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Appendix 2.3

Shancloon Substation - Outline Construction Methodology

Outline Construction Methodology

Shancloon 110kV Loop In

Date: July 2025
Report Ref: 051021-R01-01

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1.0 Introduction

TLI Group ("the Consultant") were engaged by RWE ("the Client") to identify and analyse potential 110kV loop in options available for the Shancloon Substation Project, which will loop into the existing Cashla - Dalton 110kV line.

The 110kV grid connection will consist of constructing two masts and a new standard EirGrid loop in substation. The Shancloon substation will be connected via two 110kV UGC circuits to the two mast structures that will intersect with the existing Cashla - Dalton 110kV overhead line. The grid route is relatively straightforward, with no horizontal directional drilling (HDD) or bridge crossing required. There is one road crossing required with a water crossing within the road. The OHL works will consist of the installation of two masts and terminating the existing phase conductors on those masts.

This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the planning application. Also, this document is in outline form only and will be revised and updated before the commencement of any construction activities. For the purposes of the planning application, this document should be read in conjunction with Chapter 3 of the EIAR (Description of the Proposed Development), the Construction and Environmental Management Plan (CEMP), the Appropriate Assessment Screening Report (AASR), Natura Impact Statement (NIS), and all other supporting documents and EIAR chapters as relevant.

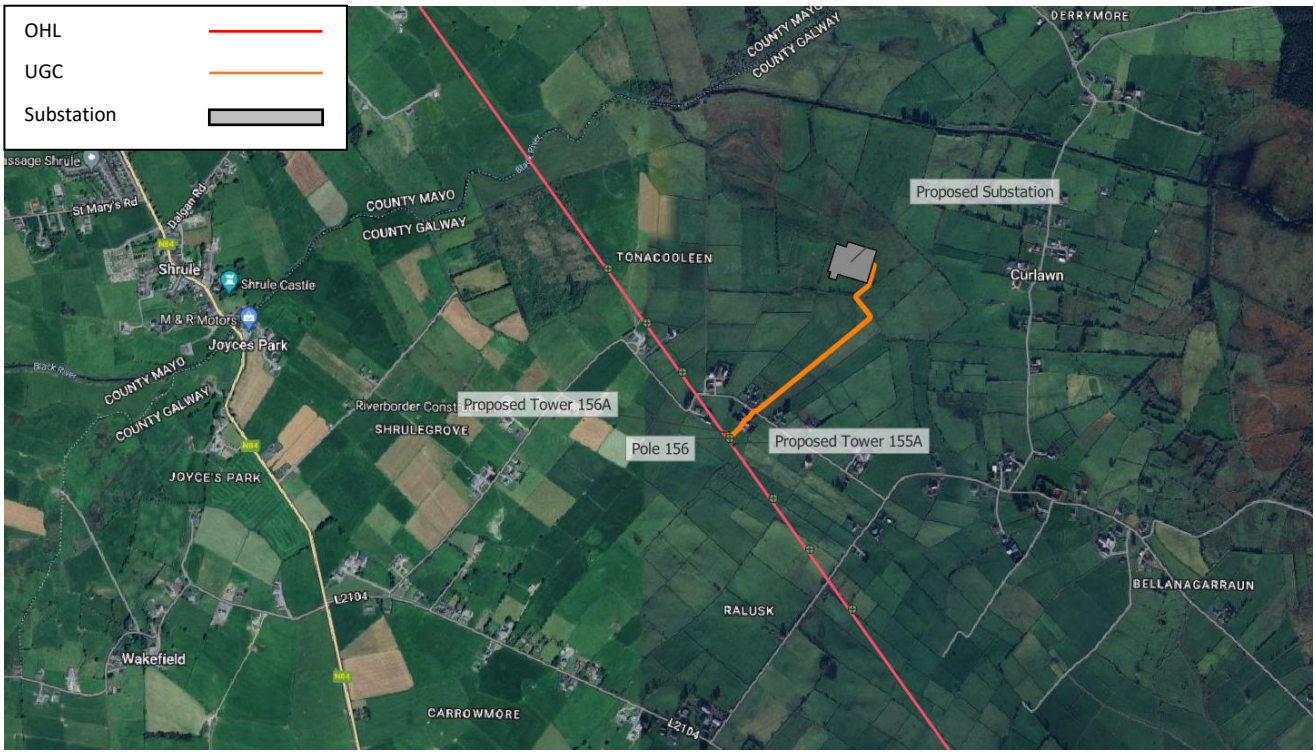


Figure 1: Location of Loop in and 110kV Substation.

Table 1 - Summary of Preliminary Grid Connection 110kV Design Route	
Section	**Description (all lengths are approximate and to be confirmed at detailed design stage)**
Section 1 **UGC**	Installation of 2 Steel line Cable Interface Masts UGC Circuit Length: 800m Approx. Road Crossing 3m approx. (x1) Minor water main Crossing (x1)
Refer to Figure 1 and to the planning drawings submitted for location details. Note: The precise location of the proposed route within the planning application boundary is subject to change as result of existing services/utility locations, ground conditions and any environmental constraints.	

