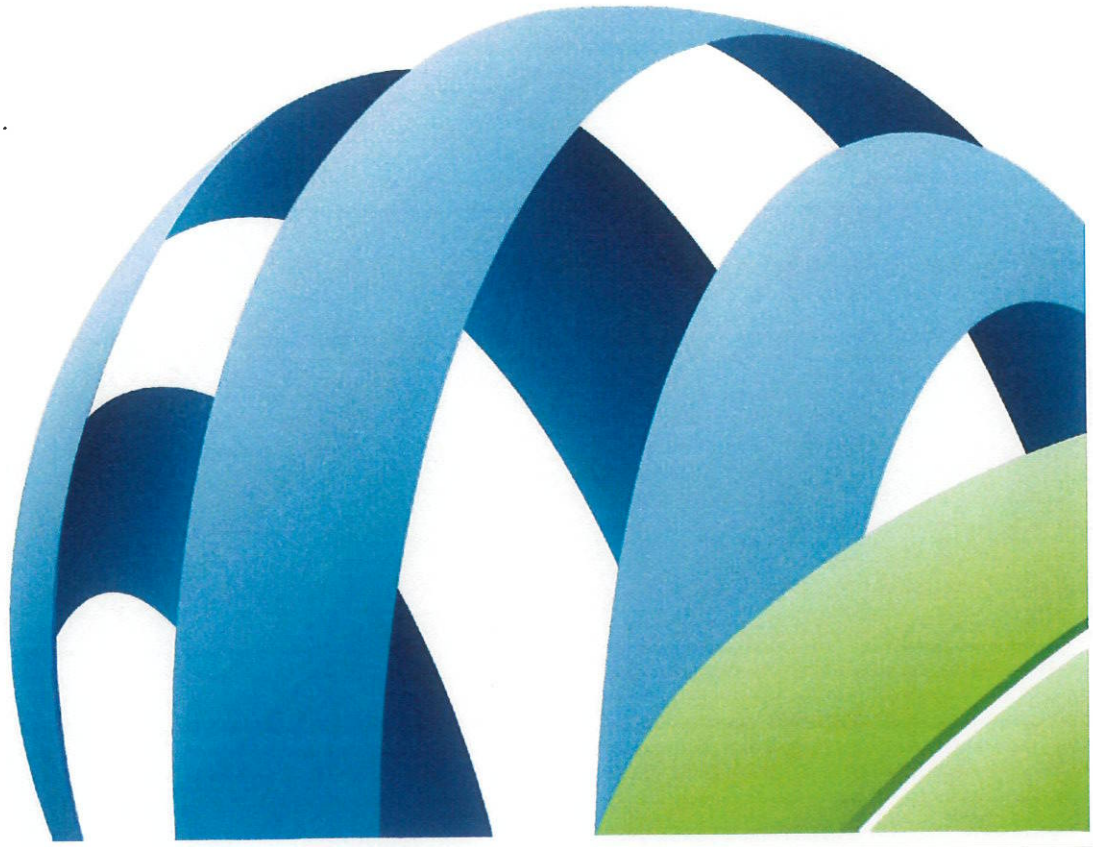
Appendix 2B

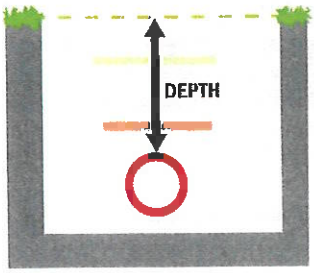


Standard Specification for ESB MV/LV Networks Ducting (Minimum Standards)

Note 1: ESb Networks reserves the right not to accept ducting which does not conform to these standards and dimensions
Note 2: Refer to ESB Networks for Specific job Specification. These instructions do not apply to 38kV/110kV/220kV cable
Note 3: All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials

ESB Networks
Drg. No. NW-014
Rev 0: Date 09-08
Approved:

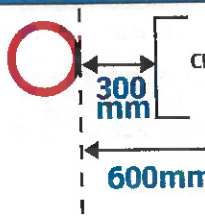
1 MINIMUM depths below finished ground level



DEPTH
- **450mm** in established footways
- **600mm** in new housing estate carriageways & footways and all grassed areas
- **750mm** All Non-Housing Estate carriageways, forestry farmland & bogland

Depth is measured to top of duct
Max depth is 1m except at:
- service crossings where 1.5m is allowed
- short rail and road crossings where up to 2.5m is allowed

2A Minimum Standard Clearances to Other Services

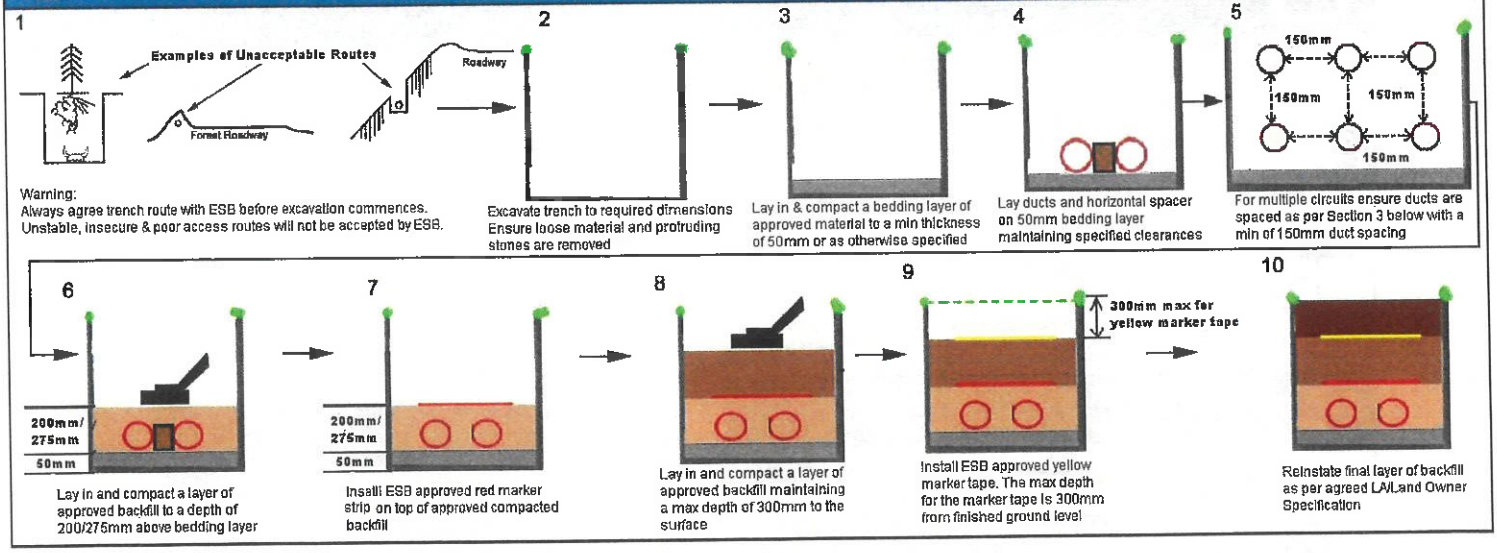


Clearance to Normal Services

Clearance to: Large Pipelines
High Pressure Pipes

- To achieve these clearances see sections 3D and 3E below
- Clearances less than the above at pinch points and crossings requires placement of additional mechanical protection (concrete slab/brick) and agreement of ESB
- ESB ducts must never be laid over other services on parallel runs, except with the written prior agreement of the other utilities and ESB
- Other Services must never be laid directly over ESB ducts on parallel runs

