

Shannon Technology and Energy Park (STEP) Power Plant

Appendix A2.2: 220 kV and Medium Voltage (10 / 20 kV) Construction

[Blank Page]

Appendix A2.2: 220 kV and Medium Voltage (10 / 20 kV) construction

The following data was prepared by others as part of two separate planning applications (for the medium voltage (10 / 20 kV) and 220 kV connections, respectively).

The construction process and contractors will be managed by Sisk.

220 kV Grid Connection

The 220 kV grid connection will connect via a new tail-fed onsite outdoor single bay substation of Air Insulated Switchgear (AIS) design and underground cable to the existing EirGrid Kilpaddoge substation in the townland of Kilpaddoge County Kerry. The onsite substation will be adopted by EirGrid post commissioning and will form part of the overall 220 kV transmission system. The onsite substation will be located within the site redline boundary approximately 300 m from the Site entrance. The onsite substation will consist of lightning protection masts, cable sealing ends, high voltage disconnectors, circuit breaker, current and voltage transformers all contained within a fence line of approximately 60 m by 50 m. All electrical equipment will not exceed 9 m in height with the exception of the lightning protection monopoles which will be 15 – 18 m in height. A single-story control building of masonry block construction up to 5 m height with an estimated footprint of approximately 375 m² will also be situated within the fenceline.



Figure A2.2.1: Typical Example of 220 kV Substation

The proposed 220 kV underground cable route will follow an internal site road exiting to the south of the site and then join the L1010 Coast Road. The grid connection will then be laid within the L1010 to entrance road to Kilpaddoge substation. At the entrance road to Kilpaddoge substation, the grid route will follow the substation access road and connect to the Kilpaddoge substation. No works are anticipated at Kilpaddoge substation. The cable route is approximately 4.6 km in length and is anticipated to be located entirely under private and public roadways. Approximately 3.5 km will be installed in public roadway (L1010). Local access will be maintained throughout the cable installation process. A separate consent application will be sought for transmission connection which will include proposed control measures and commitments in terms of mitigating nuisance and disruption impacts.

Medium Voltage (10 / 20 kV) Connection

The medium voltage (10 / 20 kV) connection will connect via a new indoor substation and underground cable to the existing ESBN / EirGrid Kilpaddoge substation in the townland of Kilpaddoge County Kerry. The onsite substation will be adopted by the Electricity Supply Board Networks (ESBN) post commissioning and will form part of the overall medium voltage (10 / 20 kV) distribution system. The onsite substation will be located within the site redline boundary approximately 740 m from the site entrance. The onsite substation will consist of a single storey building size of 10 m x 4.5 m approximately and will contain separate ESBN and Customer MV switchrooms. The proposed underground cable route will follow the L1010 road route in parallel with the 220 kV cable as described above.

220 kV Grid Connection Programme

The exact programme of works will be proposed by the appointed contractor prior to mobilisation of the site. All works will be carried out in accordance with the building regulations and up-to-date design codes at the time of mobilisation.

A preliminary indicative construction programme for the proposed onsite substation is outlined below in **Table A2.2.1**. Some of the activities noted in **Table A2.2.1** will be carried out in parallel. It is expected that overall construction and commissioning activities lasting up to 14 months. The final connection into Kilpaddoge is likely to require an outage of the local 220 kV transmission system. As such, the construction and commissioning programme will be aligned with the standard EirGrid outage season which normally runs between April and September. However, works within the L1010 will be scheduled to avoid disruption to the local school between the site and Kilpaddoge.

Table A2.2.1: Preliminary Construction Programme for 220 kV Substation and Transmission Connection

Construction Phase	Construction Activities	Programme Duration
Onsite Substation Site Preparation and Groundworks	Site establishment	1 month
	Construction of temporary site drainage works	
	Bulk earthworks: excavation and removal of topsoil / spoil	
	Infilling of material for internal access road, site compound and laydown area	
	Miscellaneous civil works (i.e. erection of fencing, internal road construction, etc.)	
Construction of 220 kV AIS plinths and Control Building	Construction of 220 kV concrete foundations	6 months
	Construction of single story control building	
	Permanent foul and surface water drainage works	
	Miscellaneous civil works: paving, permanent fencing, completion of works	
Electrical Installation, Commissioning and Operation	Delivery and installation of AIS high voltage (HV) equipment	7 months
	Wiring and cabling of HV equipment and associated protection and control cabinets	
	Commissioning of all newly installed electrical equipment	
220 kV Circuit Connection from new onsite AIS Substation to Kilpaddoge	Trenching and installation of 220 kV underground cables	4 months
	Construction of joint bays	
	Installation and jointing of 220 kV cables	
	Commissioning of 220 kV cables	

Medium Voltage (10 / 20 kV) Programme

The exact programme of works will be proposed by the appointed contractor prior to mobilisation of the site.

