOT be carried out into **Live** lines using manual/mechanical or manual only techniques.
- 9.1.4** All lifting equipment shall be of an **Approved** type, fit for purpose and be within the current inspection / test period.
- 9.1.5** No pole shall be erected into a **Live** line if the pole is damp or wet or during periods of rain. Free surface creosote is not considered as "wet" in this context.
- 9.1.6** All vehicles that are used to erect poles into **Live** lines shall be fitted with *Height Restrictors* to prevent arms/booms infringing the *Minimum Safe Working Clearance* detailed in section 9.3.3.
- 9.1.7** Safety signs ("Danger of Death") shall be fitted to all new poles erected in accordance with these **Live** Working procedures. Where practicable this shall be done prior to erection. Pole numbers may also be fitted to new poles prior to erection.
- 9.1.8** Poles erected into **Live HV** lines in accordance with these **Live** Working procedures shall not be fitted with any steelwork, staywire fitment or any form of earth bonding.
- Poles erected into **Live LV** lines shall not be fitted with any staywire fitment or any form of earth bonding. Poles erected into **Live LV** lines may be dressed with fittings and insulators.
- 9.1.9** Poles shall not be erected into 'slack tapping spans', due to the increased risk of conductor clashing.

Due to the risk of damage, and to ensure that the *Minimum Safe Working Clearance* is not compromised as a result of **Live** conductors lower down the existing pole, new poles shall not, where reasonably practicable, be erected into **Live HV** lines against poles with pole-mounted equipment - including tee-off steelwork. Where it is considered necessary,

poles may be erected into such a position subject to approval of a method statement by a suitable **Senior Authorised Person** with experience of overhead lines.

9.1.10 The following table indicates where poles may or may not be erected into **Live** lines:

Conductor type	LV	Up to and including 11kV
Bare/uninsulated	✓	✓
ABC	✓	n/a
PVC insulated/covered	x	x
Steel	x	x
BLX/Ericsson (or similar)	n/a	x

9.1.11 Where a risk of damage to an underground cable or earth **System** exists:

- Identify the location of any cables or earth **System** with **Approved** cable location instrument in accordance with OHL-14-002 Location of Underground Services.
- Manually excavate to expose the location of the cable or earth **Systems**.
- Complete work ensuring no damage is caused to the integrity of the cable or earth **System**.

9.1.12 At **Low Voltage, Live** line pole erection may be carried out next to an existing pole with pole-mounted equipment provided the *Minimum Safe Working Clearances* detailed in section 9.3.3 are maintained; however the decision to proceed shall be based upon a close examination of the benefit of **Live** line pole erection weighed against the increased risks of damage to equipment, conductor clashing, etc.

Pole-mounted equipment includes tee-off steelwork, pole terminations, street lighting furniture, etc.

9.1.13 Any excavation for a new pole shall not encroach closer than 250mm to the existing pole. Where reasonably practicable, new poles shall not be erected into **Live** lines in a mid-span position (where the separation between an existing pole and the new pole is greater than 10m). This is due to:

- Increased risk of conductor clashing during the pole erection procedure.
- Increased risk of conductor clashing following the pole erection procedure and prior to the transfer of conductors to the new pole.
- Risk of damage to/abrasion of the shrouding on the new pole prior to the transfer of conductors to the new pole.

Where it is considered necessary, poles may be erected into these positions subject to the approval of a method statement by a suitable **Senior Authorised Person** with experience of overhead lines.

9.2 Pole Preparation

9.2.1 Undressed poles may be erected into **Live LV** lines without a requirement for shrouding to be applied.

9.2.2 Shrouding shall be applied to poles erected into **HV** lines and to dressed poles erected into **LV** lines.

9.2.3 Prior to the fitting of any **Approved** shrouding the pole drilling directions shall be clearly marked.

9.2.4 There are two **Approved** methods of shrouding a pole before erection close to **Live** conductors:

- a) **Approved** reusable pole shrouds fitted at the pole top or on the pole at any appropriate height. They are rated for occasional touch contact only. **Live** conductors shall not be left in constant contact with the shrouding.
- b) 1000-gauge polythene bags with the sealed end slit open to make the bags into tubes. Bags shall be pulled over the pole top, over one another, in sufficient quantity to shroud from the pole top down to at least 1 metre below the anticipated height of the adjacent conductor to a minimum thickness of three bags. The bags shall be folded around the pole and bound by PVC tape. This method is **Approved** for occasional touch contact only.

