Underground Residential Development Master Planning Guideline v4.0

Version Control

|  |  |  |
| --- | --- | --- |
| **Version** | **Issued** | **Description** |
| 1.0 | 18/06/18 | Initial issue for consultation |
| 2.0 | 1/09/18 | Revised with input from internal and external stakeholders |
| 3.0 | 26/03/19 | Revised process and other general updates. |
| 4.0 | 26/06/20 | Revised master plan requirements, links and appendix. Incorporated REFCL requirements. |

Table of Contents

[1 Purpose 4](#_Toc42675195)

[2 Abbreviations and Acronyms 4](#_Toc42675196)

[3 References 4](#_Toc42675197)

[4 Master Plan Approval Process 4](#_Toc42675198)

[5 Master Plan Principles 5](#_Toc42675199)

[5.1 General Arrangement and Documentation 5](#_Toc42675200)

[5.2 Powercor Standards and Information 5](#_Toc42675201)

[5.3 Third Party Requirements 6](#_Toc42675202)

[5.4 High Voltage Network Arrangement 6](#_Toc42675203)

[5.5 URDs in REFCL areas 7](#_Toc42675204)

[5.6 Substation Sizing and Location 7](#_Toc42675205)

[5.7 Low Voltage Network Arrangement 7](#_Toc42675206)

[6 Appendix A – Abbreviations and Acronyms 8](#_Toc42675207)

[7 Appendix B – References 9](#_Toc42675208)

[8 Appendix C – HV and LV Master Plan 16](#_Toc42675209)

# Purpose

The intent of Powercor’s approval process for Underground Residential Development (URD) master plans is to ensure that the completed URD estate:

* complies with both Powercor standards and wider industry codes and standards;
* is approved in an efficient manner;
* does not hinder the provision of supply to neighbouring developments; and
* enables Powercor to efficiently meet the wider future planning needs of the surrounding distribution network

The following sections outline the current process for approval of URD master plans along with the guiding principles for some of the key requirements.

# Abbreviations and Acronyms

See Appendix A.

# References

All reference documents are available in the CitiPower and Powercor website (www.powercor.com.au).

A summary of the core reference documents is in Appendix B.

# Master Plan Approval Process

Powercor requires final approval rights of all URD master plans and associated stage scopes. The high level approval process is as follows:

1. Initiate preliminary meeting (optional): The Developer requests a preliminary meeting with Powercor to discuss estate requirements. Note, if a Developer is seeking a minimum solar penetration requirement, they must opt for a preliminary meeting.
2. Initial proposal: The Developer submits their proposed master plan and associated documentation (refer to 5.1 General Arrangement and Documentation) to Powercor.
3. Review: Powercor review the master plan for completeness and compliance with Powercor standards. If there are no queries or concerns then approval will be issued (Step 7).
4. Respond: Powercor respond identifying areas for clarification, perceived non-compliances and proposed alterations.
5. Revise & Resubmit: The Developer revises their proposed master plan and associated documentation to address Powercor’s specific queries.
6. Re-Review: Powercor review the master plan for completeness and compliance with Powercor standards. If further areas and stages require clarification or alteration then a response will be re-issued as per Step 4.
7. Approve: Once all outstanding issues have been clarified, Powercor can issue approval of the master plan and the URD can progress for stage scoping.

For further detail, please refer to the Master Plan Process – Guide for Customers and Contractors documentation located on the Powercor website ([www.powercor.com.au](file:///%5C%5Ccorp%5Cnwk%5CMKT%5CINTER-DEPT%5CNetwork%20Planning%20and%20Secondary%20Systems%5CNetwork%20Solutions%5CURD%5Cwww.powercor.com.au)).