All works will be carried out in accordance with the building regulations and up-to-date design codes at the time of mobilisation. An indicative construction programme for the proposed onsite substation and MV cabling is outlined below in **Table A2.2.2**. Some of the activities noted in **Table A2.2.2**. will be carried out in parallel.

Table A2.2.2: Preliminary Construction Programme for MV Substation and Cabling

Construction Phase	Construction Activities	Programme Duration
Onsite Substation Site Preparation and Groundworks	Site establishment	1 week
	Construction of temporary site drainage works	
	Bulk earthworks: excavation and removal of topsoil / spoil	
	Infilling of material for internal access road, site compound and laydown area	
	Miscellaneous civil works (i.e. erection of fencing, internal road construction, etc.)	
Construction of MV Substation	Construction of foundations	2 months
	Construction of single-story control building	
	Permanent surface water drainage works	
	Miscellaneous civil works: paving, permanent fencing, completion of works	
Electrical Installation, Commissioning and Operation	Delivery and installation of indoor MV equipment	2 weeks
	Wiring and cabling of MV equipment and associated protection and control cabinets	
	Commissioning of all newly installed electrical equipment	
MV Circuit Connection from new onsite Substation to Kilpaddoge	Trenching and installation of MV underground cables	3 months
	Installation and jointing of MV cables	
	Commissioning of MV cables	

220 kV Grid Connection Installation

It is anticipated that the three phase high voltage underground cable connections that will connect the new onsite 220 kV substation to Kilpaddoge substation will be generally installed in ducts along their entire length. The ducts will be installed in open cut trenches that are backfilled with thermally suitable material. The maximum trench widths required are considered to be 2000 mm wide and approx. 1250 mm deep for a single 220 kV circuit. Typical cross section arrangements are illustrated in **Figure A2.2.2**.

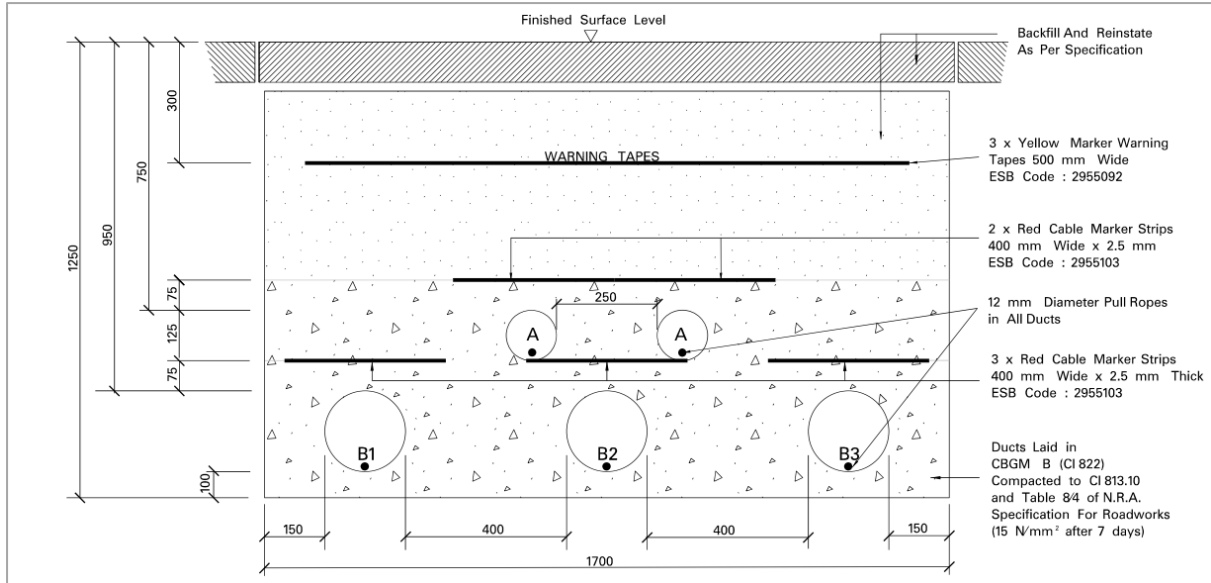


Figure A2.2.2: Typical 220 kV Trench Cross Section

Source: EirGrid Standard 220 kV Flat Formation Cross-Section

Medium Voltage (10 / 20 kV) Connection Installation

It is anticipated that the three phase MV underground cable connections will connect MV substation to Kilpaddoge substation. The ducts will be installed in open cut trenches that are backfilled with thermally suitable material. A single 3 phase circuit, in a trefoil formation is considered and the maximum trench widths required are 525 mm wide and approx. 1925 mm deep. Typical cross section arrangements are illustrated in **Figure A2.2.3**.