Note: When a pole is erected into a **Live High Voltage** line at a position more than 10m from an existing pole, the thickness of bags applied shall be doubled to a minimum of six bags to allow for additional contact and potential rubbing by the conductor.

9.2.5 Poles shall be erected so as to be a minimum of 0.15m clear of the line conductors when upright and shall not be left in constant contact with the **Live** conductors.

9.2.6 Newly erected poles should not be left amongst **Live** conductors for periods longer than one week. Where there is a requirement for the pole to remain in situ for a longer period, the pole shall be regularly inspected.

9.3 Safety from the System

9.3.1 The erection of poles in accordance with this **Live Working** procedure requires the issue of a detailed work instruction. This instruction shall define the work area by the provision of a detailed map or plan giving pole position and the precise **Location** of the new pole(s) which is (are) to be erected. The new pole construction type and height shall also be specified.

9.3.2 All **HV** work on sites together with all associated **Switching** actions shall be carried out in accordance with a detailed **Switching** schedule and to the instructions of the **Control Person**. The detailed work instruction shall be issued by the **Authorised Person** in charge of the work.

9.3.3 Throughout the course of the pole erection procedure, the *Minimum Safe Working Clearance* stipulated below between any of the lifting equipment and the **Live** conductors, shall not be infringed.

Minimum Safe Working Clearance at Low Voltage: 1.0m
Minimum Safe Working Clearance at High Voltage: 3.0m

This clearance shall be applied in all directions from the **Live** conductor – it is NOT a vertical clearance only.

9.3.4 Throughout the pole erection process, the *Vehicle Mounted Loader* or *Excavator* shall be effectively connected to earth via an **Approved** earth rod connected to the vehicle by an **Approved Field Equipment Earth**.

Prior to the installation of the earth rod, it shall be verified that there are no underground services in the vicinity. The earth rod shall be positioned such that it does not pose a hazard to either the *Controlling Craftsman* throughout the course of the procedure or to the machine *Operator* who may require emergency egress from the machine.

9.3.5 For **HV** work, and throughout the duration of the work, the **Control Person** responsible for the circuit being worked on shall where practicable ensure that the circuit protection is set to Live line mode or the auto-reclose feature inhibited. Where this is not practicable, the **Control Person** shall be notified.

9.3.6 In the event of a **Live** conductor being brought down into contact with the vehicle carrying out pole erection the following actions shall be taken:

9.3.6.1 The *Controlling Craftsman* shall manage the site to prevent unauthorised access.

9.3.6.2 Unless it is unsafe to do so (see 9.3.6.3), the *Operator* shall stay in the cab until a suitably **Authorised Person** confirms it is safe to exit the vehicle:

- **HV Live** pole erection – the **Person** shall be a **Senior Authorised Person**
- **LV Live** pole erection – the **Person** shall hold a minimum authorisation of OP-2, L-21 and /or WL-1 (WL-1.20 and WL-1.21) at **LV**.

9.3.6.3 In the event it becomes unsafe to remain in the vehicle (e.g. the vehicle catches fire), the *Operator* shall jump clear of the vehicle avoiding simultaneous contact with the vehicle and the ground.

9.3.6.4 Contact shall be established with the appropriate **Control Person** at the earliest opportunity.

9.3.6.5 Contact shall also be made with the **Working Party** supervisor to establish suitable investigations.

10. TRAINING, CERTIFICATION AND AUTHORISATION

10.1 The operations described in this procedure shall only be undertaken by **Persons** suitably trained, certificated and authorised.

10.1.1 For **HV** work the *Controlling Craftsman* shall be authorised for the appropriate **Live** work procedure:

WL-1.101 - Pole erection using 180°/360° *Excavator/loader* and pole handling attachment.

WL-1.103 - Pole erection using 180°/360° *Excavator/loader* (*Sling* method).

WL-1.104 - Pole erection using *Vehicle Mounted Loader* and *Sling*.