# Master Plan Principles

## General Arrangement and Documentation

The quality of information provided to Powercor is an essential part of providing timely approval of a proposed master planning arrangement. Lack of clarity or missing information will cause delays as clarifications are requested. Powercor require the following:

* Format: All drawings must be submitted in CAD format (e.g. DWG format). All other documents shall be submitted in digital PDF format as a minimum, with any additional information in PDF format with a second version in the required native format.
* General arrangement: Drawings and supporting information showing the general arrangement of the URD must show the following:
	+ Ultimate Development: The final state of the URD estate with lots, roadways (including bridges, overpasses, etc.), community areas, display villages and any other relevant information. Stages must be marked clearly. Refer to Appendix C.
	+ Development Order: How the proposed development will be staged with supplementary tabulated information on the development timeframe for all stages from commencement to the ultimate completed URD. Refer to Appendix C.
* Civil Drawings: Engineering drawings showing all in ground assets in areas where the Developer has specifically identified to have the potential to impact the electrical assets.
* Electrical Drawings: Engineering drawings showing connectivity of the proposed High Voltage (HV) network in a single line format, clearly showing any staging requirements. Engineering drawings showing the HV network and substations physically within the URD.
* Electrical Asset Detail: Tabulated data showing kiosk substations, customer numbers, low voltage (LV) circuit lengths, cable sizing, voltage drops and loading information in addition to identifying the lots supplied by each LV circuits and substation.
* Powercor Assets: Clearly highlighting any expected interaction (i.e. tie in works) with existing Powercor assets either above or below ground.

## Powercor Standards and Information

A number of Powercor standards currently exist covering all aspects of electricity supply to a URD estate. All of these standards and requirements can be found via the Powercor Contractors Portal. Access is for registered users only, and registration can be requested via the Technical Standards and Work practice section of our website. The guideline will not be intended as a replacement for these standards, but will provide high level detail and principles. URD Matrix is for quick reference for Developers to the relevant information contained within the standards. Refer to Appendix B.

Access to a version of Powercor’s geographic information systems (GIS) will be via an external portal to MapInsights. This will give the Developer access to Powercor’s HV and LV network data, which is solely to be used for the development of the proposed master plans.

## Third Party Requirements

It is the Developers responsibility to ensure the master plans comply with any relevant third party requirements that may be applicable. These include, but are not limited to:

* Precinct Structure Plans for the area
* Council requirements
* Cultural heritage requirements
* VicRoads & VicTrack requirements
* Environmental assessment requirements

## High Voltage Network Arrangement

The guiding principles for arrangement of the high voltage network in and around an estate are as follows

* General arrangement: All urban and rural multi stage URD’s must be arranged with HV ring supplies to provide backup capacity during planned maintenance and outages.
* Capacity: HV assets must be sized to meet the relevant maximum demand (kVA per lot) requirements as stated in Powercor Standard DA411. HV assets must maintain cable ratings and not be de-rated due to either proximity to or crossing of any other services (e.g. water, gas, sewer, etc.), depth or congestion.
* Easements: A minimum 2.0 m wide clear easement is to be provided for any HV assets in public land, council reserves or across a specific lot.
* Conduits: All HV conduits are to be a minimum of 150mm diameter.

The default minimum number of spare conduits in URD estates are as follows:

|  |  |
| --- | --- |
| **Minimum spare conduits when excavating and installing new underground cable** | **URD** |
| **On property** | 1 spare per installed cable |
| **In street** | 0 depending on  ultimate requirements |
| **Road Crossing** | 1 spare per installed cable group+ |

**Table 1: Minimum number of spare conduits when excavating and installing new underground cable**

* + Note 1: +group is defined as being HV. I.e. one spare conduit will be requires for a HV bank of cables;
	+ Note 2: Network Planning is to confirm additional spare conduits for future planned augmentation works which may be in excess of the minimum number shown in the table above; and
	+ Note 3: All spare ducts are to be 150mm diameter.
* Additional HV requirements: All additional HV requirements (such as spare conduits, tie ins, etc.), as requested by Powercor, must be incorporated into the developers submission.

The applicable Powercor standards are DA411, GA001, GA070, GA211, GB101 and GC101.

## URDs in REFCL areas

The Victorian Government has legislated changes to the Bushfire Mitigation regulations that require the introduction of REFCLs at zone substations supplying high consequence bushfire areas. With this introduction of REFCLs comes a performance requirement which must be maintained in order for the whole zone substation high voltage system to operate as required and reduce the likelihood of fire starts.

If your URD development is within an existing or future REFCL area, there may be a Powercor requirement that could impact the HV cable route and or type, along with a potential requisite for one or more parcels of land to install an isolation transformer. Further information will be provided at the Preliminary Meeting with Powercor.

