



## **APPENDIX 4-10**

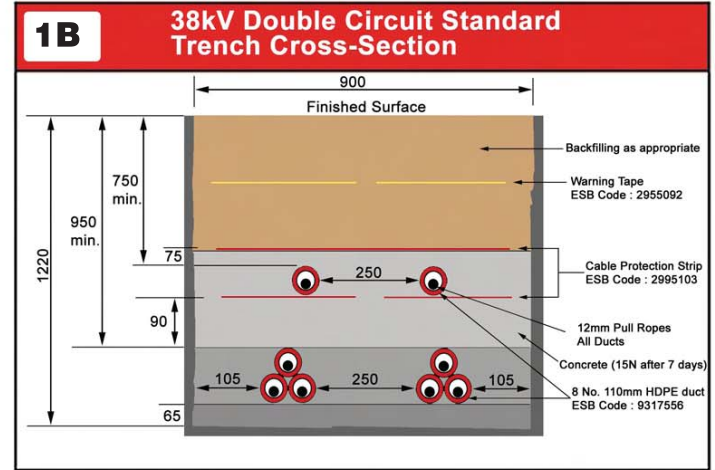
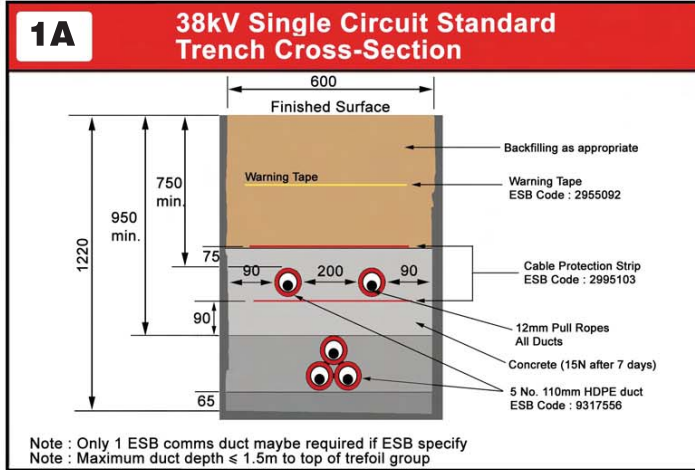
***EIRGRID STANDARD  
SPECIFICATION***

## Networks Ducting/Cabling (Minimum Standards)

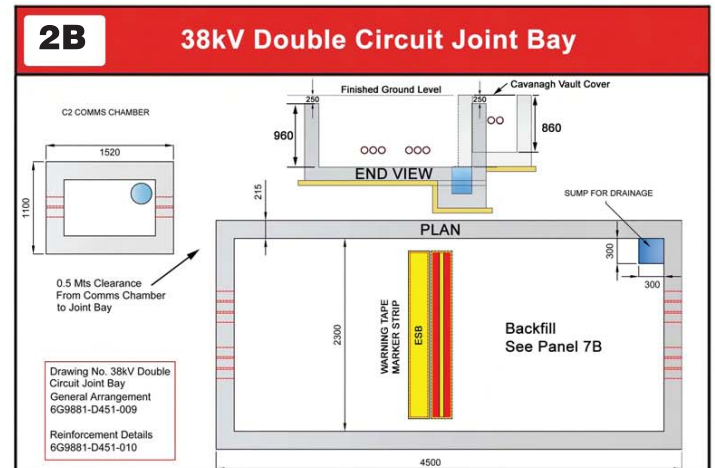
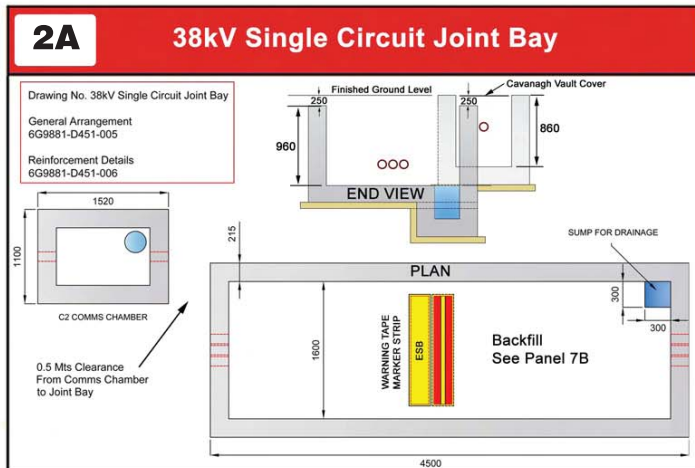
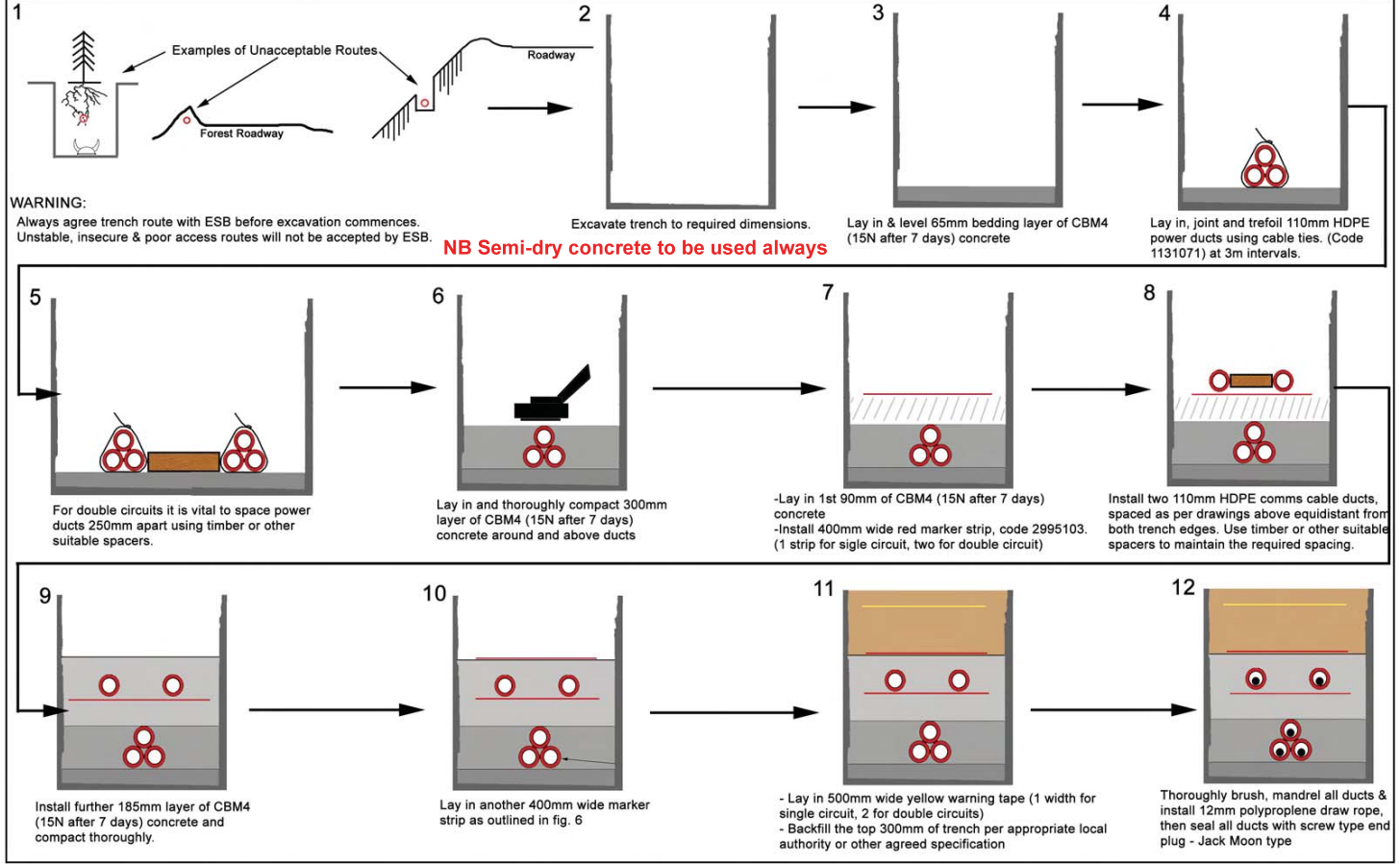
Note 1 : ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions

Note 2 : Refer to ESB Networks for Specific job Specification. These instructions do not apply to LV/MV/110kV/220kV cable

Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials

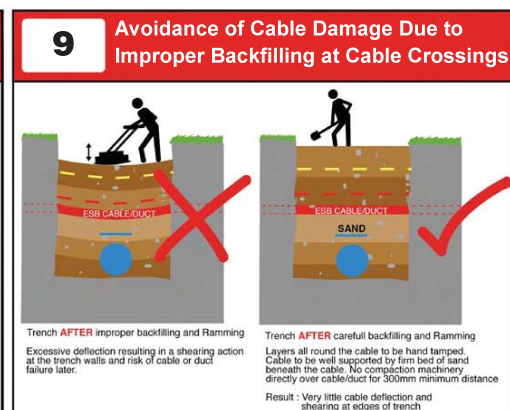
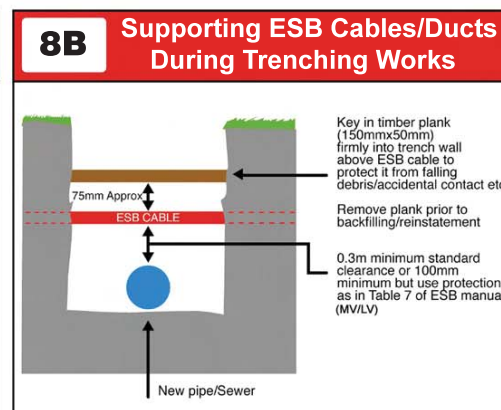
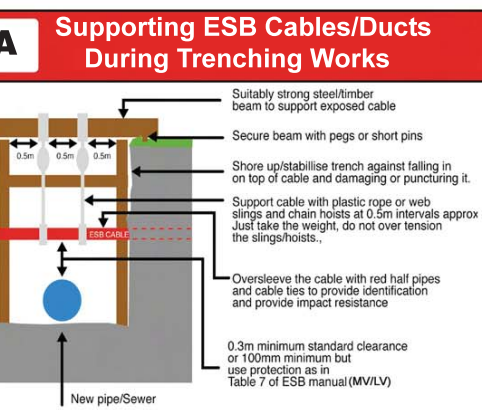
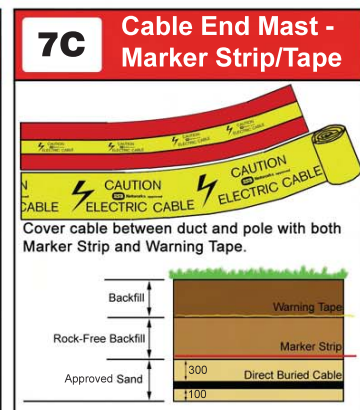
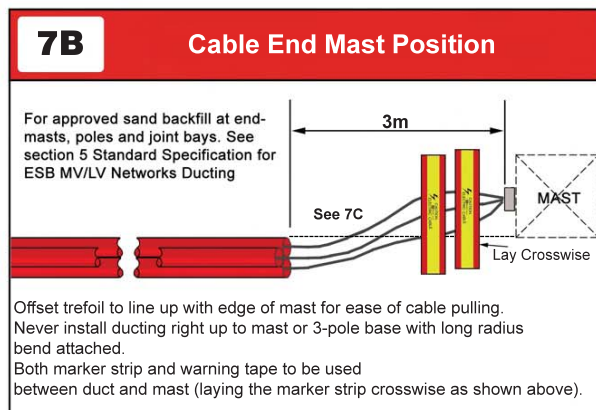
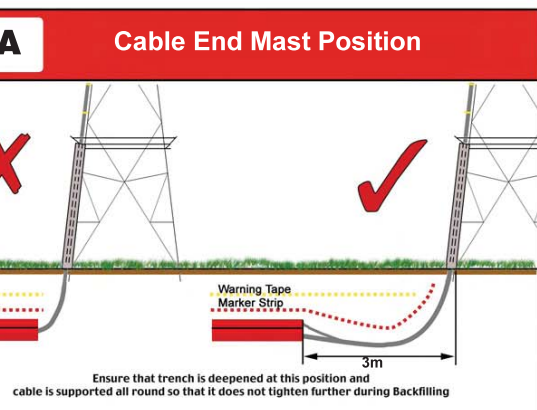
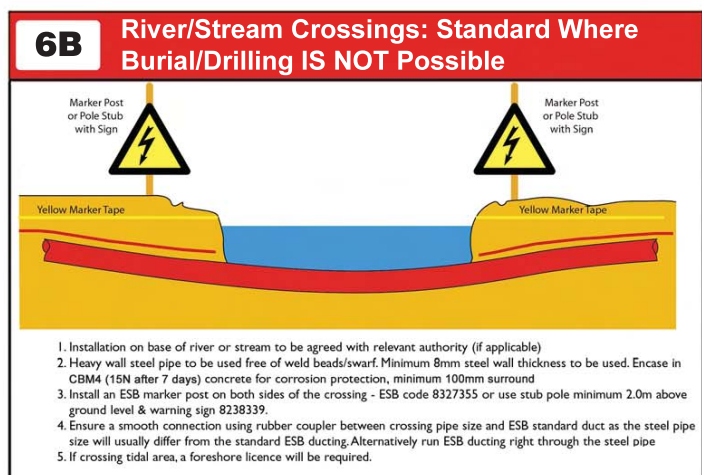
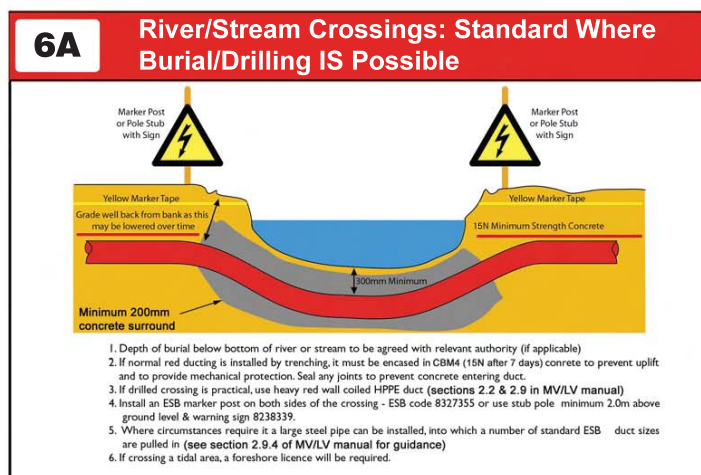
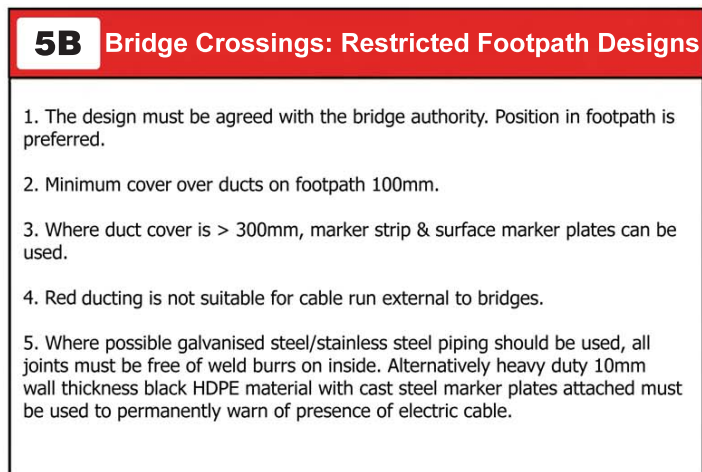
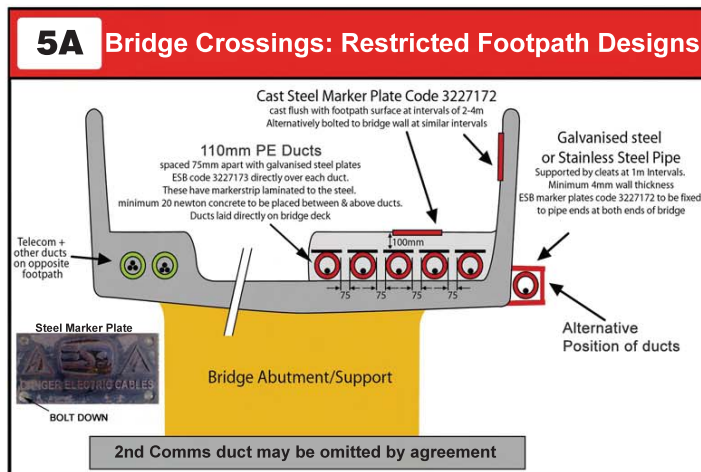


### 1C Trench Installation Sequence



# Standard Specification for ESB 38kV Networks Ducting/Cabling (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 LV/MV/110kV/220kV cable  
 Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials



## Networks Ducting/Cabling (Minimum Standards)

Note 1 : ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions  
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### 3A End Mast Termination

For existing 9m masts increase steel work height by 1.3m at mast top

12m Mast (For all new works)

Anti-Climbing Guard

EARTH GRID

Cable Assembly Drawing Number : D205778

### 3B Triple Pole Structure

Made up anti-climbing guard

Cable Steel Work Code: 1286697

7m Min Dimension to Bare Metal Use 12m Pole

### 3C Station Termination

To Cubicle

If Cable run <50m install lightning arrestors.