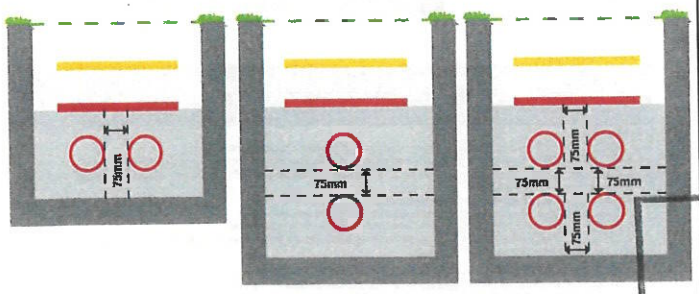
2B Trench Installation Sequence



1. Warning: Always agree trench route with ESB before excavation commences. Unstable, insecure & poor access routes will not be accepted by ESB.
2. Excavate trench to required dimensions Ensure loose material and protruding stones are removed
3. Lay in & compact a bedding layer of approved material to a min thickness of 50mm or as otherwise specified
4. Lay ducts and horizontal spacer on 50mm bedding layer maintaining specified clearances
5. For multiple circuits ensure ducts are spaced as per Section 3 below with a min of 150mm duct spacing
6. Lay in and compact a layer of approved backfill to a depth of 200/275mm above bedding layer
7. Insalll ESB approved red marker strip on top of approved compacted backfill
8. Lay in and compact a layer of approved backfill maintaining a max depth of 300mm to the surface
9. Install ESB approved yellow marker tape. The max depth for the marker tape is 300mm from finished ground level
10. Reinstate final layer of backfill as per agreed LA/Land Owner Specification

3A Minimum Duct Spacings for ESB Ducts

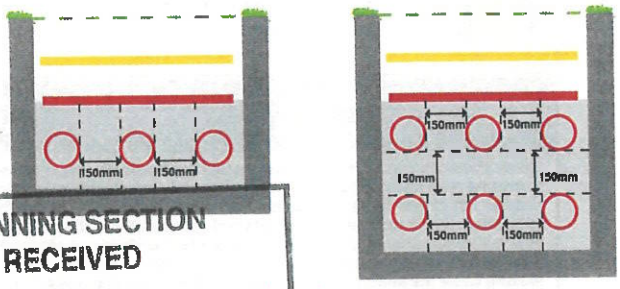
75mm minimum duct spacing for up to two ducts in any layer



Duct crossovers not allowed at any point along route.

3B Minimum Duct Spacings for ESB Ducts

150mm duct spacing required for more than 2 ducts in any layer

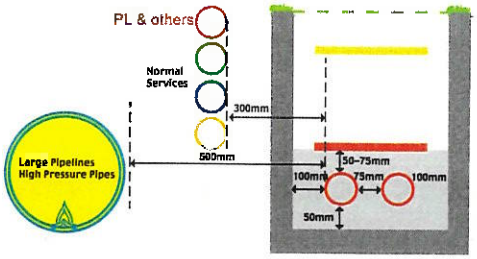


Duct crossovers not allowed at any point along route.

Standard Specification for ESB MV/LV Networks Ducting (Minimum Standards) cont.

3C Minimum Duct Spacings for ESB Ducts

Minimum duct to trench wall clearances and minimum bedding depths

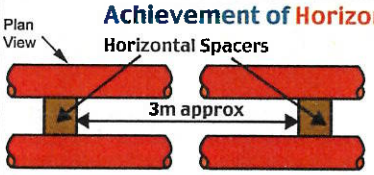


Minimun duct to trench edge clearance is 100mm and minimun bedding depth is 50mm

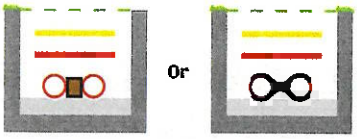
NB: 50mm minimum depth of compacted approved backfill above duct top

3D Minimum Duct Spacings for ESB Ducts

Achievement of Horizontal Duct Spacing



Use 75mm or 150mm temporary timber, brick or plastic spacers as appropriate to establish horizontal duct spacing during construction



NB Use 300mm or 600mm horizontal spacers to achieve horizontal spacing from other utilities as appropriate

Timber/Brick Spacer

Customised 75mm or 150mm Plastic Horizontal Spacer

Always keep a stock of 300mm, 150mm & 75mm spacers for ESB Trenching

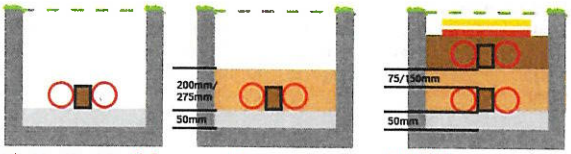
3E Minimum Duct Spacings for ESB Ducts

Achievement of Vertical Duct Spacing

STEP 1
Lay in Ducts and horizontal spacer
Lay in 50mm bedding Layer

Step 2
Lay in and compact approved backfill to 200/275mm depth depending on spacing in 3A/3B above

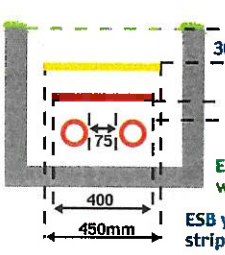
Step 3
Check depth of approved backfill above 1st duct layer and lay in 2nd layer of ducts and spacers on top of sand layer



NB. Vertical Duct Spacers are not allowed anywhere as they create point loading of ducts. Refer to 3A/3B for spacings in specific situations

4A Installation of: Special ESB marked Yellow Marker Tape and Special ESB marked Red Marker Strip in Carriageways

ESB yellow marker tape and red marker strip is to be used on all carriageways and on grassed areas for both LV & MV cables



300mm Maximum for ESB yellow marker tape

75mm minimum above duct for ESB red marker strip.