For **LV** work the *Controlling Craftsman* shall be authorised for the appropriate **Live** work procedure:

WL-1.31 - Pole erection using 180°/360° *Excavator/loader* and pole handling attachment.

WL-1.32 - Pole erection using 180°/360° *Excavator/loader* (*Sling* method).

WL-1.33 - Pole erection using *Vehicle Mounted Loader* and *Sling*.

10.1.2 The *Operator* shall, in addition to having a certificate for operation of the plant, have attended a **Company Approved** training course for the erection of poles into **Live** lines and shall hold an authorisation of WL-2 at **LV** and/or **HV** with a limitation of L-44 applied.

If a **Person** who is authorised as a *Controlling Craftsman* also holds a certificate for operation of plant he may assume the role of *Operator* without holding the specific WL-2 L-44 authorisation. It is not permissible to fulfil both roles simultaneously – two appropriately authorised **Persons** shall be present during the procedure.

10.1.3 The *Controlling Craftsman* and *Operator* shall agree on suitable hand signals/communication to ensure completion of work in a safe manner.

11. SITE OPERATIONS

11.1 Preliminary Work

11.1.1 Prior to the erection of any poles into **Live LV** or **HV** lines, it shall be determined whether there is a risk of any part of the *Vehicle Mounted Loader* or *Excavator* infringing the *Minimum Safe Working Clearance*. Where such a risk exists, a *Height Restrictor* shall be enabled.

11.1.2 Measure the height of the lowest conductor at the new pole position using **Approved** rods or other **Approved** devices/means. Mark the new pole as follows:

11.1.2.1 At the position of the lowest conductor, as calculated once the new pole is in the pole hole. This is to ensure that the new pole will be shrouded from the top of the pole to a position no less than 1m below the height of the lowest conductor.

11.1.2.2 At a position below the height of the lowest conductor, by an amount equal to the *Minimum Safe Working Clearance*. This is to assist in the positioning of the *Pole Manipulator* or *Sling* as a control measure to prevent the *Excavator* arm or *Vehicle Mounted Loader* boom infringing the *Minimum Safe Working Clearance* to the lowest conductor during the pole erection process.

11.1.3 Apply a visible marker band, at a distance equal to the *Minimum Safe Working Clearance*, below the conductors on the existing pole. This marker is to assist in ensuring that the *Excavator* arm or *Vehicle Mounted Loader* boom will not, at any stage of the pole erection procedure, infringe the *Minimum Safe Working Clearance*.

No pole impaired by decay or damage shall be climbed with either climbing irons or a ladder. There is no **Approved** procedure for supporting a rotten pole to allow climbing to take place.

If the existing pole cannot be climbed the limit of approach for the loading arm may be indicated by the temporary attachment of **Approved** insulated rods, clearly marked at the appropriate distance (as above) below the height of the lowest conductor.

11.1.4 For **HV**, excavate a hole for the new pole preferably on the opposite side to the existing pole's steelwork and in a parallel position to the conductors. For **LV**, excavate a hole at an angle no greater than 60° from the line of the existing conductors (Appendix C). The position of the new pole in relation to the old pole shall take into account the ground conditions and any cable termination or other pole-mounted or other utility apparatus. Suitable precautions shall be taken at all times to ensure that the stability of the old pole is maintained. This may include the use of temporary guy ropes applied with insulated rods outside the *Minimum Safe Working Clearance*.

Poles shall not be erected into augered excavations without first battering the side of the hole to create an angled profile similar to that shown in Appendix B.

Pole planting depths are specified in OHL-15-001- Excavation & Reinstatement Requirements for Pole & Stay Holes.

Prior to the excavation of the pole hole, it shall be verified that there are no underground services in the vicinity.

11.1.5 Clear all persons not directly involved in the procedure from the working area.

11.1.6 During the pole erection operation, the *Operator* shall take direct instructions from the *Controlling Craftsman* only.

11.2 **WL-1.101 and WL-1.31- Pole Erection Using 180° & 360° Excavator/Loader and Pole Manipulator**

11.2.1 Refer to Appendix A.

11.2.2 Grip the pole securely with the *Pole Manipulator* at a site away from the **Live** line. The

clamping position is specified in the Wood Pole Overhead Line Manual, document number OHL-16-002, and should be as close as possible to the point of balance of the pole (approximately 40% of the pole height from the butt). It is essential that during the pole erection process no part of the *Excavator/Pole Manipulator* shall infringe the *Minimum Safe Working Clearance*.