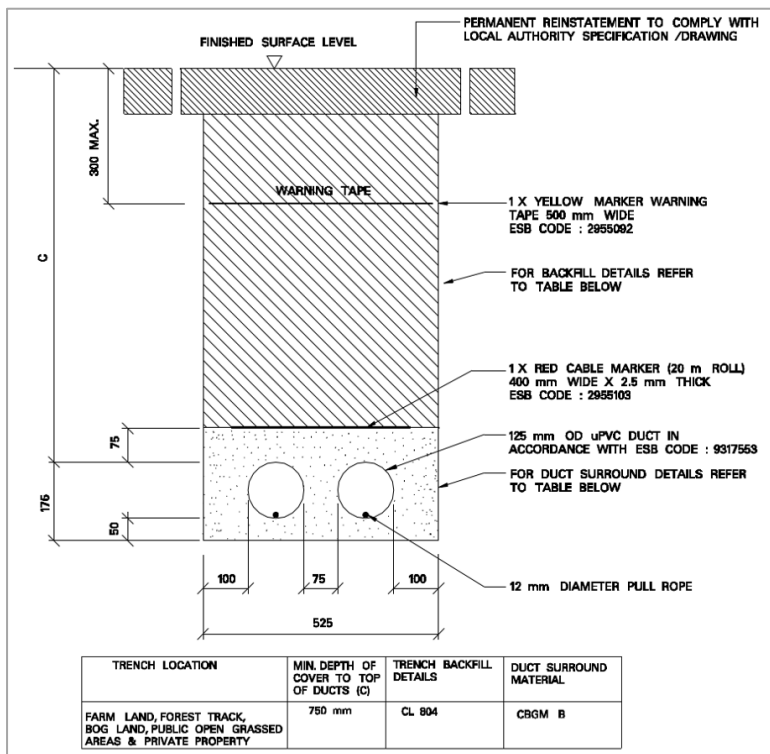


Figure A2.2.3: Typical MV Trench Cross Section

Source: ESB Standard MV Flat Formation Cross-Section

Duct Installation

Following implementation of traffic control measures, the road surface will be saw cut to the width of the trench and excavated using an excavator with hydraulic breaker. Typical noise emissions from saw cutter are in the order of 100 dB and the anticipated duration is approximately 3 hours per day. Trenches are excavated to a specified depth such that sufficient cover is provided in accordance with the required project trench design. Once the desired depth is reached, the trench walls will be either graduated to prevent collapse and to negate the need for trench supports or supported using timber poling boards and walers along with steel trench struts, as indicated in **Figure A2.2.4**. Once a trench of sufficient length (e.g. 20 – 50 m) has been excavated and secured, a layer of Selected Sand (SS), Cement Bound Sand (CBS), Cement Bound Granular Material (CBGM) or Concrete can be poured into the open trench and the ducts arranged in position on top. Following the bedding in of the ducts, additional layers of SS, CBS, CBGM or concrete are added and compacted in accordance with the project specifications. Once the backfill is complete and/or cured, protective tiles and hazard marker tape are installed. The trench is then backfilled and compacted with thermally suitable indigenous material and the road reinstated to the standard agreed with the local authority. The installation is advanced as a set of rolling works between joint bay locations.