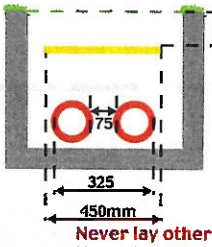
ESB yellow marker tape and red marker strip widths must always be wider than ducts beneath

ESB yellow marker tape and ESB red marker strip must never be laid directly on top of ducts

Never lay other utility marker tape or strip over ESB ducts
Never lay ESB marker tape or strip over other utility pipes

4B Installation of Special ESB marked Yellow Marker Tape in all Footways

ESB approved yellow marker tape to be used on all Footways



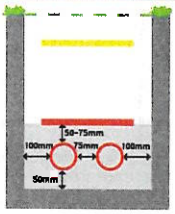
300mm Maximum for ESB yellow marker tape

ESB yellow marker tape width must always be wider than width of ducts beneath

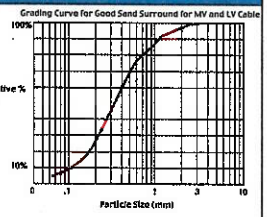
ESB Yellow marker tape must never be laid directly on top of ducts

Never lay other utility marker tape or strip over ESB ducts
Never lay ESB marker tape or strip over other utility pipes

5 Specification for duct surround material



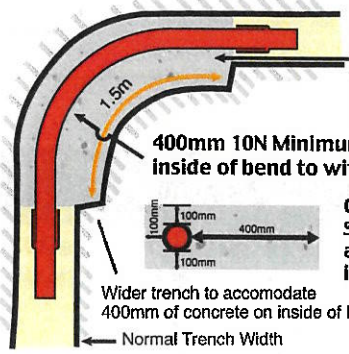
The thermal resistivity of the duct surround material must be maximum1.0km/watt @0% moisture content. Only ESB approved unwashed sand graded to BS882 standard or equivalent ESB approved material is acceptable.



Duct surround material must be well compacted around ducts without damaging the ducts

NB: Pea gravel and foam concrete are unacceptable ESB duct surround materials

6A Specification for Installation of Ducts at sharp route bends

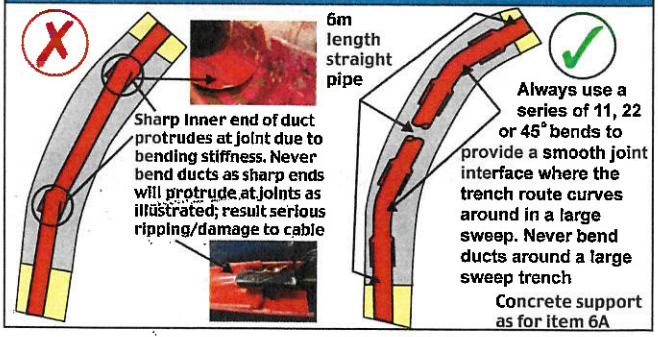


ESB Approved Long Radius Bend (minimum Duct Bend Radius 1.2 Metres) Bends less than 1.2 m radius are unacceptable

400mm 10N Minimum strength concrete on inside of bend to withstand cable pulling forces

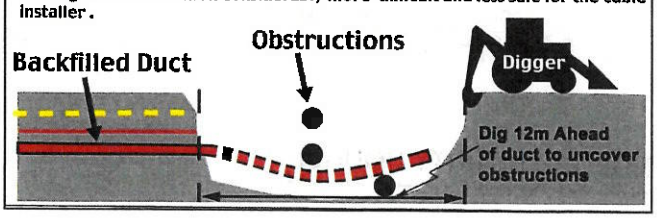
Cross Section at bend Showing concrete support all around the duct and increased trench width

6B Specification for Installation of Ducts at Gentle sweep bend positions



7 Obligation of Duct Installer to minimise the number and severity of duct bends

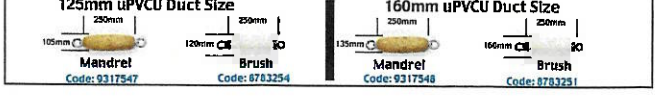
The duct installer must minimise the number and severity of preformed bends in ground with obstructions and other utility service crossings by opening ground 12m ahead of backfilled duct, wherever practical to do so. This safety obligation, which may require use of steel plating, allows the duct installer to pick the least bendy duct route through utility crossings and obstructions. Otherwise, numerous sharp unrecorded duct route deviations will be present making cable installation considerably more difficult and less safe for the cable installer.



8 Standard for Brushing, Mandrelling Roping and End-capping of MV/LV Ducts

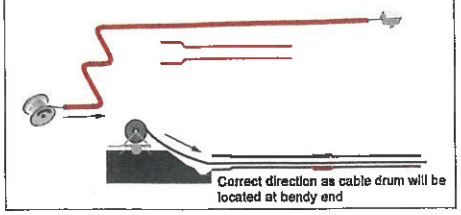
All Ducts must be:
- Thoroughly brushed and mandrelled to prove ducts against debris /excessive deflection
- Roped using 12mm polypropilene rope with certified safe breaking load of 1.6 tons – all rope joints to be properly spliced and PVC taped over. Approved Supplier Silver Strand Bunclana Donegal, ph (074) 9382503 - 500m drum lengths available to minimise splicing/coil handling
- Sealed using endcaps against grit and water getting into them
  NB: Replace mandrels once mandrel wear indicators or grooves are worn down
  Replace brushes once brush diameter falls 5mm below dimensions in table below
- Approved endcaps, both disposable and reusable types, are available from suppliers of approved ESB ducting
- Approved ESB Mandrel and brush suppliers :

Brandon Agencies, Rathmew, Co Wicklow: Phone 0404 20500 (Brushes & Mandrels)
IS Varian, Greenhills Industrial Estate, Walkinstown, Dublin 12 Phone: 01-4501150 (Brushes Only)
Clydesdale UK Phone 086 172 6665 (Brushes & Mandrels)
Tynagh Network Systems, Loughrea, Co Galway. Phone: 091 842206 (Brushes & Mandrels)



9 Guidance on Correct Direction to Lay Spigot and Socket Ducting

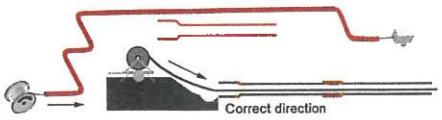
Case 1 Duct run with all bends at one end



Case 2 (a) Bendy no matter which side route is looked at

No best direction to lay ducts

Case 2(b) More bends at one end than the other



Case 3 Trenching routes longer than 500m

Treat any route as a series of lengths between joint bays at say 500m intervals and lay ducting as for Case 1 & 2 above