## Substation Sizing and Location

The guiding principles for selecting locations for substations within a URD are as follows:

* General arrangement: As far as practically possible, substations should be located at the centre of the area to be supplied to ensure balanced LV loading and to minimise voltage drop. A HV switching cabinet might be required to satisfy the area’s HV reticulation and or development.
* Sizing: Substations must be sized to meet the relevant maximum demand (kVA per lot) requirements as stated in Powercor standard DA411. However, consideration needs to be made for any solar, commercial, super lot or display village requirements the Developer has. The standard size of a kiosk shall be 315kVA, proposed alternative sized kiosks must be submitted for review and approval by Powercor.
* Site Location: Substations must be located on a defined lot and not on public land, open spaces or within council reserves unless the relevant council can provide written agreement to this arrangement. It is the Developers responsibility to obtain a Council approval letter prior to Master Plan approval.
* HV and LV Access: Site selection must give consideration to other in ground services and ensure that they do not limit access. Furthermore, where substations are located, avoid having other ground services in the area outside the Kiosk reserve and ensure minimum HV bending radius is per the Powercor standard GC021.

The applicable Powercor standards are DA411, DA421, DA431, GL051, GL001, GL021, GL031, GL201 and GL251.

## Low Voltage Network Arrangement

The guiding principles for LV network plans are as follows:

* LV Parallels: Allowance should be made for a minimum of three LV paralleling pillars for each substation to connect to neighbouring substations in the area.
* LV Loading: Where there are commercial, super lot or display villages being connected, the Developer must ensure that LV circuits are not overloaded.
* Voltage Compliance: LV circuit lengths and sizing must be designed to ensure voltage drop/rise and another supply quality conditions meet the specifications outlined in the Electricity Distribution Code. This is to apply under all loading scenarios including LV circuit parallels with neighbouring substations. Note that LV circuit lengths greater than 300m will require justification and approval from Network Planning (which will only be granted in exceptional circumstances).
* Service Pit Placement: Pits shall be located adjacent to the property boundary they serve and out of the line of any normal vehicle crossings.
* Public Lighting: Consideration shall be given to the provision of public lighting in compliance with any council requirements. Consideration shall also be given to potential spare HV conduits alongside with public lighting LV cables.
* Spare Conduits: All spare LV spare conduits are to be a minimum of 150mm diameter.

For default minimum number of spare conduits in URD estates please refer to Table 1 and its Notes above.

* Additional LV requirements: All additional LV requirements (such are spare conduits, tie ins, etc.), as requested by Powercor, must be incorporated into the developers submission.

The applicable Powercor standards are DA311, FA001 – 101, GL031 and GS001 - GS421

# Appendix A – Abbreviations and Acronyms

PAL Powercor Australia Limited

URD Underground Residential Development

HV High Voltage

LV Low Voltage

K/S Kiosk Substation

REFCL Rapid Earth Fault Current Limiting

# Appendix B – References

PAL Technical Standards:

|  |  |
| --- | --- |
| **URDREFERENCES:** | **TITLE:** |
| **DA** | Distribution Construction |
| **DC** | Clearances |
| **DD** | Drafting |
|  |  |
| **EA** | General Overhead |
| **EJ** | 3 Phase Structures |
| **EL** | Overhead Transformers |
| **EM** | Switches and Fuse Mounts |
| **ES** | LV Bare Structures |
| **ET** | LV ABC and Servicing |
|  |  |
| **FA** | Public Lighting |
|  |  |
| **GA** | Underground |
| **GB** | HV Cable and Accessories |
| **GC** | Conduit and Cable Pulling |
| **GE** | Cable Head Poles |
|  |  |
| **GL** | Kiosk Substation |
| **GS** | UG LV Mains and Services |