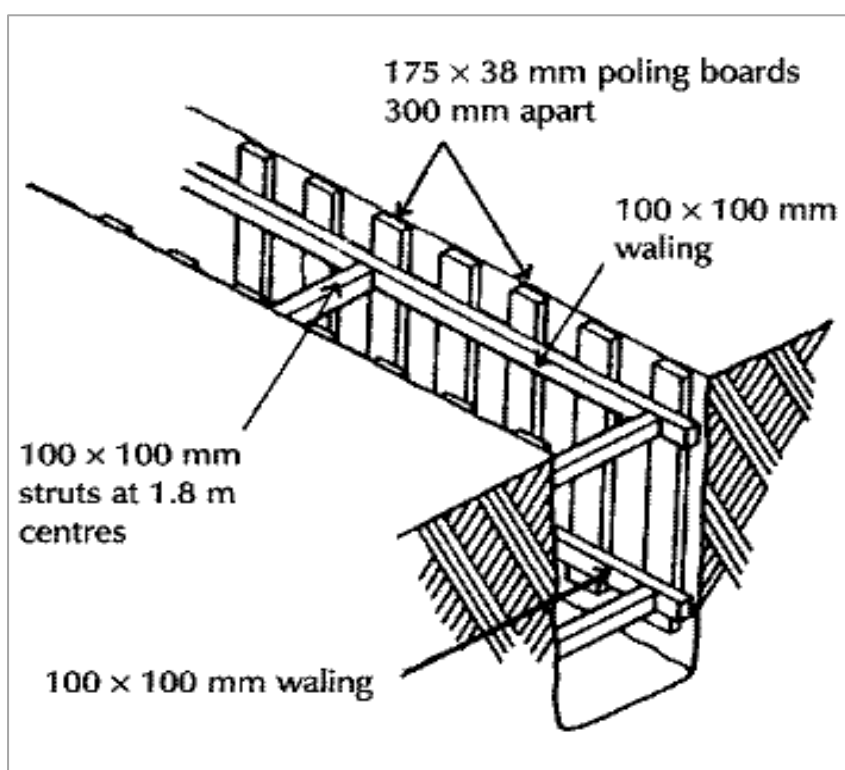


Figure A2.2.4: Typical 220 kV Excavation for Concrete Duct

Local storage and laydown areas at the Power Plant site and Kilpaddoge are required for the storage of materials including material removed from the trench and imported trench backfill material. These sites will be approximately 100 m².

Cable pulling

The Cables will be brought to site on cable drums which will then be placed into position by tractor and trailer. Once the drum is set up, a winch system including pulling cable will be attached to the nose of the cable and rollers used to guide the cable end towards the duct. The cables will then be pulled into the duct with lubrication being applied to the cable and duct throughout the pull in order to control pulling tensions.

220 kV Grid connection Joint Bays

Joint bays will be required approximately every 500 m on average to facilitate jointing of cable sections. Each joint bay will be approximately 6 m X 3 m in size. It is anticipated that there will be approximately 8 joint bays located within the L1010 road.

Once the jointing process is complete, the excavation will be backfilled with thermally suitable material together with protective tiles and hazard marking tape.

Medium Voltage (10 / 20 kV) Cabling Connection Joint Pits

Joint pits will be required approximately every 500 m on average to facilitate jointing of cable sections. Unlike the 220 kV cable circuit, a permanent joint bay is not required. Once the jointing process is complete, the excavation will be backfilled with thermally suitable material together with protective tiles and hazard marking tape.

Construction Activities

Construction will be carried out between 08.00 to 18.00 Monday to Friday and 08.00 – 14.00 on Saturdays. However, works within the L1010 can be scheduled to avoid school opening hours and Saturdays as required. It is anticipated that the following traffic movements will be required:

220 kV Grid Connection: Tail-Fed AIS Substation

- Maximum construction workers onsite: 15;
- Peak Construction Movements (daily): 4 (all within the site boundary);
- Vehicles: 15 (80% percent will arrive to the site in the morning peak hour of 08:00 and 9:00 and 15 vehicles will depart the site in the evening); and
- Deliveries: 2 HGV daily.

220 kV Grid Connection: L1010 Cable Ducting and Cable Installation & Jointing Works

- Maximum construction workers onsite: 7;
- Peak Construction Movements (daily): 4 (between the works on L1010 and either laydown area at Kilpaddocke / site);
- Vehicles: 7 (80% percent will arrive to the site in the morning peak hour of 08:00 and 9:00 and 7 vehicles will depart the site in the evening); and
- Deliveries: 1 HGV daily.

MV Substation: ESB substation

- Maximum construction workers onsite: 6;
- Peak Construction Movements (daily): 2 (all within the site boundary)'
- Vehicles: 6 (80% percent will arrive to the site in the morning peak hour of 08:00 and 9:00 and 3 vehicles will depart the site in the evening); and
- Deliveries: 1 HGV weekly.

MV Cabling connection: MV Cable Ducting and Cable Installation & Jointing Works

- Maximum construction workers onsite: 5;
- Peak Construction Movements (daily): 3 (All within the site boundary and in the cabling route);
- Vehicles: 5 (80% percent will arrive to the site in the morning peak hour of 08:00 and 9:00 and 3 vehicles will depart the site in the evening); and
- Deliveries: 1 HGV daily.

Construction Traffic Related Impacts

The cable route construction works will involve constantly moving the working area as the cable installation works progress while always maintaining one lane open to traffic. The grid works are estimated to take approximately 4 months on the assumption that 75 m of cable will be installed each day with a further month for cable installation and jointing.

Roadworks

The road works associated with the grid connection and MV cabling will be completed in line with the requirements of a road opening licence as agreed with the local authority. Details of road reinstatement will be agreed in advance with Kerry County Council. Reasonable local access will be maintained at all times during any road closures associated with the grid connection works. The details of which will be agreed in advance with Kerry County Council.