11.2.3 Position the *Excavator* at an appropriate position in relation to the pole hole – the *Field Equipment Earth* shall be attached as soon as practicable.

11.2.4 Position the pole into the hole, ensuring at all times that the *Minimum Safe Working Clearance* is not infringed. Erect the pole in position as close to vertical as possible and leaving a separation of at least 450mm from the old pole. Commence backfilling the hole. The *Pole Manipulator* shall be used to maintain the pole in position during backfilling. Rotate the new pole as necessary to align the pole drillings for steelwork/fittings bolts. Unclamp the pole and disconnect the *Field Equipment Earth*.

11.3 WL-1.103 and WL-1.32 - Pole Erection using a 180° & 360° Excavator/Loader (Sling Method)

11.3.1 Refer to Appendices B and D

11.3.2 Where there is any risk of infringing the *Minimum Safe Working Clearance* the pole shall only be maneuvered using the *Excavator* arm.

11.3.3 Position the *Excavator* and attach the *Field Equipment Earth* as soon as practicable. Position the *Sling*, hook and arm to ensure that no part of the *Sling*, hook or *Excavator* arm will infringe the *Minimum Safe Working Clearance* once the new pole is erected.

The position of the marker band on the existing pole shall be used to ensure that no part of the *Sling*, hook or *Excavator* arm will infringe the *Minimum Safe Working Clearance* at any stage of the erection operation. Keeping the pole close to the ground, place the butt of the pole over the pole hole, with the pole parallel to the new pole hole, as shown in Appendix B.

11.3.4 If any adjustment is required to the slinging arrangement then the pole shall be lowered to the ground in order that any adjustments can be made.

11.3.5 Erect the pole as close to the vertical as possible and leaving at least 450mm separation from the old pole. Commence backfilling of the hole. Use the *Excavator* arm and *Sling* to maintain the position of the new pole.

11.3.6 Rotate the new pole as necessary to align the pole drillings for steelwork/fittings-bolts.

11.3.7 When the pole is secure, lower the *Excavator* arm, remove the *Sling*, disconnect the *Field Equipment Earth* and move the *Excavator* to a position away from the overhead line.

11.4 WL-1.104 and WL-1.33 - Pole Erection using a Vehicle Mounted Loader and Sling

11.4.1 Move the vehicle into a suitable position as shown in Appendices B and D.

A vehicle with a front mounted loader shall be positioned parallel to the overhead line.

With a rear mounted loader this is not always practicable, and in these cases the *vehicle* may be positioned at the appropriate angle to the line.

11.4.2 Attach the *Field Equipment Earth*. Where the *Vehicle Mounted Loader* is being used with operating levers at ground level, a temporary equipotential mat shall be suitably positioned allowing easy operation of the *loader* controls, with the *Operator* standing with both feet on the equipotential mat. The *Operator* shall not be in contact with any other object or equipment except the *loader* during the lifting operation, and shall remain with both feet on the equipotential mat for the duration of the operation.

11.4.3 All other members of the Working Party shall remain at a sufficient distance from the *Vehicle Mounted Loader* to ensure they do not make inadvertent contact while the pole is being positioned under the line.

11.4.4 Where a *Vehicle Mounted Loader* is fitted with a remote control which uses an umbilical cable, the remote control shall not be used.

11.4.5 If the remote control has no umbilical cable (e.g. infra-red remote control) remote control is permissible, provided that an **Approved Field Equipment Earth** is connected to the *vehicle* and the *Operator* has no risk of contact with that vehicle..

11.4.6 If a *Vehicle Mounted Loader* is fitted with top mounted controls then it is necessary to ensure the *Operator* is not at risk of infringing the *Minimum Safe Working Clearance* to **Live** conductors. Use of an equipotential mat is not required where the top mounted controls are being used.

11.4.7 If, at any time, adjustment is required to the slinging arrangement then the pole shall be lowered to the ground in order that any adjustments can be made.