Table 1: Summary of OHL works

2.0 Preliminary Site Investigations

Trial pits or boreholes will be required at the location of each overhead line structure and the substation, which will be in addition to boreholes and trial pits undertaken to date.

2 boreholes or trial pits required at tower locations and along the access road to ascertain thermal resistivity of the soil.

At least 4 No. Boreholes are required at specified locations at the substation site location to ascertain ground composition and thermal/electrical resistivity of the soil.

2 boreholes or trial pits required at Joint Bay locations to ascertain thermal resistivity of the soil.

Some trial pits and boreholes have already taken place. Notably around the substation location. (PBH-20)

Figure 2: Trial Pits and Bore Hole Locations

Equipment:

- 4x4 vehicle
- Wheeled dumper
- Soil compactor
- 360° tracked excavator (wheeled excavator where required)
- Borehole Drill Equipment

3.0 Loop-In Masts

3.1 Existing 110kV OHL

The proposed Shancloon 110kV loop-in station will connect into the existing Cashla - Dalton 110kV overhead transmission line. The two new end masts will be placed either side of existing Pole set No.156. Pole set structure No. 156 is to be removed after the installation of the two new cable interface masts.

The proposed design for the 110kV Loop-In from the existing OHL will require two new mast structures, which will be constructed under the existing Cashla - Dalton 110kV OHL. The existing OHL conductor will be terminated at these towers connecting to the substation via underground cable.

The duration of works of the overhead line construction is expected to be approximately 12 weeks. Construction of foundations for masts circa. 7 days each with time allowing for curing of the concrete, erection of the masts circa 5 days each, weather dependant. Stringing of conductor will be a 2-week process and final connection to the existing grid will be carried out by ESBN and at that point in time commissioning of the substation can start.

3.3 Steel Mast Structures

The proposed mast structure locations have been selected based on ground surveys, ground profiles, sight lines and ruling span checks.

The proposed construction scope will require the relevant personnel, machinery and materials which is as follows: -

Equipment	**Materials:**
• 5 operatives • 4x4 vehicle • Winch • Tractor and trailer • Crane • Teleporter • Chains / small tools • Tracked Excavator • Tracked Dumper • Sheet Piling Rig	• Lattice steel mast • Insulators • Electrical connections • Concrete (foundation) • Aggregate

The following section outlines the methodology to be followed during construction works of the new Mast structures.

1. Prior to any work been undertaken at the mast site, the area will be subject to a pre-construction geophysical survey, carried out by a suitably qualified consultancy, followed by a programme of targeted archaeological test trenching. These site investigations will be carried out under licence by National Monuments Service (NMS) of the Department of Housing, Local Government Heritage.

   Mast sites are scanned for underground services such as cables, water pipes etc. Consultation with the landowners will help to identify hazards and ensure there are no unidentified services in the area.

2. For each leg of the 2 No. masts (8 legs in total) a foundation circa. 4m x 4m x 3m deep is required. To allow for safe construction the excavation will be stepped back which requires additional area to be excavated. Sheet piles may used if ground material is not suitable for benching or where there is limited space for benching. The formation levels (depths) will be checked by the onsite engineer. The excavated material will be temporarily stored close to the excavation and excess material will be used as berms along the site access roads.

Figure 3: Sheet Piled Foundations

3. To aid construction, a concrete pipe is placed into each excavation to allow operatives level the mast at the bottom of the excavation. The frame of the reinforcing bars will be prepared and strapped to a concrete pipe with spacers as required. The reinforcing bars will be lifted into each excavated foundation using the excavator and chains/slings. The base and body section of each mast will then be assembled next to the excavation.
4. Concrete trucks will pour concrete directly into each excavation in distinct stages.
5. A final pour for the mast is the encasing of the mast leg which will be finished 300mm over finished ground level. The leg of the mast is required to be shuttered with metal panels to form the required shape.
6. Once the concrete is set after five days the shuttering is removed and if used sheet piles removed.