URD Matrix:

|  |  |  |  |
| --- | --- | --- | --- |
| **DA** | **Distribution Construction** | **DA031** | **General – Definitions** |
| **DA211** | **General – Ferroresonance Design Considerations** |
| **DA311** | **General – LV DESIGN Software (CP/PAL)** |
| **DA315** | **General – Earthing Design Software (CP/PAL)** |
| **DA320** | **General – Rail Crossings, (CP/PAL)** |
| **DA411** | **General – Residential Electrical Demand** |
| **DA421** | **General – Residential Distribution Transformer Rating** |
| **DA431** | **General – Residential Design Guidelines Customer Per S/stn.** |

|  |  |  |  |
| --- | --- | --- | --- |
| **DC** | **Clearance** | **DC102** | **Clearances – No Go Zone Concept (CP/PAL)** |
| **DC111**  | **Clearances – Above Ground, Roads, Rails, or Water (CP/PAL)** |
| **DC201**  | **Clearances – Distribution Pole Mounted Lanterns (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **DD** | **Drafting** | **DD071** | **Crossing Plans (PCA7/----)** |
| **DD072**  | **Under Crossing Plans (PCA 7/----)** |
| **DD101** | **Lease and Easement Plans (PCA2/----)** |
| **DD111** | **Substation (indoor and Ground Type) (PCA11/----)**  |
| **DD131**  | **Operation Diagrams**  |
| **DD200**  | **Drafting Standard - Introduction** |
| **DD201** | **Drafting Standard - General** |
| **DD202** | **Drafting Standard - Drawing Sheets** |
| **DD203** | **Drafting Standard - Drawing Sheet Title**  |
| **DD204** | **Drafting Standard - Scaling** |
| **DD205** | **Drafting Standard - Drawing Layout**  |
| **DD206** | **Drafting Standard - Drafting Precision**  |
| **DD207** | **Drafting Standard - Layers**  |
| **DD208**  | **Drafting Standard - Line Styles**  |
| **DD209**  | **Drafting Standard - Symbols**  |
| **DD210**  | **Drafting Standard - Text**  |
| **DD211**  | **Drafting Standard - Abbreviations** |
| **DD212** | **Drafting Standard - Hatching**  |
| **DD213** | **Drafting Standard - Dimensioning**  |
| **DD214** | **Drafting Standard - Revisions** |
| **DD215**  | **Drafting Standard - Referencing**  |
| **DD216**  | **Drafting Standard**  |
| **DD218**  | **Drafting Standard - Glossary**  |
| **DD220**  | **Drafting Standard - Connection Diagrams**  |
| **DD230**  | **Drafting Standard - Underground Cable (Field Notes/Loc. Plans) - General**  |
| **DD231**  | **Drafting Standard - Underground Cable - Detailing** |
| **DD232**  | **Drafting Standard - Underground Cable - CAD Drawn** |
| **DD233**  | **Drafting Standard - Underground Cable - Hand Drawn**  |
| **DD234**  | **Drafting Standard - Underground Cable - Quality Assurance**  |
| **DD235**  | **Drafting Standard - Underground Cable - URD**  |
| **DD250** | **Drafting Standard - UG Construction Plans - General**  |
| **DD251**  | **Drafting Standard - UG Construction Plans - URD** |