11.4.8 Ensure that the position of the *Sling*, hook and arm are such that they will not infringe the *Minimum Safe Working Clearance* to **Live** conductors at any stage of the erection operation. Keeping the pole close to the ground, place the butt of the pole over the pole hole, with the pole parallel to the new pole hole. Erect the pole in position as close to the vertical as possible and leaving at least 450mm separation from the old pole. Commence backfilling the hole. Use the boom and *Sling* to maintain the position of the new pole.

11.4.9 Rotate the new pole as necessary to align the pole drilling for steelwork bolts.

11.4.10 When the pole is secure, lower the boom, remove the *Sling*, disconnect the *Field Equipment Earth* and move the *vehicle* to a position away from the overhead line.

12. COMPLETION OF WORK

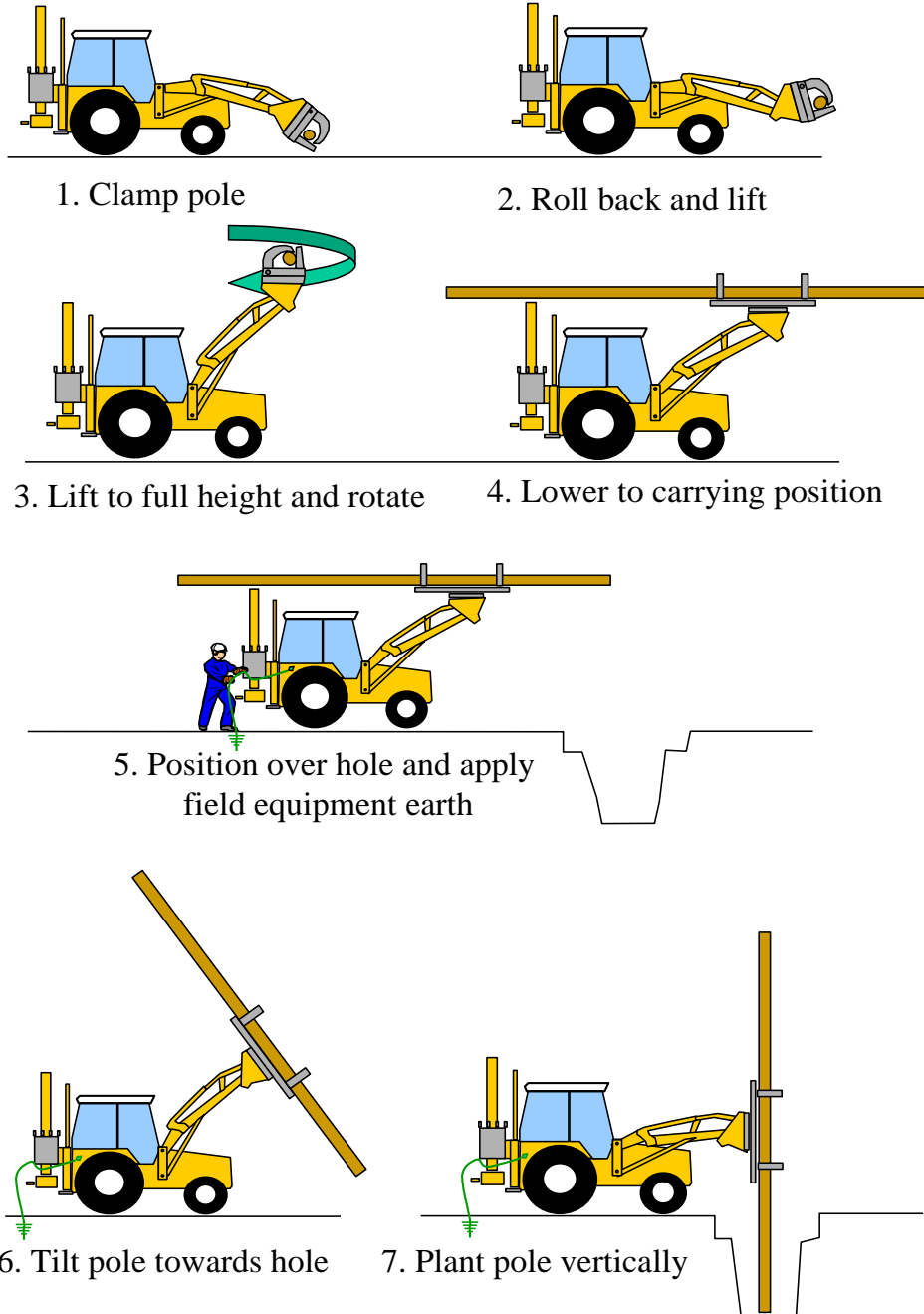
12.1 Removal of Shrouding/Markers/Old Pole

12.1.1 Shrouding and markers shall remain on the new pole until the remaining work is carried out to transfer conductors.