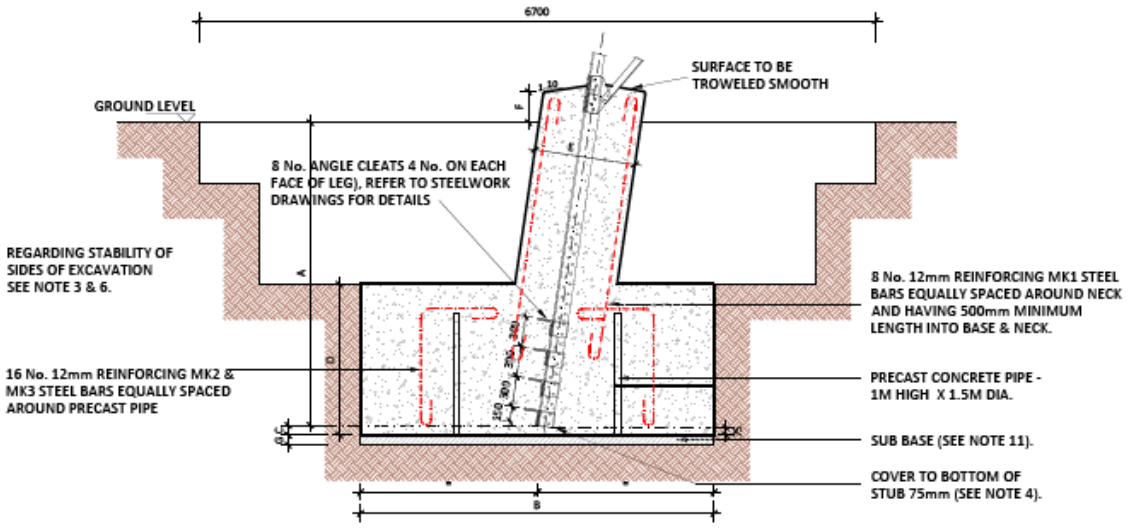


Figure 4: New Mast Foundation

7. The Mast foundations will be backfilled one leg at a time with the material already excavated at the location. The backfill will be placed and compacted in layers. All dimensions will be checked following the backfilling process. All surplus excavated material will be removed from the mast locations and stored in berms for reuse across the construction site.

Figure 5: Base of mast structure backfilled

8. For the masts located under the existing line, the line will be de-energised by ESB so work can commence on the construction of the masts. Where it is offline the masts will be built without an outage.

9. An earth mat consisting of copper or aluminium wire will be laid circa 400mm below ground around the mast. This earth mat is a requirement for the electrical connection of the equipment on the mast structure.

10. Once the base section of each mast is completed and the concrete sufficiently cured, it is ready to receive the mast body.

11. A hardstand area for the crane will be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate.

12. A physical barrier (Heras Fence Site Boundary) will be put in place to restrict plant from coming too close to the OHL.
13. The mast will be constructed lying flat on the ground beside the recently installed mast base.
14. The conductor will be moved off centre using a stay wire and weights to anchor the stay wire to ground.
15. The mast section will be lifted into place using the crane and guide ropes.
16. The body sections will be bolted into position.
17. The conductor will be centred over the masts and held in place. Once the conductor is secured at both ends it is then cut and attached onto each mast. The section of conductor in between the two masts will be removed and utilised as connector wire for the new masts.
18. Down dropper conductors (For Electrical Connections, Insulators, Surge arrestors), shackles and all associated accessories required for transition from line to cable will be installed on the interface masts.
19. The circuit will be tested in both directions before the line is re-energised.

Figure 6: Cable End Mast

4.0 Proposed Substation Build

The Shancloon 110kV substation will be constructed to loop-in the existing Cashla - Dalton 110kV overhead line. The Shancloon 110kV substation will be made up of a control building, transformer compound and busbar compound. The control building works will consist of foundation works, block work, roofing, low voltage electrical fit out, cladding and building finishing works. The transformer, cable chair and structural steelwork will be installed in the transformer compound. The busbar compound structural steelwork will be erected. Substation electrical equipment will be installed once the control building and compound is complete. Palisade fencing will be erected around the compound for security/protection and a concrete post and rail fence to mark the substation boundary.

5.0 Substation Construction

Equipment	**Materials:**
• Up to 10 Electrical/Civil Crews • Tracked Excavators • 360˚ tracked excavators (13 ton normally, 22 ton for rock breaker) • Tracked dumpers / tractors and trailers • Crane • Hoist • Power Tools • Generator • Scaffolding	• Stone • Geotextile • Lighting • Paving. • Fencing. • Steel Uprights • Concrete • Timber • Cladding • Doors

The proposed construction scope will require the relevant personnel, machinery and materials which is as follows:

1. This new substation will be in a compound of circa 130m x 110m (the footprint is irregularly shaped) surrounded by a 2.6m high palisade fence.
2. The substation compound and drainage will be marked out by a qualified engineer.
3. A drainage system will be excavated and installed around the compound area.
4. Topsoil and subsoil will be removed from the footprint of the compound using an excavator. The excavated material will be temporarily stored in adjacent berms for later use during reinstatement works.
5. A layer of geotextile material will be laid over the footprint of the compound.
6. Using an excavator, a base layer of Clause 804 material will be laid followed by a 6F2 capping layer which will provide the finished surface.
7. Each layer will be compacted using a vibrating roller.
8. Earthing cable will be laid underground around the substation for connection to the various electrical components during the electrical fit out phase.

9. The construction of a substation compound circa 13560m², comprising of approx. 435m² single storey 110kV substation control building, a 228m² IPP building and associated outdoor electrical equipment, including 1 no. 110kV transformer, associated internal access track, 2.6m high station perimeter fencing and concrete post and rail property boundary fence will be built.
10. Adequate lighting will be installed around the compound on the lighting masts.
11. Lightning protection masts of approximate height 18m will be installed to protect the station from direct lightning strikes.
12. The electrical installation is expected to take 20 weeks and includes the following:
    - Delivery and installation of 33/110kV transformer. The deliveries will be managed in accordance with regulations governing the movement of large loads.
    - Delivery and installation of all other HV equipment.
    - Wiring and cabling of HV/LV equipment, protection, and control cabinets.
    - Commissioning of all newly installed equipment.