Assess need for mesh screen guard (Code: 3175003)

Drg. No A3205856

Clearances : Phase to:  
 - Phase 500mm outdoor  
 - Earth 500mm outdoor

### 3D Earth Grids

10m PLAN

10m

3m approx.

1.5m

1.5m

12 Rod Earth Grid For 3-Pole Structure

12 Rod Earth Grid For Mast Structure

Warning Tape

500

300

Earth Grid resistances <10 Ohms. If ground is known to be high resistance, plan ahead and put additional earthwire into cable trench.

Drg. No. A4D 205343  
 PE424-D901-911-001-000

### 4A 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 15m 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.

Backfilled Duct

Obstructions

Digger

Dig 15m Ahead of duct to uncover obstructions

### 4B Standard for Brushing, Mandrelling, Roping and End-Capping of 38kV ducts

All Ducts must be:

- Thoroughly brushed and mandrelled to prove ducts against debris /excessive deflection
- Roped using 12mm polypropylene rope with certified safe breaking load of 1.5 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, Rathnew, Co Wicklow: Phone 0404 20500 (Brushes & Mandrels)  
 IS Varian, Greenhills Industrial Estate, Walkinstown, Dublin 12 Phone: 01-4501 150 (Brushes Only)  
 Clydesdale UK Phone 086 172 6665 (Brushes & Mandrels)  
 Tynagh Network Systems, Loughrea, Co Galway. Phone: 091 842206 (Brushes & Mandrels)

110mm HDPE Duct Size

250mm

85mm

Mandrel  
 Code: 9317546

100mm

Brush  
 Code: 8783255

Sponge  
 Code: 8783252

### 4C Approved ESB Ducting for 38kV Cables

- Use only solid wall high impact resistance ESB approved HDPE red ducting to IS 370 colour standard and ESB specification 16113 (6.3mm 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 HDPE Duct and duct bend manufacturers are:  
 Lynplast (bend fittings only), Uponor-Radius Systems, Wavin, Quality Plastics

### 4D Specification for Duct Jointing for 38kV Cables

Mallet or Hammer

Timber block to protect end of duct from damage

Long Coupler

Fully jointed Duct Marks

All ducts to be securely jointed by tapping against timber board on each duct until the black depth insertion mark is reached  
 Always smear duct lubricant on coupler rubber ring

### 4E Repair of Existing Ducts

Use only approved slip couplers from approved manufacturers in section 4C

Damaged Duct Section

Slip Coupler

Slip Coupler

Repair length

- 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

### 4F 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

Endcap Plain End

ESB Code 110mm: 9317569

### 10A 38kV Railway Crossing Details

Formal licence for crossing and approval required from CIE. Accurately record crossing location & erect marker posts.

### 10B Directional Drill/Thrust Bore Duct Bore Details

DESIGN 1

Alternatively use 2 x 37mm HDPE ducts for comms cables with C2 chamber on each side of the crossing to permit pulling along entire route. (See 10C)

Completed interstitial space to be bentonited thoroughly to maintain cable rating. Accurately record crossing location & erect marker posts.

### 10C Directional Drill/Thrust Bore Duct Bore Details

ALTERNATIVE DESIGN

Install 1 no. 200mm SDR 17.6 duct with 3 no. short length cables pulled into this pipe along with 2 x 37mm comms ducts. Full cable joint bays are required on either side of crossing along with C2 chambers for this design. This method is used where it is not practical to install large diameter pipe -eg. risk of ground upheaval or presence of obstructions. Completed interstitial space to be thoroughly bentonited to maintain cable rating. Accurately record crossing location & erect marker posts.

### 10D Double Circuit Bore Crossing

Standard Design

Separate drilling for each circuit crossing

Alternative

2 no. sets of 110mm HDPE ducts - 8 ducts in total. All crossings to be accurately recorded and signposts erected given impracticality of marker tape. If both circuits = 40MVA then use 630 Cu cable

### 12 Minimum Standard Clearances to Other Services

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

### 13 Combined MV & 38kV Cable Runs

Where it is impractical to avoid such trench runs, the separation of 300mm should be strictly controlled and monitored to minimise derating (See MV/LV manual page 180)

### 14 Sealing and Protection of 38kV Cables Once They Exit Ducts

Ducts to be thoroughly using ESB approved water sealant and 4hr fire rating approved for firestop. NB - All joint bay duct entries to be thoroughly sealed to prevent sand washout and subsidence.

### 15 Duct Crossovers Are Not Allowed

Eliminate this possibility by marking ducts 1, 2, 3 etc before & after flattening to avoid an obstruction.

NB. If using double circuit, tape mark power ducts 1 to 6

### 16 Crossing Dumps/Contaminated Ground

NB. Avoid whenever possible due to: Subsidence, methane gas & severe thermal derating risks. Seek advice from ug networks section to ensure rating of cable is adequate (derating of 50% can occur) NB. Waste oils and chemicals can also seriously damage cables