12.1.2 On completion of pole erection all guy and winch ropes shall be removed. Where practicable this shall be carried out from ground level.

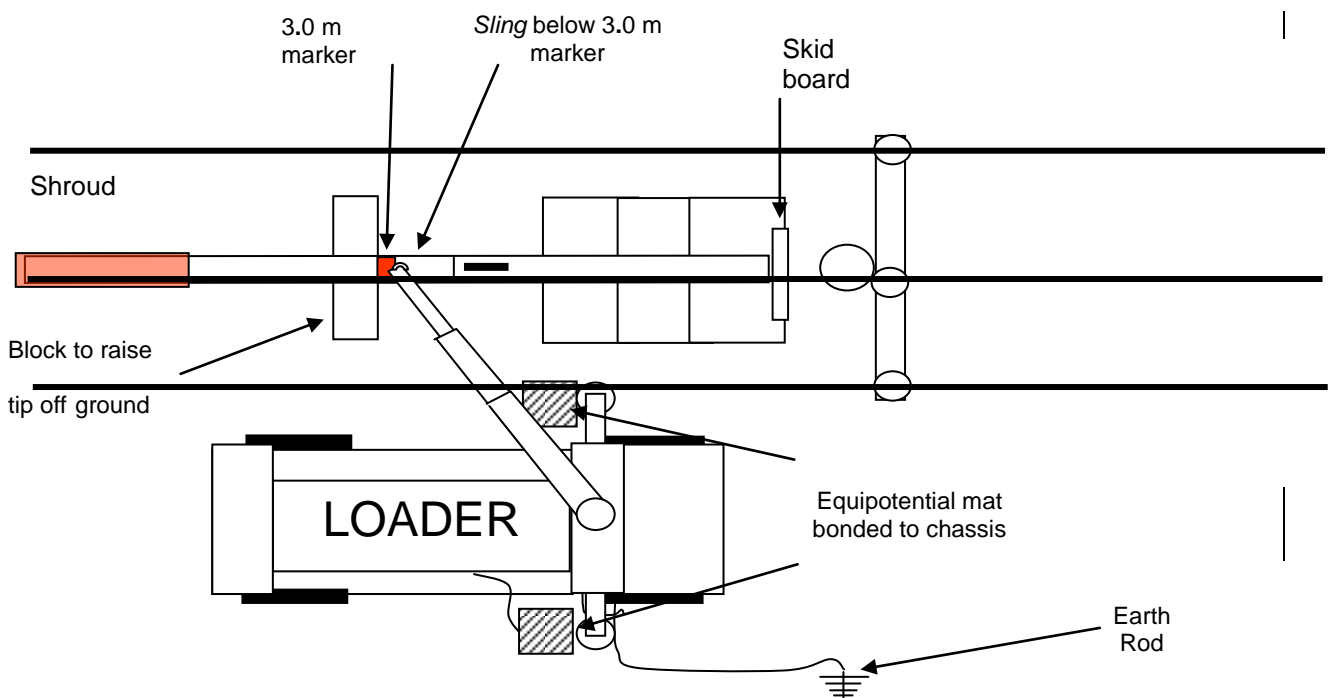
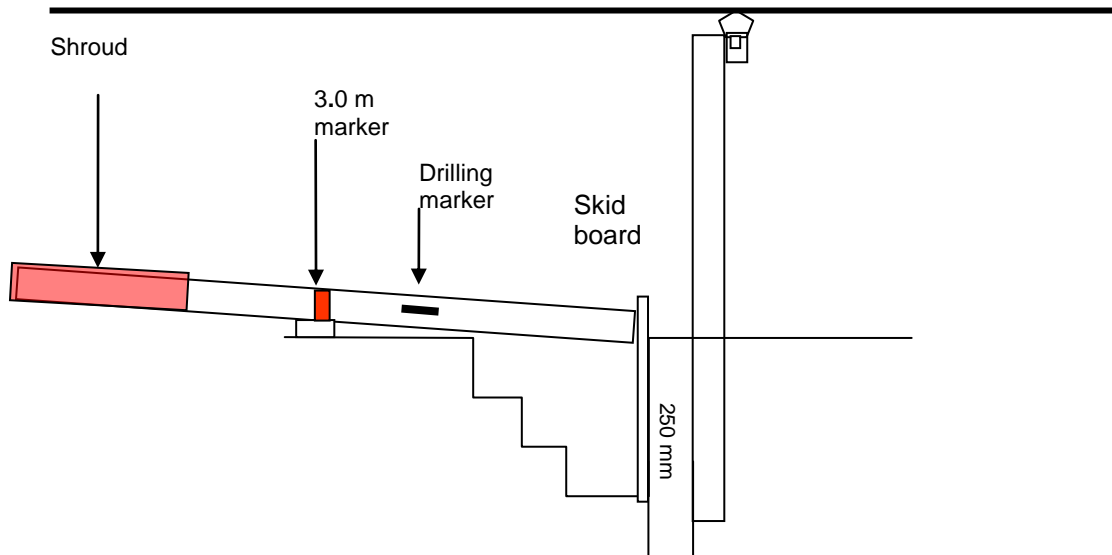
When the old pole is removed the old pole hole must be backfilled with care to ensure that the old excavation does not undermine the newly erected pole.