Figure 7: Typical 110kV Electrical Infrastructure

Figure 8: Typical 110kV Transformer Connection

6.0 UGC Construction Methodology

The proposed UGC will consist of 2 No. trenches with a minimum of 2.3m separation distance between each circuit. Each trench will contain 3 No. 160mm diameter HDPE power cable ducts and 3 No. 125mm diameter HDPE communications duct to be installed in an excavated trench, typically 825mm wide by 1,315mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. The power cable ducts will accommodate 3 No. power cables. The communications duct will accommodate a fibre cable to allow communications between the Shancloon substation and the adjoining Cashla and Dalton 110kV substations. An Earth Continuity Conductor (ECC) duct is required for electrical safety purposes and in accordance with ESB / EirGrid specifications. The ducts will be installed, the trench reinstated in accordance with landowner/Galway County Council specification, and then the electrical cabling/fibre cable is pulled through the installed ducts. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of EirGrid and ESB.

6.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the planning application and accompanying reports and as required by planning conditions where relevant;
- All existing underground services shall be identified on site prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the planning application and accompanying reports, the detailed Construction Environmental Management Plan (CEMP) to be prepared prior to the commencement of construction, and best practice construction methodologies;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- In the event that culverts require removal for ducting installation, it is proposed that a suitable method of damming the water source and pumping the water around the work area would be set out in a method statement and agreed with the relevant stakeholders. Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions. If works of this nature are required, the contractor will liaise with Inland Fisheries Ireland in advance of works;
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Report, and a detailed Traffic Management Plan will be prepared and agreed with Galway County Council;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;

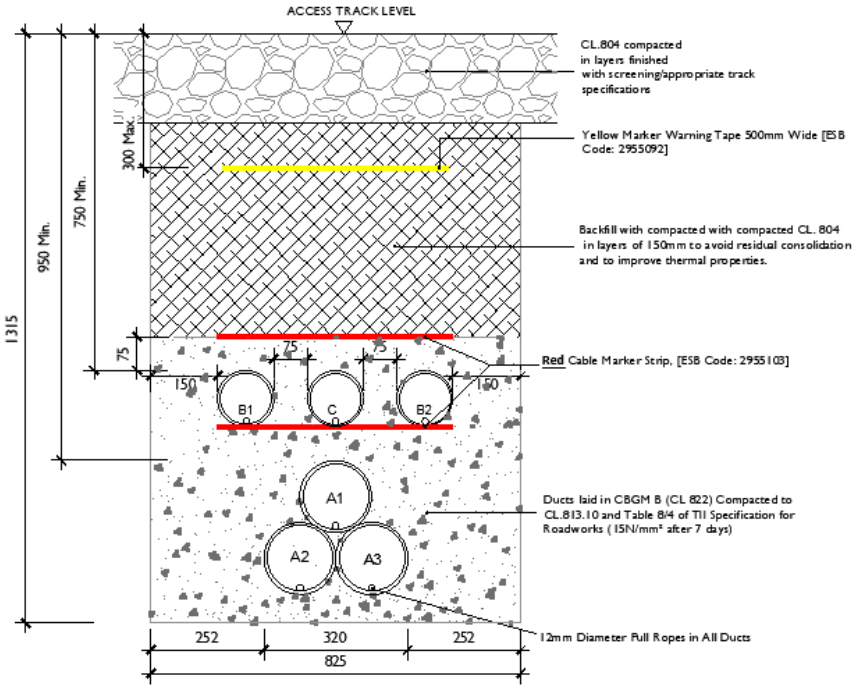
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

Figure 9: Typical 110kV Underground Duct Installation

6.2 Ducting Installation Methodology

For the trenching and ducting works the following step by step methodology will apply:

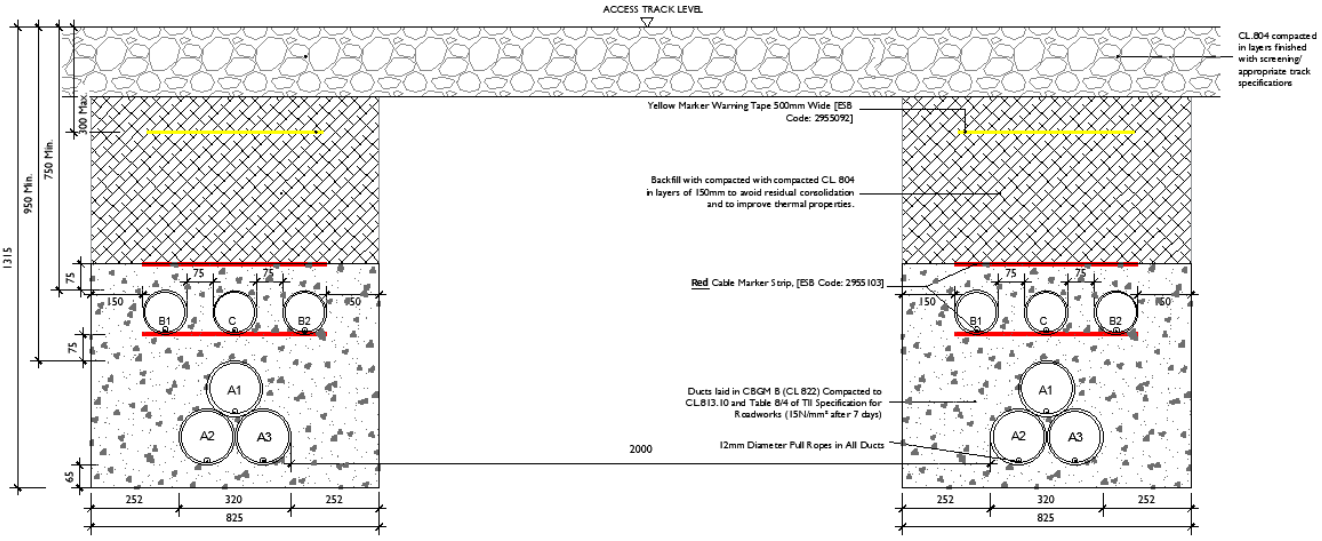
1. Grade, smooth and trim trench floor when the required 1315mm depth and 825mm width have been obtained.
2. Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.
3. Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
4. Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
5. Place cable protection strips on compacted CBGM B directly over the ducts.
6. Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.
7. Carefully surround and cover ducts with CBGM B material in accordance with the drawings and thoroughly compact without damaging ducts.
8. Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.
9. Place and thoroughly compact CBGM B material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.
10. For unsurfaced/grass sections, backfill with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner.
11. Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12 mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by ESBN Clerk of Works (CoW) as required.



A = 160mm: Outer Diameter HDPE ESB Approved Duct, SDR= 21.0 (Power) [ESB Code: 9317560]
B = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (Comms) [ESB Code: 9317552]
C = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (ECC) [ESB Code: 9317552]

110kV Ducting Section Through Access Track

Figure 10: Typical Single Trench in Access Track



A = 160mm: Outer Diameter HDPE ESB Approved Duct, SDR= 21.0 (Power) [ESB Code: 9317560]
B = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (Comms) [ESB Code: 9317552]
C = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (ECC) [ESB Code: 9317552]

110kV Double Circuit Ducting Section Through Access Track

Figure 11: Typical Double Trench in Access Track

Equipment:

- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads);
- 1 no. dumper or tractor and trailer.

Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- 160mm diameter HDPE ducting;
- 125mm diameter HDPE ducting;
- Temporary Surface Reinstatement Materials

6.2.1 On Private Tracks

Where the cable is installed in private tracks the location where the cable is laid will depend on several factors, width of track, bends along the track and crossings. Where the track needs to be widened stone will be brought in to build up the area to the same level of the track. The excess material from the track will be used elsewhere on reinstatement works where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site.

6.3 Surface Cable Markers & Marker posts

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESB standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker posts shall also be placed in the event that burial depth is not to standard. Siting of marker posts to be dictated by ESBN as part of the detailed design process.

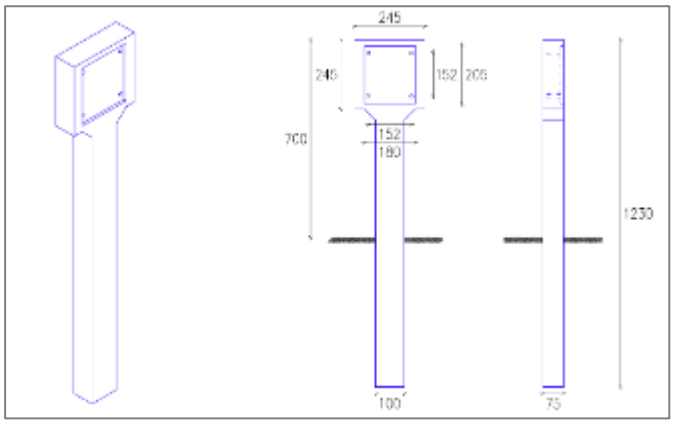


Figure 12: Typical ESB Marker Posts Example

6.4 Managing Excess Material from Trench

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Where excess material exists, it will be disposed of to a licensed facility.

6.5 Storage of Plant and Machinery

All plant, machinery and equipment will be stored on site within the works area or within the temporary construction compound to be located within the Shancloon station. Oils and fuels will not be stored on site and will be stored in an appropriately bunded area within the temporary storage compound.

Equipment:

- 1 Excavator Operator
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- 1 no. tracked dumper or tractor and trailer.