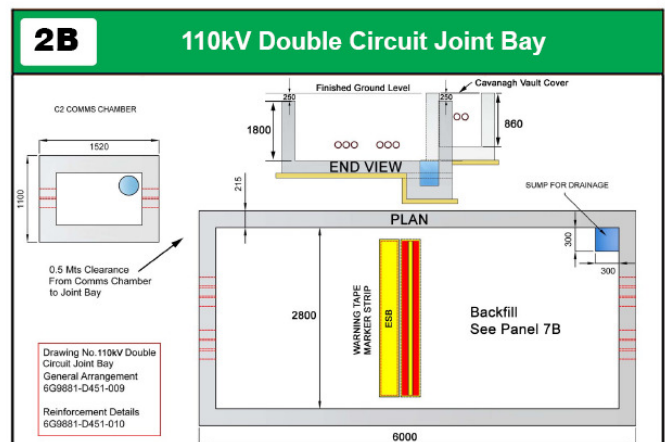
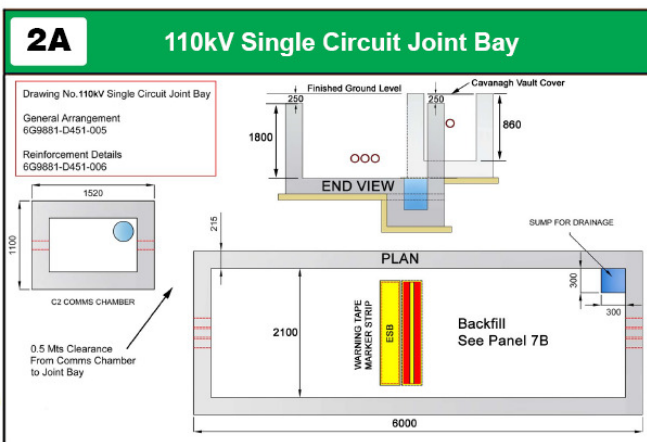
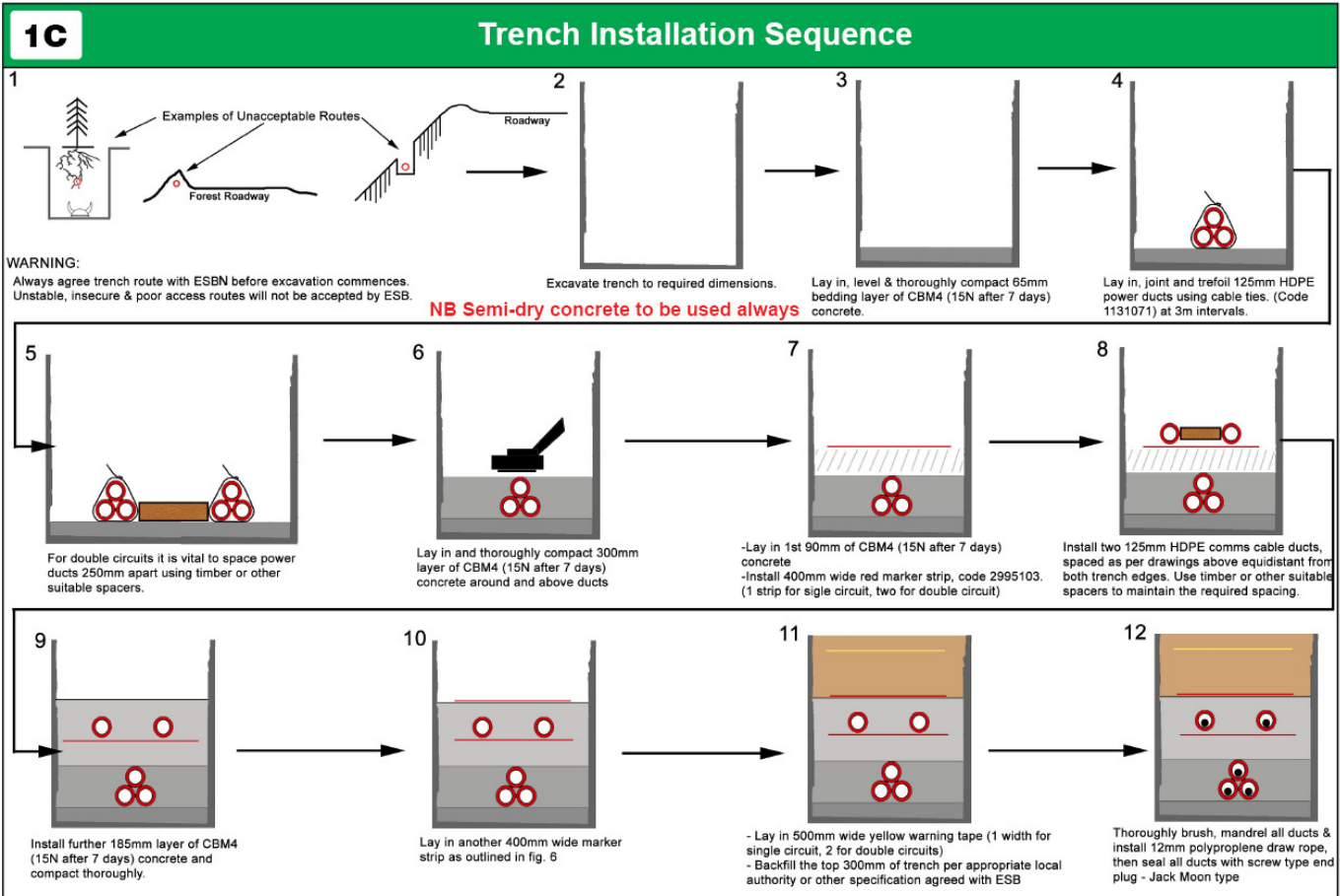
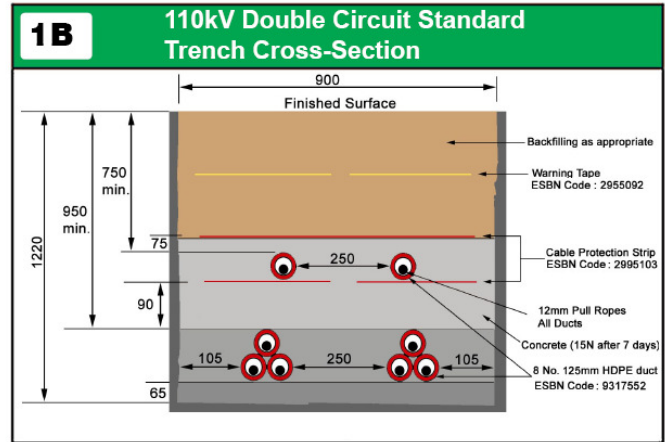
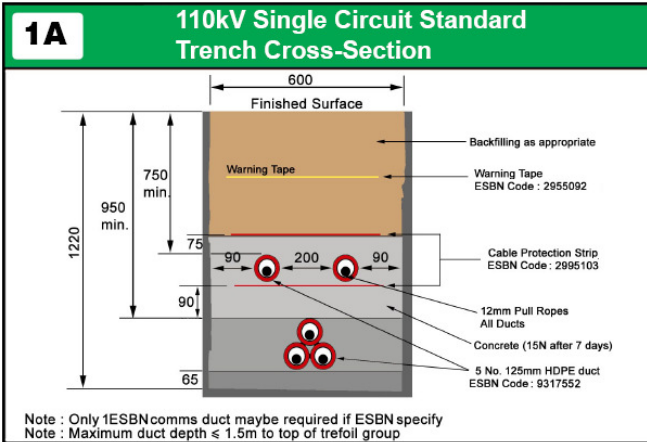
Seal all duct joints with duct adhesive compound or use continuous duct lengths & seal all duct ends in joint bays. Alternatively weld pipes.