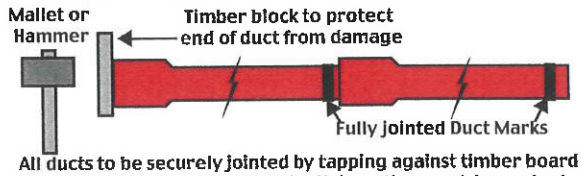
If on large sloping route lay as shown

10 Approved ESB Ducting for MV/LV Cables

- Use only solid wall high impact resistance ESB approved PVC red ducting to IS 370 colour standard and ESB specification 16113 (3.8mm minimum wall thickness) Discoloured or unidentified ducting not acceptable. All duct material must be approved by ESB Networks.
- Lightweight flexible corrugated twinwall ducting is not acceptable to ESB irrespective of manufacturer

- Current approved Duct and duct bend manufacturers are: Lynplast (bend fittings only) Radius Systems, Wavin, Quality Plastics, MFP Plastics, Cork Plastics, Emtelle

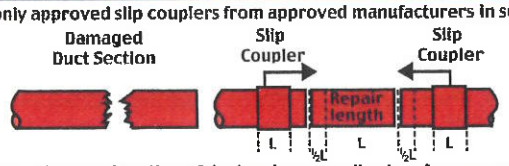
11 Specification for Duct Jointing for MV/LV Cables



All ducts to be securely jointed by tapping against timber board on each duct until the black depth insertion mark is reached

12 Repair of Existing Ducts

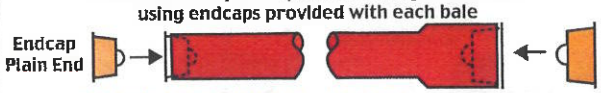
Use only approved slip couplers from approved manufacturers in section 9



- Cut out damaged section of duct and ensure all cut surfaces are square and free from sharp edges
- Slide, position and centre the repair couplers on the centering marks

13 Sealing of Ducts

All ducts to be permanently sealed at both ends of duct run
Ducts to be temporarily sealed during installation using endcaps provided with each bale

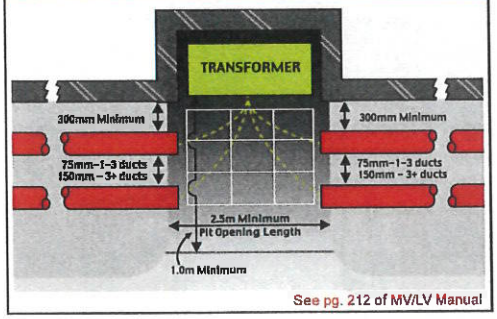


ESB Code 125mm: 9317583 ESB Code 160mm: 9317566

14A Cross-Sectional Drawing of Backfilling in Front of MV Sub

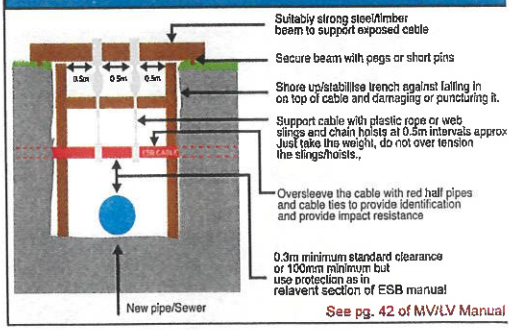
See pg. 213 of MV/LV Manual

14B Plan View of Ducting in Front of Substation



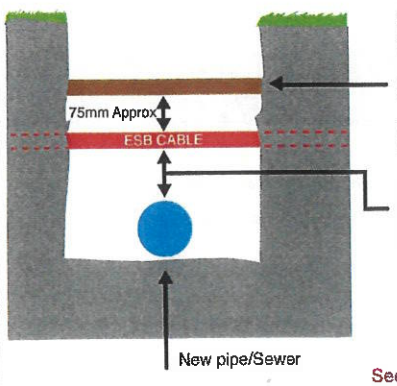
See pg. 212 of MV/LV Manual

17A Supporting ESB Cables/Ducts During Trenching Works



See pg. 42 of MV/LV Manual

17B Supporting ESB Cables/Ducts During Trenching Works



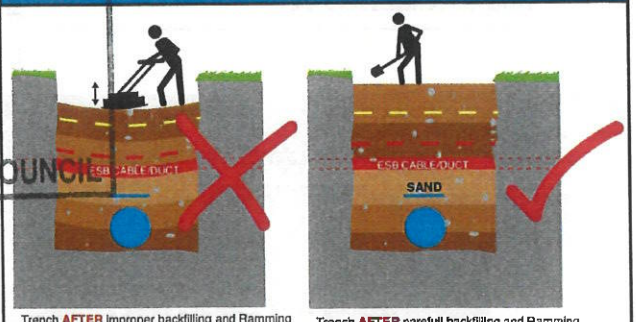
Key in timber plank (150mmx50mm) firmly into trench wall above ESB cable to protect it from falling debris/accidental contact etc

Remove plank prior to backfilling/reinstatement

0.3m minimum standard clearance or 100mm minimum but use protection as in Table 7 of ESB manual

See pg. 42 of MV/LV Manual

18 Avoidance of Cable Damage Due to Improper Backfilling at Cable Crossings



Trench **AFTER** improper backfilling and Ramming

Excessive deflection resulting in a shearing action at the trench walls and risk of cable or duct failure later.

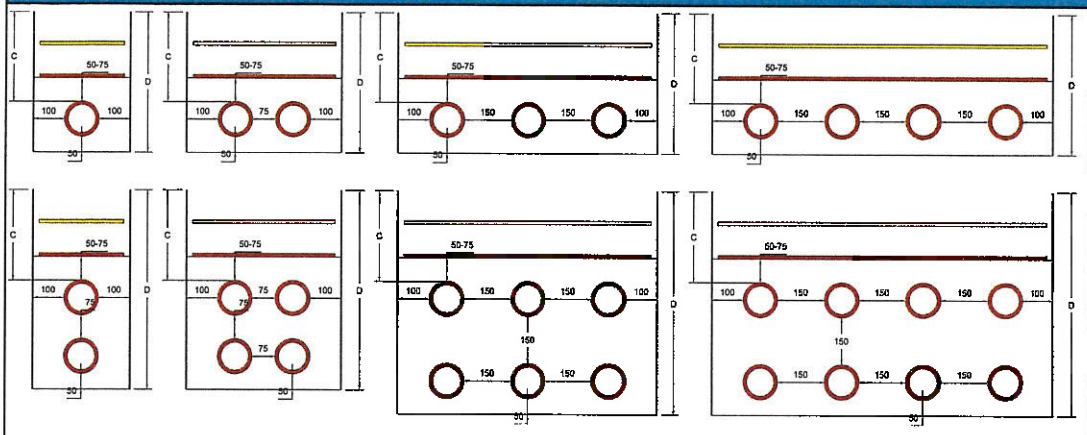
Trench **AFTER** careful backfilling and Ramming