|  |  |  |  |
| --- | --- | --- | --- |
| **FA** | **Public Lighting** | **FA001** | **Public Lighting – General Information (CP/PAL)** |
| **FA011** | **Public Lighting – Pedestrian Lighting Category P (CP/PAL)** |
| **FA021** | **Public Lighting – Vehicle Lighting Category V (CP/PAL)** |
| **FA031** | **Public Lighting – Flood Lighting (CP/PAL)** |
| **FB041** | **Public Lighting Structure, Buildings, Suspension Mounting and Bridges (CP/PAL)** |
| **FA051** | **Public Lighting – Decorative Lighting (CP/PAL)** |
| **FA056** | **Public Lighting – Standard Fittings (CP/PAL)** |
| **FA061** | **Public Lighting – Column Placement and Clearances (CP/PAL)** |
| **FA071** | **Public Lighting – Shared Use of Columns (CP/PAL)** |
| **FA081** | **Public Lighting – Servicing Arrangements (CP/PAL)** |
| **FA091** | **Public Lighting – Volt Drop (CP/PAL)** |
| **FA101** | **Public Lighting – Maintenance (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **GA** | **Underground** | **GA001** | **General Information (CP/PAL)** |
| **GA070** | **HV Network Design Guidelines** |
| **GA080** | **LV Network Design Guidelines (CP/PAL)** |
| **GA211** | **Trenching (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **GB** | **HV Cable and Accessories** | **GB001** | **Underground HV Cable and Accessories – General Information(CP/PAL)** |
| **GB011** | **Underground HV Cable and Accessories – 22kVCable (CP/PAL)** |
| **GB015** | **Underground HV Cable and Accessories – 11kV Cable (CP/PAL)** |
| **GB021** | **Underground HV Cable and Accessories – Loadbreak Elbows (CP/PAL)** |
| **GB026** | **Underground HV Cable and Accessories – Deadbreak Elbows (CP/PAL)** |
| **GB031** | **Underground HV Cable and Accessories – Terminations (CP/PAL)** |
| **GB051** | **Underground HV Cable and Accessories – Tee Joints (CP/PAL)** |
| **GB061** | **Underground HV Cable and Accessories – Straight Joints (CP/PAL)** |
| **GB101** | **Cable Assembly – HV Mains Distribution (22kV) (CP/PAL)** |
| **GB103** | **Cable Assembly – HV Mains Distribution (11kV)(CP/PAL)** |
| **GB201** | **Elbow Assembly – 200 Amp (22kV) (CP/PAL)** |
| **GB211** | **Elbow Assembly – 400 Amp (22kV) (CP/PAL)** |
| **GB213** | **Elbow Assembly – 400 Amp (11kV) (CP/PAL)** |
| **GB251** | **Cable Entry Assembly – Transformer (22kV) (CP/PAL)** |
| **GB306** | **Termination Assembly – Heatshrink (22kV) (CP/PAL)** |
| **GB308** | **Termination Assembly – Heatshrink (11kV) (CP/PAL)** |
| **GB311** | **Screen Wire Assembly – HV Terminations (22kV)(CP/PAL)** |
| **GB313** | **Screen Wire Assembly – HV Terminations (11kV) (CP/PAL)** |
| **GB321** | **Trifurcation Assembly – 3/Core Cable (22kV) (CP/PAL)** |
| **GB323** | **Trifurcation Assembly – 3/Core Cable (11kV) (CP/PAL)** |
| **GB351** | **Sealed End Assembly – Heatshrink (22kV) (CP/PAL)** |
| **GB353** | **Sealed End Assembly – Heatshrink (11kV) (CP/PAL)** |
| **GB421** | **HV Straight Joint Assembly (22kV) (CP/PAL)** |
| **GB423** | **HV Straight Joint Assembly (11kV) (CP/PAL)** |
| **GB501** | **Cable, 12.7/22kV, Underground (CP/PAL)** |
| **GB551** | **Cover Slab, Polymeric, Straight (CP/PAL)** |
| **GB552** | **Cover Slab, Polymeric, Corrugated (CP/PAL)** |
| **GB556** | **Tape, Warning, High Voltage (CP/PAL)** |
| **GB601** | **Elbow, Loadbreak, 200 Ampere (CP/PAL)** |
| **GB606** | **Elbow, Deadbreak, 200 Ampere CP/PAL** |
| **GB611** | **Elbow, 400 Ampere, Pin Type 22kV(CP/PAL)** |
| **GB613** | **Elbow, 400 Ampere, Pin Type 11kV(CP/PAL)** |
| **GB616** | **Elbow, 400 Ampere Profile, 630 Ampere, Bolted Type (CP/PAL)** |
| **GB619** | **Elbow, 400A profile, 630A Bolted (11kV) (CP/PAL)** |
| **GB621** | **Elbow, 400 Ampere, Connector, Pin to Bolted (CP/PAL)** |