13. APPENDIX A - ERECTION OF POLE USING *POLE MANIPULATOR* (e.g. STRIMECH)



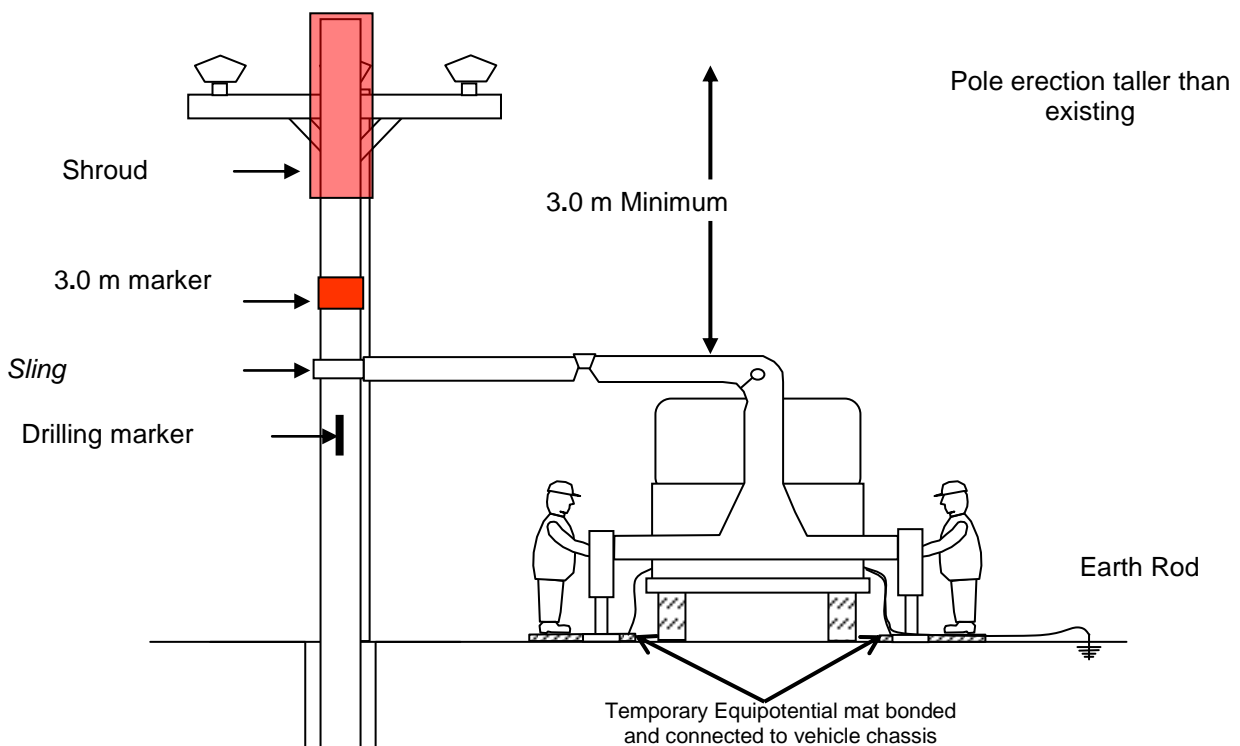
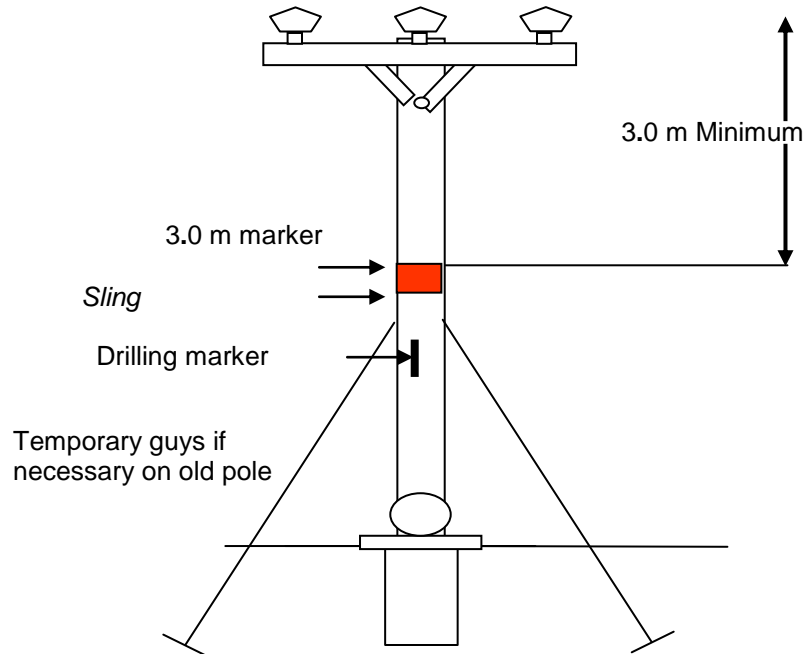
NB: Clamping position is specified in the Wood Pole Overhead Line Manual, document OHL-16-002. For guidance this is approximately 40% of the pole height from the butt. It is essential that during the erection process no part of the *Excavator/pole handling attachment* shall infringe the *Minimum Safe Working Clearance*.