Layers all round the cable to be hand tamped. Cable to be well supported by firm bed of sand beneath the cable. No compaction machinery directly over cable/duct for 300mm minimum distance

Result : Very little cable deflection and shearing at edges of trench

See pg. 44 of LV/MV Manual

19 MV/LV Trench Dimensions & Duct Clearances for 125mm Ducting Layouts



Minimum Trench Widths for 1 & 2 Rows of Ducts

No. Of Ducts in Row	1	2	3	4	5	6
Minimum Trench Width	325	525	875	1150	1425	1700

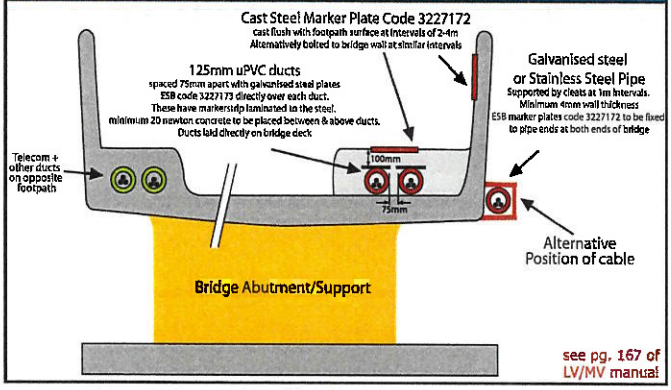
Minimum Trench & Duct Depths for 1 Horizontal Row of Ducts

Location of Trench	New Housing Scheme Footpath, road & Grass Areas in Vicinity	Existing Footpaths	Existing or New Roads Other Than New Housing Scheme	Farmland, Forestry tracks & Bogland
Minimum Trench Depth (D)	775	625	925	925
Minimum Depth to top of Duct (C)	600	450	750	750

Minimum Trench & Duct Depths for 2 Horizontal Row of Ducts

Location of Trench	New Housing Scheme Footpath, road & Grass Areas in Vicinity	Existing Footpaths	Existing or New Roads Other Than New Housing Scheme	Farmland, Forestry tracks & Bogland
Minimum Trench Depth (D)	975	825	1125	1125
	1050	900	1200	1200
Minimum Depth to top of Duct (C)	600	450	750	750

20A Bridge Crossings: Restricted Footpath Designs



see pg. 167 of LV/MV manual

20B Bridge Crossings: Restricted Footpath Designs

1. The design must be agreed with the bridge authority. Position in footpath is preferred.

2. Minimum cover over ducts on footpath 100mm.

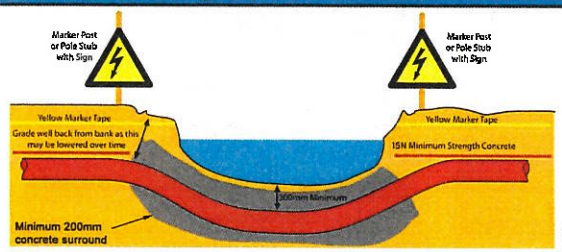
3. Where duct cover is > 300mm, marker strip & surface marker plates can be used.

4. Red uPVC ducting is not suitable for cable run external to bridges.

5. Where possible galvanised steel/stainless steel piping should be used, all joints must be free of weld burrs on inside. Alternatively heavy duty 10mm wall thickness black HDPE material with cast steel marker plates attached must be used to permanently warn of presence of electric cable.

see pg. 167 of LV/MV manual

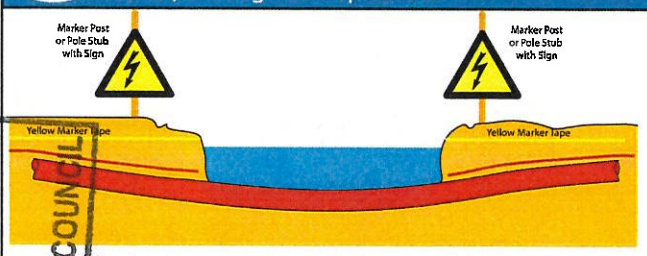
21A River/Stream Crossings: Standard Where Burial/Drilling is possible



1. Depth of burial below bottom of river or stream to be agreed with relevant authority (if applicable)
2. If normal red ducting is installed by trenching, it must be encased in CBM4 (15N after 7 days) concrete to prevent uplift and to provide mechanical protection. Seal any joints to prevent concrete entering duct.
3. If drilled crossing is practical, use heavy red wall coiled HPPE duct (sections 2.2 & 2.9 in MV/LV manual)
4. Install an ESB marker post on both sides of the crossing - ESB code 8327355 or use stub pole minimum 2.0m above ground level & warning sign 8238339.
5. Where circumstances require it a large steel pipe can be installed, into which a number of standard ESB duct sizes are pulled in (see section 2.9.4 of MV/LV manual for guidance)
6. If crossing a tidal area, a foreshore licence will be required.

See pg. 168 of LV/MV manual

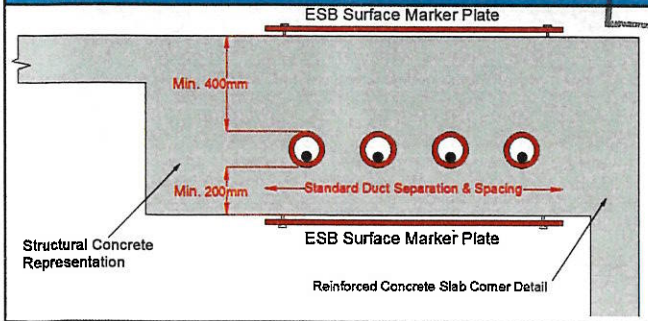
21B River/Stream Crossings: Standard Where Burial/Drilling is not possible



1. Installation on base of river or stream to be agreed with relevant authority (if applicable)
2. Heavy wall steel pipe to be used free of weld beads/swarf. Minimum 8mm steel wall thickness to be used. Encase in CBM4 (15N after 7 days) concrete for corrosion protection, minimum 100mm surround
3. Install an ESB marker post on both sides of the crossing - ESB code 8327355 or use stub pole minimum 2.0m above ground level & warning sign 8238339.
4. Ensure a smooth connection using rubber coupler between crossing pipe size and ESB standard duct as the steel pipe size will usually differ from the standard ESB ducting. Alternatively run ESB ducting right through the steel pipe.
5. If crossing tidal area, a foreshore licence will be required.