## Networks Ducting/Cabling (Minimum Standards)

Note 1 : ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions  
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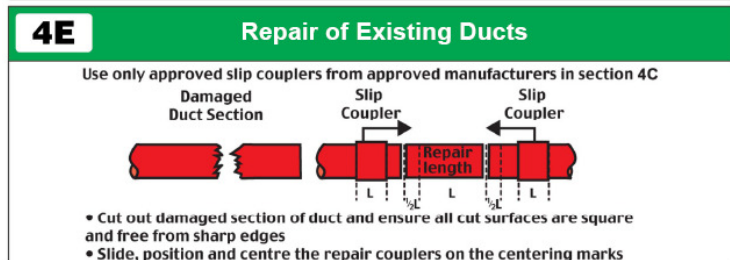
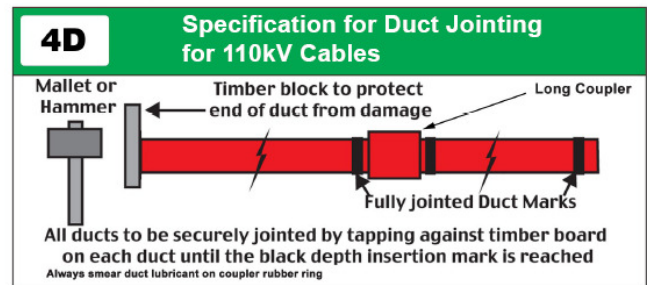
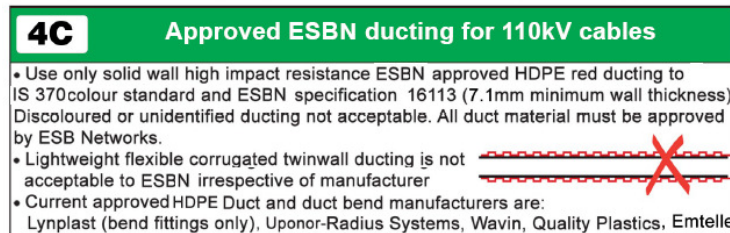
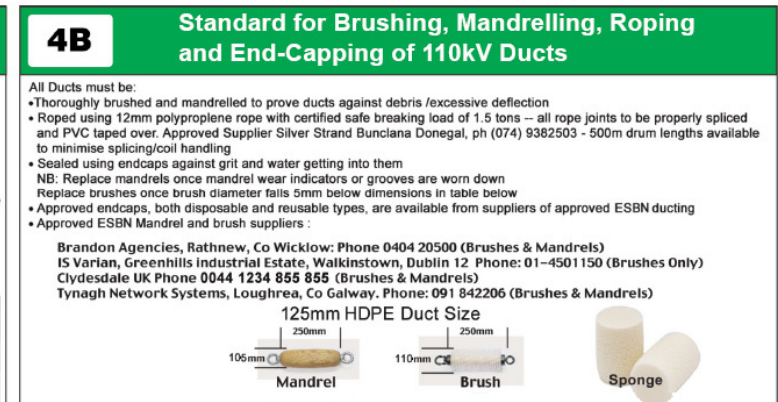
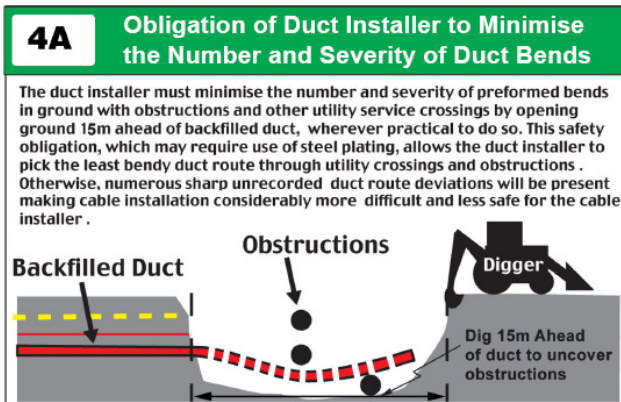
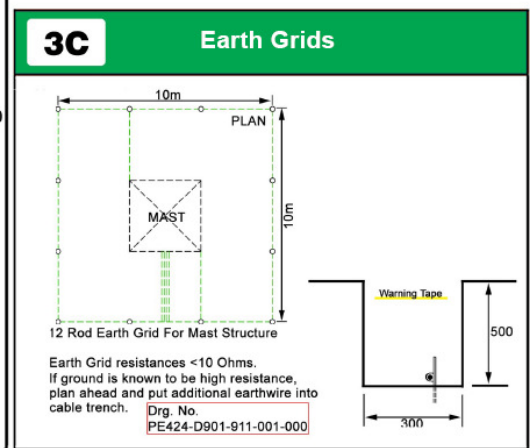
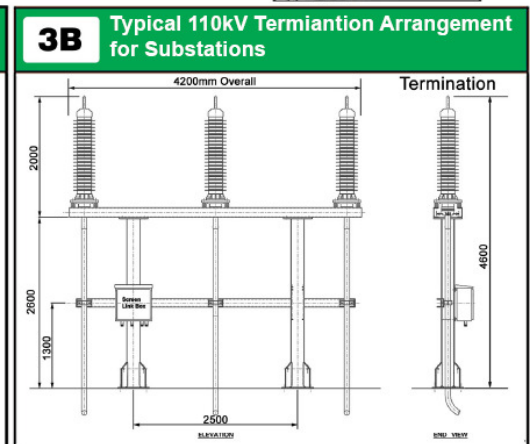
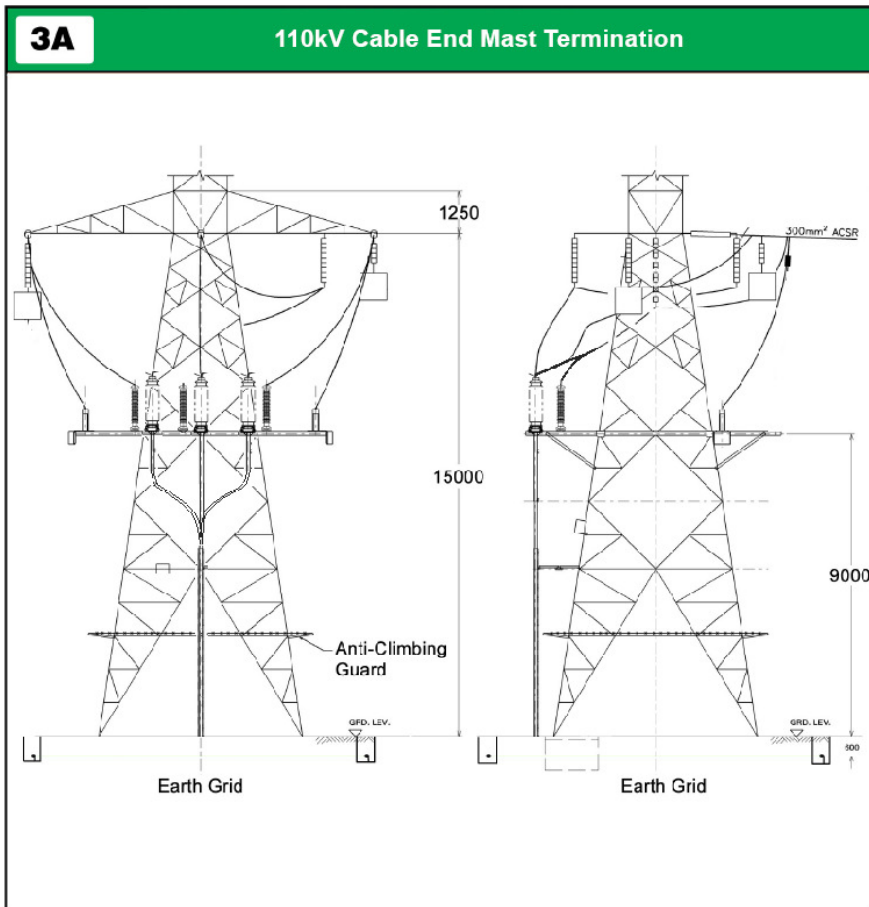
**ESB Networks**  
 Rev 0: Date 09-10  
 Approved:

Document No:DTIS-230908-BUV



## Networks Ducting/Cabbling (Minimum Standards)

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# Standard Specification for ESB 110kV Networks Ducting/Cabling (Minimum Standards)

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### 5A Bridge Crossings: Restricted Footpath Designs

Cast Steel Marker Plate Code 3227172  
 Cast with footpath surface at intervals of 2-4m  
 Alternatively bolted to bridge wall at similar intervals

125mm PE Ducts spaced 75mm apart with galvanised steel plates ESN code 3227173 directly over each duct. These have marker strip laminated to the steel. Minimum concrete to be placed between & above ducts. Ducts laid directly on bridge deck

Galvanised steel or Stainless Steel Pipe Supported by ducts at 1m intervals. Minimum duct wall thickness ESN marker plates code 3227172 to be fixed to pipe ends at both ends of bridge

Steel Marker Plate

Bridge Abutment/Support

Alternative Position of ducts

2nd Comms duct may be omitted by agreement with ESB Networks

### 5B Bridge Crossings: Restricted Footpath Designs

- The design must be agreed with the bridge authority. Position in footpath is preferred.
- Minimum cover over ducts on footpath 100mm.
- Where duct cover is >600mm, marker strip 75mm above ducts and marker tape (300mm below surface) + steel surface markers suffice
- Red ducting is not suitable for cable run external to bridges.
- 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.

### 6A River/Stream Crossings: Standard Where Burial/Drilling IS Possible

- Depth of burial below bottom of river or stream to be agreed with relevant authority (if applicable)
- If normal red ducting is installed by trenching, it must be encased in CDM4 (15N after 7 days) concrete to prevent uplift and to provide mechanical protection. Seal any joints to prevent concrete entering duct.
- If drilled crossing is practical, use heavy red wall coated HDPE duct (sections 2.2 & 2.9 in MV/LV manual)
- Install an ESN marker post on both sides of the crossing - ESN code 8327355 or use stub pole minimum 2.0m above ground level & warning sign 0230339.
- Where circumstances require it a large steel pipe can be installed into which a number of standard ESN duct sizes are pulled in (see section 2.9.4 of MV/LV manual for guidance)
- If crossing a tidal section of a river or stream a foreshore licence will be required

### 6B River/Stream Crossings: Standard Where Burial/Drilling IS NOT Possible

- Installation on base of river or stream to be agreed with relevant authority (if applicable)
- Heavy wall steel pipe to be used free of weld beads/swarf. Minimum 8mm steel wall thickness to be used. Encase in CDM4 (15N after 7 days) concrete for corrosion protection, minimum 100mm surround
- Install an ESN marker post on both sides of the crossing - ESN code 8327355 or use stub pole minimum 2.0m above ground level & warning sign 8238339.
- Ensure a smooth connection using rubber coupler between crossing pipe size and ESN standard duct as the steel pipe size will usually differ from the standard ESN ducting. Alternatively run ESN ducting right through the steel pipe
- If crossing a tidal section of a river or stream a foreshore licence will be required

### 7A Cable End Mast Position

Ensure that trench is deepened at this position and cable is supported all round so that it does not tighten further during Backfilling

### 7B Cable End Mast Position

For approved sand backfill at end-masts, poles and joint bays. See section 5 Standard Specification for ESN MV/LV Networks Ducting

Offset trefoil to line up with edge of mast for ease of cable pulling. Never install ducting right up to mast with long radius bend attached. Both marker strip and warning tape to be used between duct and mast (laying the marker strip crosswise as shown above).