Materials:

- Sand for pipe bedding
- Blinding Concrete where necessary
- Clause 804 Material
- 160mm diameter HDPE ducting.
- 125mm diameter HDPE ducting.
- Precast Chamber Units / Relevant construction materials for chambers
- Link Box

6.6 Joint Bays and associated chambers

Joints Bays are to be installed approximately every 650m - 850m along the UGC route to facilitate the jointing of 2 No. lengths of UGC. Joint Bays are Standardly 6m x 2.5m x 2.05m pre-cast concrete structures installed below finished ground level. Joint Bays will be in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between Shancloon substation and the existing 110kV substations. Earth Sheath Link Chambers are also required at every joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are near Joint Bays. Earth Sheath Link Chambers and Communication Chambers will Standardly be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

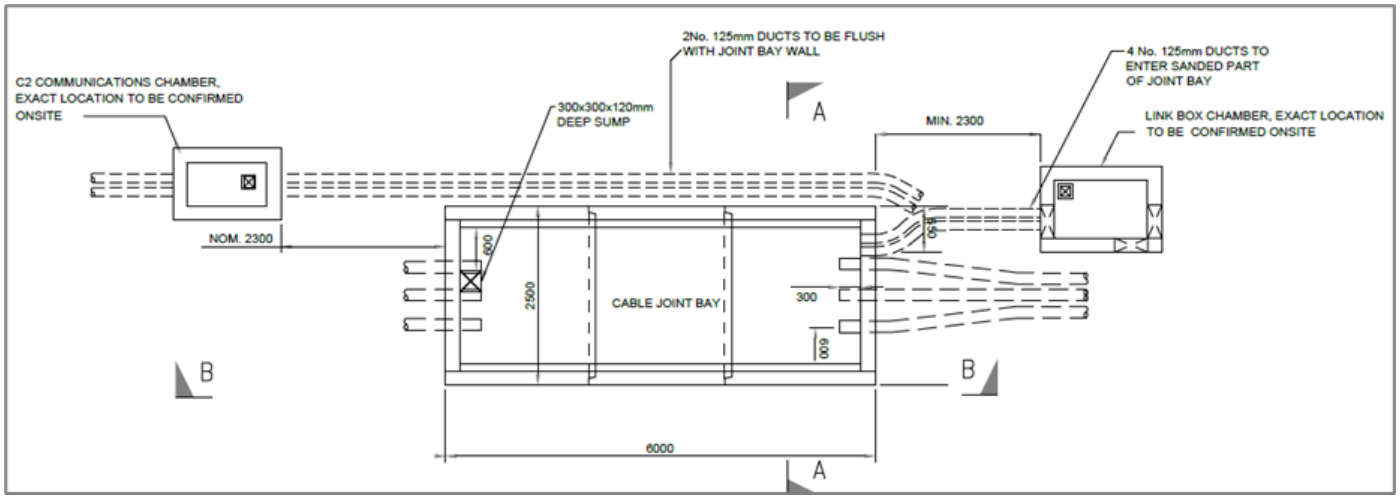


Figure 13: Typical 110kV Joint Bay Plan Layout

6.6.1 Joint Bay Construction and Cable Installation

Before starting construction, the area around the edge of the joint bay which will be used by heavy vehicles will be surfaced with a terram cover (if required) and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse.

All excavated material will be stored near the excavations and reused for reinstatement works, apart from excess material to be removed to an approved waste facility. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 60m back from the nearest major watercourse on level ground and at least 10m back from minor watercourses. Temporary stockpiles will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The risk of concrete reaching surface waters is considered very low given that all concrete will be poured into the pit excavated for the joint bay so that spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g. using sandbags and geotextile sheeting or silt fencing to contain any solids in run-off.

The following steps outline the methodology for joint bay construction and reinstatement:

1. The contractor will excavate a pit for joint bay construction, including for a sump in one corner.
2. Grade and smooth floor; then lay a 75 mm depth of blinding concrete (for in situ construction) or 50 mm thick sand (for pre-cast concrete construction) on 200 mm thick Clause 804 granular material.
3. In situ construction. Construct 200 mm thick reinforced concrete floor slab with sump and starter bars placed for walls as detailed on the drawings.
4. In situ construction. Construct 200 mm thick reinforced concrete sidewalls as detailed on the drawings. *(**Figure 14**)*

Figure 14: Standard joint bay under construction (in-situ)

5. In situ construction. Remove formwork and backfill with suitable backfill material in grassed areas or Clause 804 material once ducting has been placed in the bay. Backfill externally with granular material.

Figure 15: Example of completed joint bay prior to cable installation (in-situ)

6. Pre-cast concrete construction. Place pre-cast concrete sections on sand bedding.
7. Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
8. Precast concrete covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.
9. Later to facilitate are cable installation and jointing, reinstating traffic management signage, securing individual sites, re-excavating three consecutive joint bays and storing excavated material for reuse.
10. The cable is supplied in pre-ordered lengths on large cable drums. Installing “one section” of cable normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer**.** A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.

Figure 16: HV cable pulling procedure (Standard drum set-up)

11. Once the "two sections" of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment.

Figure 17: HV cable jointing container.

Following the completion of jointing and duct sealing works in the joint bay, place and thoroughly compact cement-bound sand in approximately 200 mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100 mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250 mm below surface and carry out permanent reinstatement including placement of warning tape at 400 mm depth below finished surface.