See pg. 168 of LV/MV manual

22A Minimum Standard Over Basements/Carparks



22B Minimum Standard Over Basements/Carparks

Minimum depth of duct is 400mm.

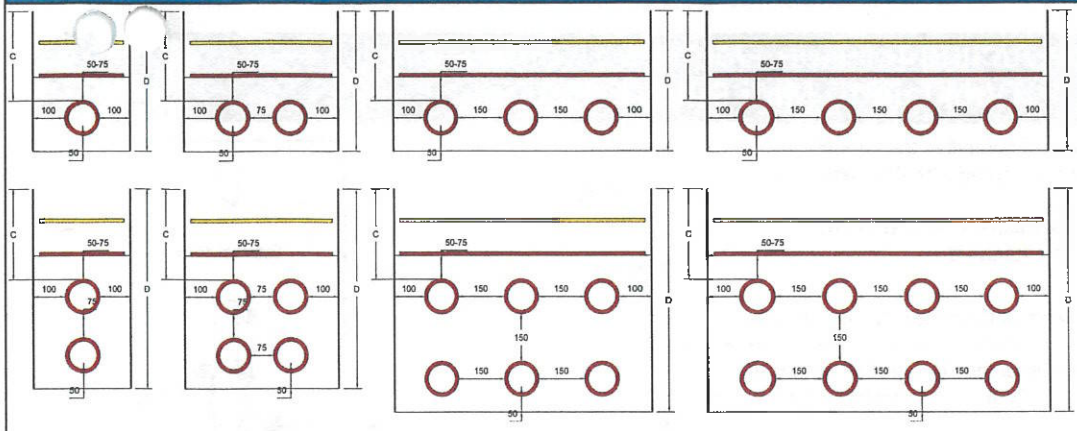
Minimum thickness from bottom of duct to underside of slab is 200mm.

ESB suface marker plates are to be placed at approximate intervals of 3 metres on the top and bottom surfaces of the slab.

Marker plates are to be cast level with the surface and screwed down to to avoid lift off (ESB code: 3227172)

For ESB Ducts concrete surround - same strength for entire slab

23 MV/LV Trench Dimensions & Duct Clearances for 160mm Ducting



Minimum Trench Widths for 1 & 2 Rows of Ducts

No. Of Ducts in Row	1	2	3	4	5	6
Minimum Trench Width	360	595	980	1290	1600	1910

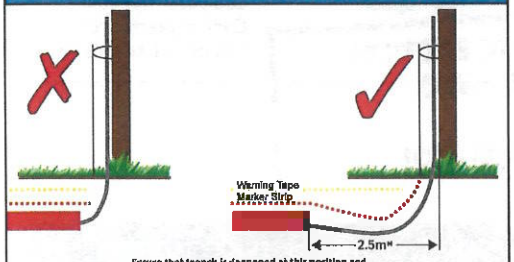
Minimum Trench & Duct Depths for 1 Horizontal Row of Ducts

Location of Trench	New Housing Scheme Footpath, road & Grass Areas in Vicinity	Existing Footpaths	Existing or New Roads Other Than New Housing Scheme	Farmland, Forestry tracks & Bogland
Minimum Trench Depth (D)	810	660	960	960
Minimum Depth to top of Duct (C)	600	450	750	750

Minimum Trench & Duct Depths for 2 Horizontal Row of Ducts

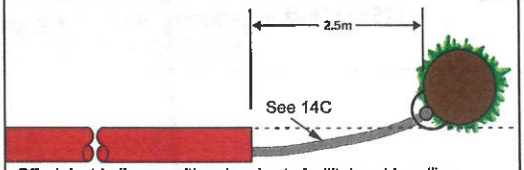
Location of Trench	New Housing Scheme Footpath, road & Grass Areas in Vicinity	Existing Footpaths	Existing or New Roads Other Than New Housing Scheme	Farmland, Forestry tracks & Bogland
Minimum Trench Depth (D)	1045	895	1195	1195
	1120	970	1270	1270
Minimum Depth to top of Duct (C)	600	450	750	750

24A MV Cable End Pole Position - Elevation



See pg. 122 of LV/MV manual

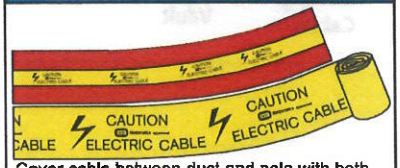
24B MV Cable End Pole Position - Plan View



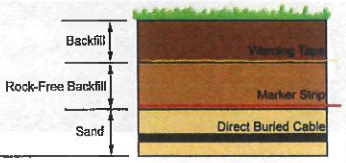
Offset duct to line up with pole edge to facilitate cable pulling.
Never install ducting right up to pole base with long radius bend attached.
Both marker strip & warning tape to be used between duct & pole.
Take precautions to prevent pole toppling.

See pg. 211 of LV/MV manual

24C MV Cable End Pole - Marker Strip/Tape

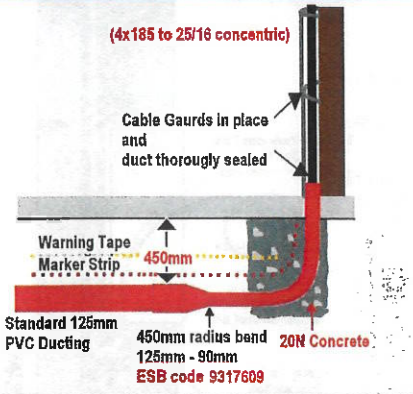


Cover cable between duct and pole with both Marker Strip and Warning Tape.



24D LV Cable End Pole Position - Elevation

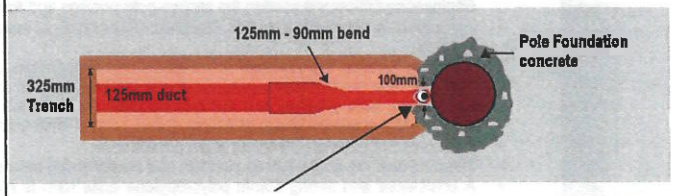
Ducting For LV Mains and LV Service Cable



24E LV Cable End Pole Position - Plan View

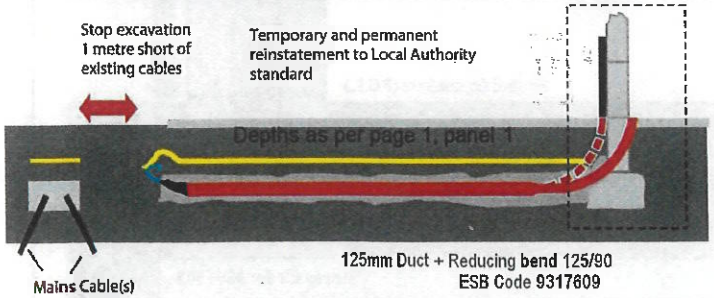
Ducting for LV Mains and LV Service Cable