### 7C Cable End Mast - Marker Strip/Tape

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

### 8A Supporting ESN Cables/Ducts During Trenching Works

Suitably strong steel/timber beam to support exposed cable

Secure beam with pegs or short pins

Shore up/stabilise trench against falling in on top of cable and damaging or puncturing it.

Support cable with plastic rope or web slings and chain hoists at 0.5m intervals approx. Just take the weight, do not over tension the slings/hoists.

Over-sheave the cable with red half pipes and cable ties to provide identification and provide impact resistance

0.3m minimum standard clearance or 100mm minimum but use protection as in Table 7 of ESN MV/LV manual

New pipe/Sewer

### 8B Supporting ESN Cables/Ducts During Trenching Works

Key in timber plank (150mmx50mm) firmly into trench well above ESN 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 ESN manual (MV/LV)

New pipe/Sewer

### 9 Avoidance of Cable Damage Due to Improper Backfilling at Cable Crossings

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

Trench AFTER careful backfilling and Flaming  
 Layers all round the cable to be hand tamped. Cable to be well supported by firm bed of sand beneath the cable. No compression machinery directly over conductor for 300mm minimum distance.

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



### 10A 110kV Railway Crossing Details

ESBN Signpost

3m

ESBN Signpost

Drilling pits outside CIE property line

Formal licence for crossing and approval required from **Iarnrod Eireann**. Accurately record crossing location & erect marker posts.

### 10B Typical Directional Drill/Thrust Bore Duct Bore Details

DESIGN 1

Minimum internal bore size = 370mm for 5 ducts  
= 330mm for 4 ducts where approved by ESBN

Spacer

5 no. 125mm diameter HDPE ducts

Duct C = comms  
Duct P = power

Alternatively use 2 x 37mm HDPE ducts for comms cables with C2 chamber on each side of the crossing to permit pulling along entire route. (See 10C)

**All interstitial space to be bentonited thoroughly to maintain cable rating.**  
Accurately record crossing location & erect marker posts.

### 10C Typical Directional Drill/Thrust Bore Duct Bore Details

ALTERNATIVE DESIGN

ESBN Signpost

3m

ESBN Signpost

Cable joint pit

Install 1 no. 300mm ID SDR 17.6 duct with 3 no. short length cables pulled into this pipe along with 2 x 37mm comms ducts. Full cable joint bays are required on either side of crossing along with C2 chambers for this design. This method is used where it is not practical to install large diameter pipe -eg. risk of ground upheaval or presence of obstructions.

**All interstitial space to be thoroughly bentonited to maintain cable rating.**  
Accurately record crossing location & erect marker posts.

### 10D Typical Double Circuit Bore Crossing

Standard Design

3m min

-Both Bentonited

Separate drilling for each circuit crossing

Alternative

HDPE or steel thrust bore pipe Diameter ID= 500mm

6 no. 125mm Power ducts + 2 no. 125mm comms ducts

All crossings to be accurately recorded and signposts erected given impracticality of marker tape.

### 11 Minimum Standard Clearances to Other Services

Normal Services 300

Large Pipework/High Pressure Pipes 600

Clearances less than the above at pinch points and crossings requires placement of additional mechanical protection (concrete slab/brick) and agreement of ESBN

ESBN ducts must never be laid over other services on parallel runs, except with the written prior agreement of the other utilities and ESBN

Other services must never be laid directly over ESBN ducts on parallel runs

### 12 Combined 110kV & 38kV Cable Runs

110kV Trench

38kV/MV/LV Cables

Yellow Marker Tape

Red Marker Strip

Pilot Cables

Concrete Surround

150mm

150mm

Additional MV/LV Ducts as Required

300mm Strict Minimum Separation

NB. Where it is necessary to employ this formation, the separation distance of 300mm should be strictly controlled and monitored to minimise derating (see MV/LV manual page 180) Detailed calculations and design to be agreed between ESBN / ESB!

### 13 Sealing and Protection of 110kV Cables Once they Exit Ducts

Ducts to be thoroughly sealed using ESBN tyco approved water sealant and 4hr fire rating approved for firestop.

NB - All joint bay entries to be thoroughly sealed to prevent sand washout and subsidence.

Sandbags or other durable support for cable as it exits ducts to prevent damage to cable sheath

### 14 Duct Crossovers Are Not Allowed

Be especially careful when going from flat to trefoil formation in vicinity of services

Eliminate this possibility by marking ducts 1, 2, 3 etc before & after flattening to avoid an obstruction.

Tape

NB. If using double circuit, tape mark power ducts 1 to 6

### 15 Crossing Dumps/Contaminated Ground

Concrete is continued up to 300mm of final surface to offset derating (CBM4 - 15N after 7 days)

Thoroughly seal all joints with adhesive water-tight duct jointing compound and pressure test for airtightness. Gasketed couplers alone are inadequate.

Fusion welded couplers are also acceptable but require red over-taping.

NB. Avoid whenever possible due to: Subsidence, methane gas & severe thermal derating risks. Seek advice from ug networks section to ensure rating of cable is adequate (derating of 50% can occur) NB. Waste oils and chemicals can also seriously damage cables

Seal all duct joints with duct adhesive compound or use continuous duct lengths & seal all duct ends in joint bays. Alternatively weld pipes.