7.0 33kV Collector Network

A 33kV Collector network connects the Shancloon 110kV substation to the Wind farm substation. The 33kV collector network UGC will consist of 3 No. 125mm diameter HDPE power cable ducts, 1 No. 110mm diameter HDPE communications duct and 1 No. 110mm diameter earth continuity duct to be installed in an excavated trench, typically 450mm wide by 1250mm deep, with variations on this design to adapt to watercourse crossings and service crossings, etc. The power cable ducts will accommodate 1 No. power cables per duct. Sections of this collector network will require a double circuit UGC. This UGC typically will consist of 6 No. 125mm diameter HDPE power cable ducts, 2 No. 110mm diameter HDPE communications duct and 2 No. 110mm diameter earth continuity duct to be installed in an excavated trench, typically 1000mm wide by 1250mm deep, with variations on this design to adapt to watercourse crossings and service crossings, etc. Sections of this collector network will require a triple circuit UGC. This UGC typically will consist of 9 No. 125mm diameter HDPE power cable ducts, 3 No. 110mm diameter HDPE communications duct and 3 No. 110mm diameter earth continuity duct to be installed in an excavated trench, typically 1550mm wide by 1250mm deep, with variations on this design to adapt to watercourse crossings and service crossings, etc.

7.1 Service Crossing

Where the cable route intersects with existing watercourses & Gas Networks a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. Crossing existing culverts will be implemented using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. The culvert crossing methods are detailed in Figure 18***Error! Reference source not found.*** and Figure 19Figure 19 below, and more detailed watermain crossing drawings are available. Ref Drawings 051021-DR-314 & 051021-DR-315.

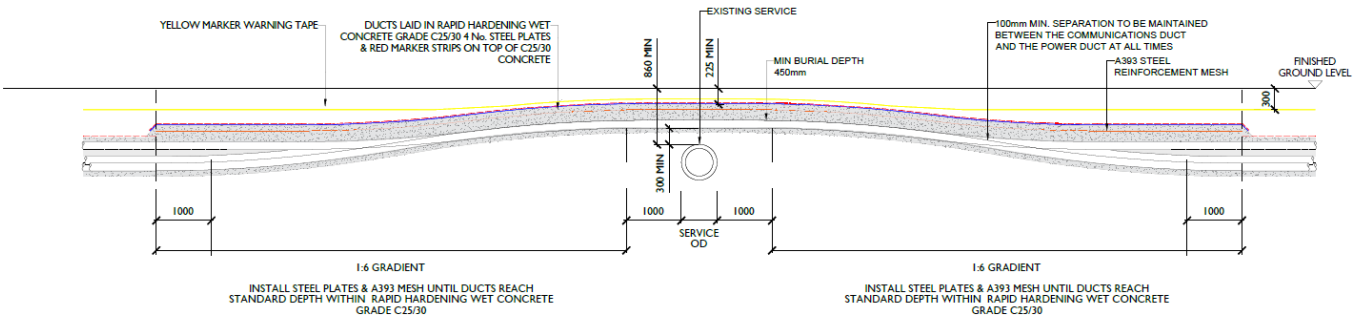


Figure 18: Service Overcrossing

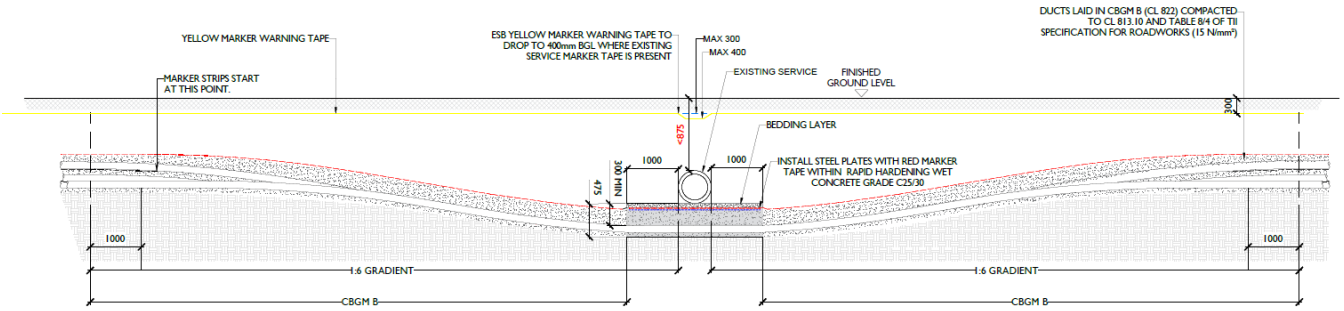


Figure 19: Service Undercrossing

7.2 Horizontal Directional Drilling (HDD)

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles, such as bridges, railways, watercourses, etc., in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There is a watercourse crossing along this UGC route which will be performed using HDD, so that this obstacle is traversed in the least intrusive manner possible.