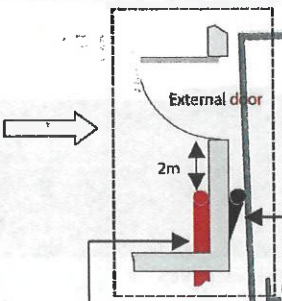
(4x185 to 25/16 Concentric)



1. Cut channel into pole concrete foundation to allow for the vertical section of the duct bend to lie against the pole
2. Place duct bend into position
3. Backfill and support bend with 20N concrete mix as per elevation view

25 A LV Ducting for Non Domestic Connections Duct laid to Mains Cable





General Note for all Cases:

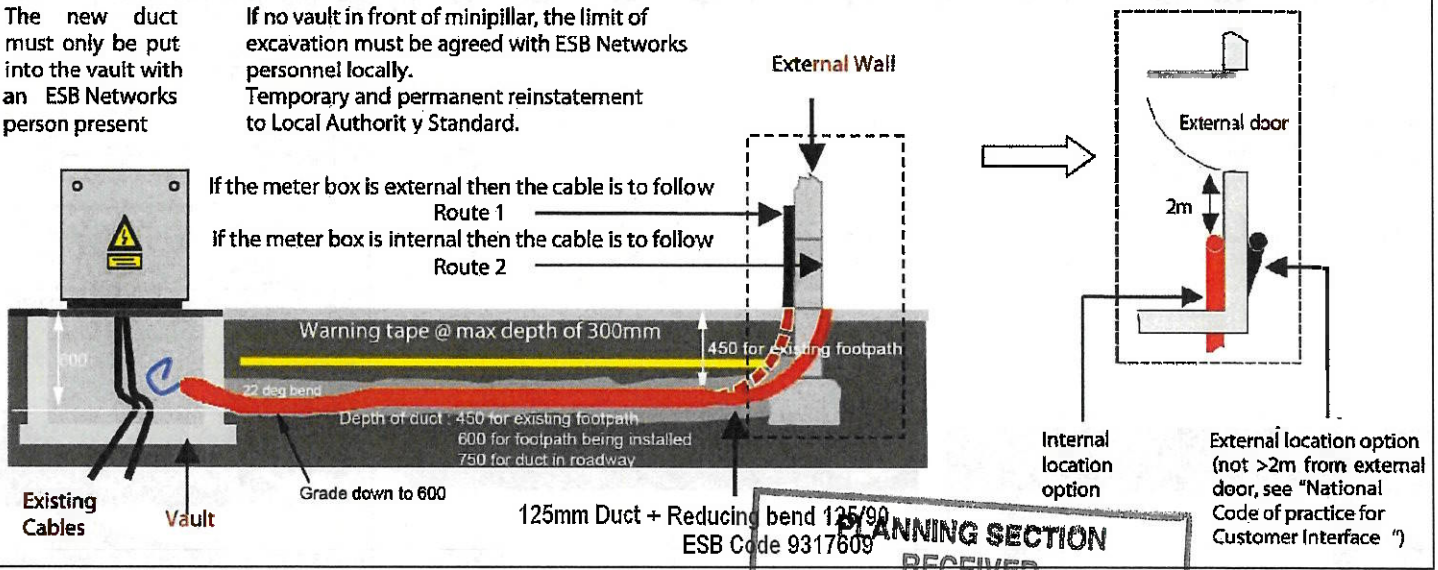
1: Excavation within 1 metre of existing cables must only be carried out by hand and with agreement of the local ESB Networks office. This is to prevent damage to existing cables and consequent safety risk for workers.
2: Liaise with ESB Networks to confirm location of all cables.

All Excavation work to be in accordance with HSA Code of Practice

25B LV Ducting for Non Domestic Connections
Duct laid to Mini Pillar Location

The new duct must only be put into the vault with an ESB Networks person present

If no vault in front of minipillar, the limit of excavation must be agreed with ESB Networks personnel locally.
Temporary and permanent reinstatement to Local Authorit y Standard.



26 Specification for Standard Non-Scheme Domestic Underground Service to an Outdoor Meter Cabinet (low-voltage service not exceeding 60m) from an Overhead Network

ESB Networks

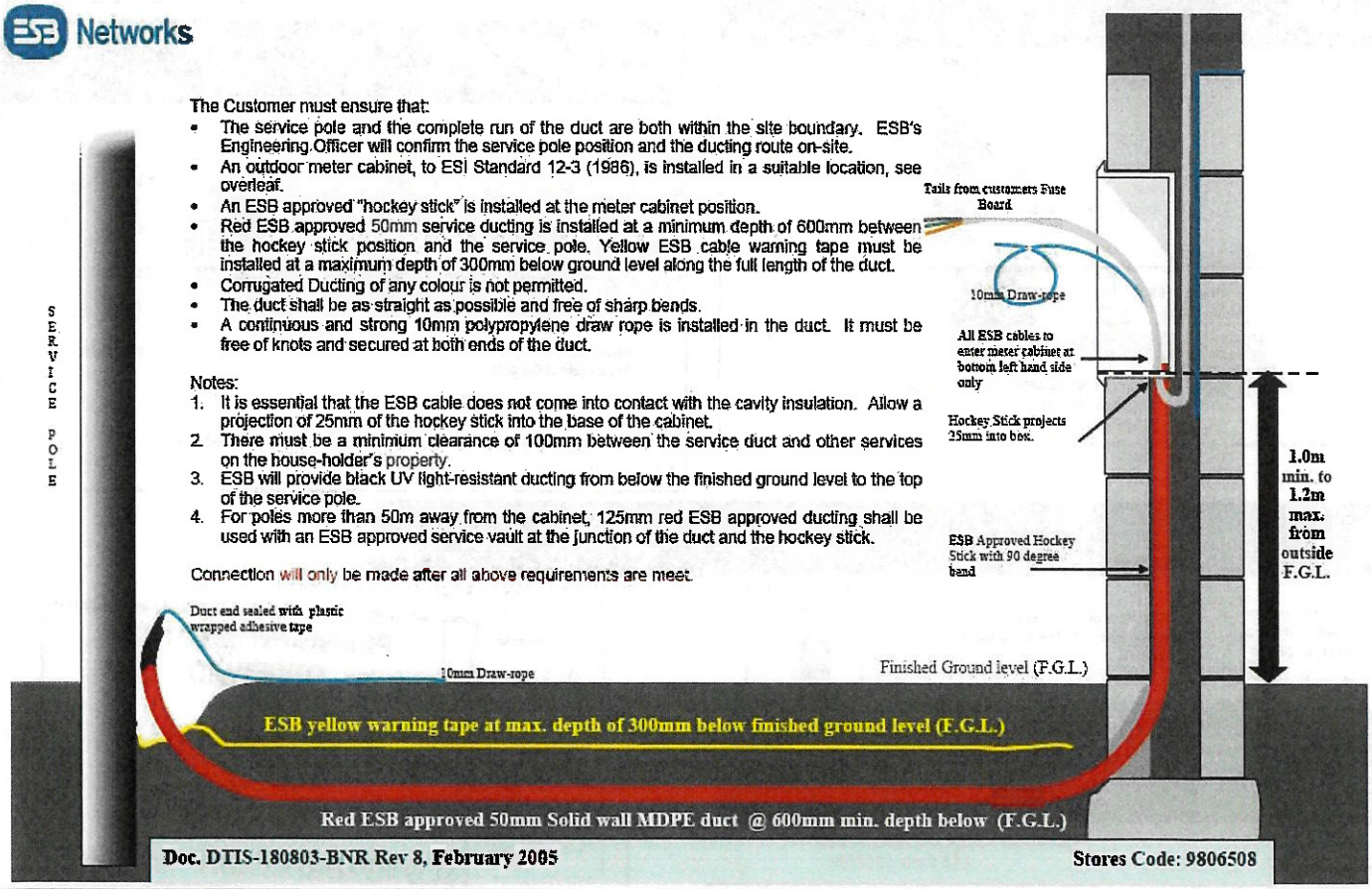
The Customer must ensure that:

- The service pole and the complete run of the duct are both within the site boundary. ESB's Engineering Officer will confirm the service pole position and the ducting route on-site.
- An outdoor meter cabinet, to ESI Standard 12-3 (1986), is installed in a suitable location, see overleaf.
- An ESB approved "hockey stick" is installed at the meter cabinet position.
- Red ESB approved 50mm service ducting is installed at a minimum depth of 600mm between the hockey stick position and the service pole. Yellow ESB cable warning tape must be installed at a maximum depth of 300mm below ground level along the full length of the duct.
- Corrugated Ducting of any colour is not permitted.
- The duct shall be as straight as possible and free of sharp bends.
- A continuous and strong 10mm polypropylene draw rope is installed in the duct. It must be free of knots and secured at both ends of the duct.

Notes:

1. It is essential that the ESB cable does not come into contact with the cavity insulation. Allow a projection of 25mm of the hockey stick into the base of the cabinet.
2. There must be a minimum clearance of 100mm between the service duct and other services on the house-holder's property.
3. ESB will provide black UV light-resistant ducting from below the finished ground level to the top of the service pole.
4. For poles more than 50m away from the cabinet, 125mm red ESB approved ducting shall be used with an ESB approved service vault at the junction of the duct and the hockey stick.

Connection will only be made after all above requirements are meet.



ENVIRONMENTAL

Appendix 2C

SAFE SYSTEM OF WORK PLAN (SSWP)

HEALTH AND SAFETY AUTHORITY

WORKING ON ROADS

Plan No. ☐

PART 1

Job Details	Resources Required	Emergency Details
Employer Name: _____	Worker Skills: _____	Contact Names & Tel No.
Responsible Person/Supervisor: _____	_____	1. _____
Number of Workers: _____	_____	2. _____
Specific Location: _____	_____	3. _____
Description of Works: _____	Plant/Equipment: _____	First Aider: _____
_____	_____	_____
_____	_____	Location of First Aid Box:
_____	_____	_____
Start Date: _____	Hazardous Materials: _____	**WORK PERMITS REQUIRED**
NOTE: A new SSWP must be completed when the task or the environment changes.	_____	Hot ☐ Electricity ☐ Excavation ☐
	_____	Confined Space ☐ Other ☐
		Method Statement Yes ☐ No ☐

Before Works Starts the following MUST be in place Tick the ✓ circle when confirmed

PART 2

SELECT HAZARD OR ACTIVITY | **SELECT CONTROL** — All controls identified below must be in place before work starts

Tick the ☑ box to identify controls required; Tick the ✓ circle when control is in place.

LA1

PART 2

HAZARD OR ACTIVITY	CONTROL — Tick the ☑ box to identify controls required; Tick the ✓ circle when control is in place.									
Excavation	Batter Back	Trench Box	Sheet Piling	Shoring	Environment Risk Assess	Back Fill	Spoil Back	Chock	No Undermining	Ladder/ Access/Egress
	Exclusion Zone	Barriers	Covers	Pumping	Safe Stacking	Propping	Lighting	Examination & Inspection	Weather	Warning Signs
Falls and Falling Objects	Risk Assess	Scaffolding	Working Platform	Trestle Platform	Edge Protection	MEWP	Safe Ladder	Tie Ladder	Open Holes	Propping
Sewers/Culverts/ Mains/Services	Service Supplier	Divert / Off	Survey Map	Detect & Mark	Permit to Work	Hand Dig	Over Head Lines	Barriers	No Flames	Gas Bottle Storage
Working Close to Water	Edge Protection	Working Platform	Safety Line/Grab Line	Personal Floatation Device	Life Ring	Boat	Fall Arrest & Rescue	Diving	Coffer Dam	Platform & Crane
Substances	Storage/Labels	Safety Data Sheet	Hand Wash	No Eating	Biological Agents	Survey/Risk Assess	Permit to Work	Litter Picker	Cover Cuts	Wash Hands
Asbestos Cement Water Pipes	Identity/Survey	Risk Assess	Procedure	Dust/Wetting	Waste Removal	Examination & Inspection	Confined Space	Risk Assess	Survey	Permit to Work
Other Items	Housekeeping	Lighting	Ground Conditions	Degassing/Purging	Steel Structures/ Drawings	Fire Control/Assembly	Emergency Procedures	Detect/Monitor	Tripod	Communication
Health	Assess Health Effects	Health Surveillance	Manual Handling	Risk Assess	Mechanical Aids	Work Organisation	Training	Identify	Other	Other
PPE	Safety Helmet	Safety Boot/Hi-Vis	Eye Protection	Safety Gloves	Ear Protection	Dust Mask	Respiratory Equipment	Face Protection	Safety Harness	Other

PART 3

Hazards, activities and controls on this SSWP identified by: _____ **Date:** _____ **Time:** _____

Controls put in place by: _____ **Date:** _____ **Time:** _____

I have been made aware of the hazards & controls for this activity. **Signed by Team:**

NOTE: **This list of Hazards and Controls is not exhaustive and is in no particular order.**

IF IT'S NOT SAFE DON'T DO IT AND INFORM SITE MANAGEMENT