14. APPENDIX B - HV POLE ERECTION USING VEHICLE MOUNTED LOADER (OR EXCAVATOR) AND SLING

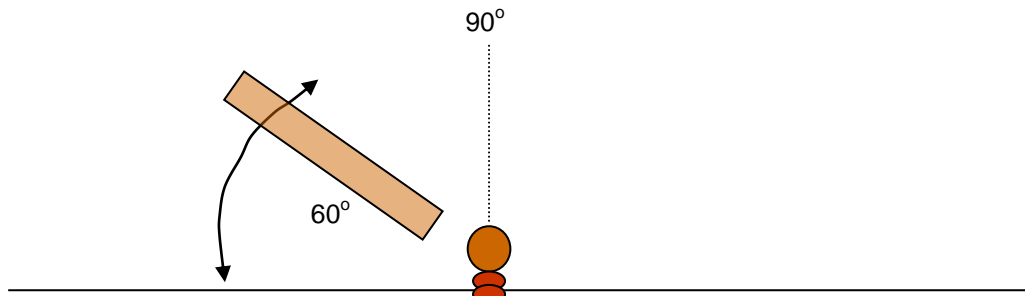


APPENDIX B - HV POLE ERECTION USING VEHICLE MOUNTED LOADER (OR EXCAVATOR) AND SLING (CONTINUED)

Existing Pole



15. APPENDIX C - LV POLE EXCAVATION



16. APPENDIX D - LV POLE ERECTION USING VEHICLE MOUNTED LOADER (OR EXCAVATOR) AND SLING