The proposed drilling methodology is as follows:

- A works area of circa 180m^2 for the HDD entry side, and circa 550m^2 on the HDD exit side, will be required for the HDD equipment and vehicles. These areas will be fenced off during the HDD implementation.
- The drilling rig and fluid handling units will be located on the designated entry side of the watercourse and will be appropriately bunded using sandbags, which will contain any fluid spills and stormwater run-off.
- Entry and exit pits (approximately 2m (width) x 3m (length) x 1m depth) will be excavated using an excavator. The excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer.
- The pilot bore will be drilled to the pre-determined profile and alignment under the watercourse crossing.
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the entry pit and treated for re-use.
- Once the first pilot hole has been completed, a hole-opener or back-reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming/hole opening process to enlarge the hole to the needed size.
- When the pre-reaming/hole opening/hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation.
- The drilling fluid will be disposed of to a licensed facility. The interior of the ducts will be cleaned, and the ducts will be proven to ascertain their suitability. Their installed location will be mapped.
- The entry and exit pit areas will be reinstated to the specification of the landowner and any requirements of Galway County Council.

- A joint slab/transition chamber/transition coupler will be installed on either side of the drill shot, following the horizontal directional drilling procedure, which will serve as interface between the HDD ducts and the standard ducts.

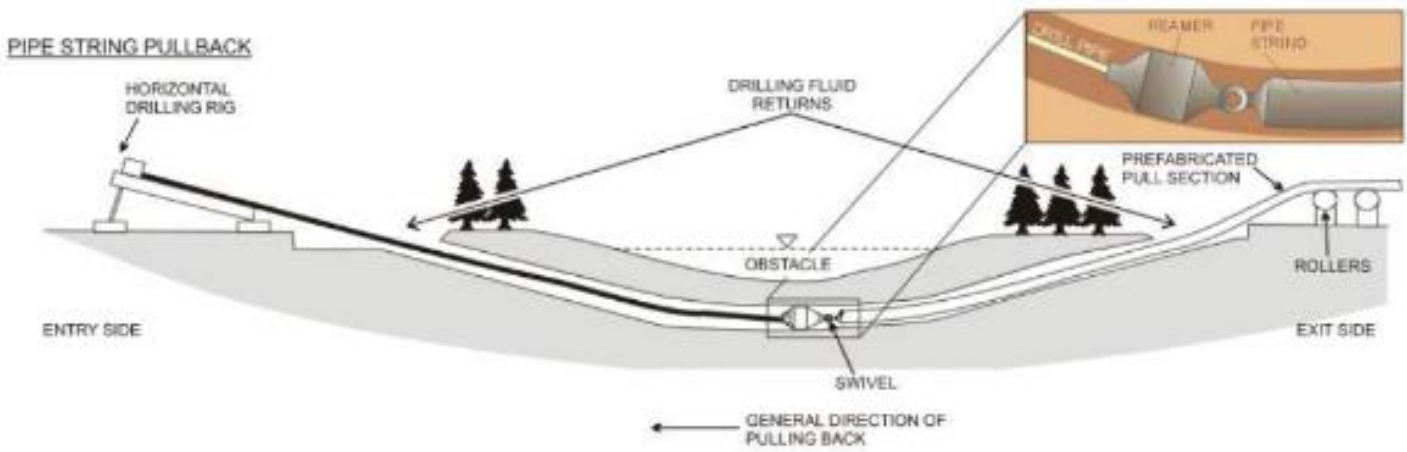


Figure 20: Typical HDD Installation

7.3 Gas Networks

It will be required to cross the gas main with 2 No. 33kV circuits. Consultation with Gas Networks Ireland must take place before starting works where gas pipes are present. Gas Networks Ireland will advise on the safety measures required and will arrange for the exact location of the pipe to be marked out on site. Detailed gas crossing drawings are available.

8.0 Access Routes to Work Area, Crane Pads and Temporary Laydowns

Access tracks, laydown areas and crane pads on the consented land (if required due to ground conditions and/or landowner requirements) will consist of crushed rock on a geotextile. Upon completion of the works, all access tracks will remain in place for future access to the substation and wind farm grounds. Access routes will be carefully selected to avoid any damage to land. Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine specific requirements for each area. Any such requirements will be incorporated into the relevant method statement. A combined laydown and crane pad area (40x82m) will be utilised for tower installation and erection.

Figure 21: Crushed Rock Roadway

Figure 22: Crushed Rock Roadway Build-up With Geotextile

Figure 23: Crane pad and laydown areas.

9.0 Reinstatement of Private Land

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition. This work will be carried out in in consultation with the landowner and in line with any relevant measures outlined in the planning application, CEMP and planning conditions.

10.0 Construction Hours

Standard working hours for construction will be 7.00am to 7.00pm Monday to Friday and 7.00am to 1.00pm on Saturday (if required), with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. All site personnel will be required to wear project notification labelling on high visibility vests and head protection so that they can be easily identified by all workers on-site.

11.0 Waste Management

All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act 1996 and associated amendments and regulations, and a Waste Management Plan will be prepared by the contractor before the commencement of construction. All waste material will be disposed of at a fully licensed facility.

12.0 Programme

Estimates for the duration of the construction works are included in the table below. Please note that some of the elements are likely to happen concurrently, therefore the overall start-to-finish duration is estimated to be fourteen months.

Table 3: Estimated Construction Duration (Activities Run Concurrently)

Development Element	Estimated Construction Duration
Construct 110kV Substation	14 months
Overhead Line Structures	3 months
Underground Cable	3 months
Connection to Existing OHL and Commissioning	6 weeks
Total	14 Months