| **GB631** | **Cap, Insulated (Dead-end Receptacle) (CP/PAL)** |
| **GB636** | **Bushing, Insulated Parking (Stand-off Plug) (CP/PAL)** |
| **GB641** | **Bushing, Earthed Parking (CP/PAL)** |
| **GB646** | **Insert, Bushing, 200 Ampere (CP/PAL)** |
| **GB651** | **Insert, Bushing, Feedthrough, 200 Ampere (CP/PAL)** |
| **GB676** | **Receptacle (Connector), Straight, Deadbreak, 200 Ampere 22kV (CP/PAL)** |
| **GB678** | **Receptacle (Connector), Straight, Deadbreak, 200 Ampere 11kV (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **GC** | **Conduit and Cable Pulling** | **GC001** | **Conduit and Cable Pulling—General Information (CP/PAL)** |
| **GC011** | **Conduit and Cable Pulling—Physical Data (CP/PAL)** |
| **GC021** | **Conduit and Cable Pulling—Bending Radius & Pulling Tensions (CP/PAL)** |
| **GC031** | **Conduit and Cable Pulling—Conduit Selection (CP/PAL)** |
| **GC051** | **Conduit and Cable Pulling—Conduit Sealing (CP/PAL)** |
| **GC061** | **Conduit and Cable Pulling—Boring and Ploughing (CP/PAL)** |
| **GC031** | **Conduit and Cable Pulling—Conduit Selection (CP/PAL)** |
| **GC101** | **HD Conduit Assembly—Underground (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **GE** | **Cable Head Poles** | **GE001** | **Cable Head Poles – General Information (CP/PAL)** |
| **GE101** | **22kV Non-Switched Cable Head Pole Assembly – Wood Pole (CP/PAL)** |
| **GE106** | **22kV Switched Cable Head Pole Assembly – Wood Pole (CP/PAL)** |
| **GE115** | **HV Double Cable Head Pole Assembly – Wood Pole (CP/PAL)** |
| **GE118** | **HV Piggy Back Cable Head Pole Assembly – Wood Pole (CP Only)** |
| **GE121** | **LV Mains Cable Head Pole Assembly – Wood Pole (CP/PAL)** |
| **GE131** | **LV Service Cable Head Pole Assembly – Wood Pole (CP/PAL)** |
| **GE201** | **22kV Non-Switched Cable Head Pole Assembly – Concrete Pole (CP/PAL)** |
| **GE206** | **22kV Switched Cable Head Pole Assembly – Concrete Pole (CP/PAL)** |
| **GE215** | **HV Double Cable Head Pole Assembly – Concrete Pole (CP/PAL)** |
| **GE218** | **HV Piggy Back Cable Head Pole Assembly – Concrete Pole (CP Only)** |
| **GE221** | **LV Mains Cable Head Assembly – Concrete Pole (CP/PAL)** |
| **GE231** | **LV Service Cable Head Assembly – Concrete Pole (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **GL** | **Kiosk Substation** | **GL001** | **Kiosk Substations – General Information (CP /PAL)** |
| **GL011** | **Kiosk Substations – Reduced Capacity Networks (CP/PAL)** |
| **GL021** | **Kiosk Substations – Full Capacity Networks (CP/PAL)** |
| **GL031** | **Kiosk Substations – Low Voltage Configurations (CP/PAL)** |
| **GL041** | **Kiosk Substations – Cable Entry, Foundations & Civil Works (CP/PAL)** |
| **GL051** | **Kiosk Substations – Reserves / Easements (CP/PAL)** |
| **GL052** | **High Voltage Outdoor Switchgear Cabinets**  |
| **GL101** | **Kiosk Assembly – 22kV Loop Through (CP/PAL)** |
| **GL111** | **Kiosk Assembly – Reduced Capacity Loop Through (CP/PAL)** |
| **GL201** | **Kiosk Assembly – 22kV Double Switch (CP/PAL)** |
| **GL251** | **Kiosk Assembly – 22kV Triple Switch (CP/PAL)** |
| **GL301** | **Kiosk Assembly – 22kV Non-Switched Radial (CP/PAL)** |
| **GL401** | **Kiosk Substations – Earth Kit Assembly (CP/PAL)** |
| **GL501** | **Kiosk Substation, 22kV, 3 Phase, Loop Through (CP/PAL)** |
| **GL511** | **Kiosk Substation, 22kV, 3 Phase, Reduced Capacity Loop Through (CP/PAL)** |
| **GL521** | **Kiosk Substation, 22kV, 1 Phase, Loop Through (CP/PAL)** |
| **GL531** | **Kiosk Substation, 12.7kV, SWER, Loop Through (CP/PAL)** |
| **GL541** | **Kiosk Substation, 22kV, 3 Phase, Non-Switched Radial (CP/PAL)** |
| **GL551** | **Kiosk Substation, 22kV, 3 Phase, Double Switch (CP/PAL)** |
| **GL561** | **Kiosk Substation, 22kV, 3 Phase, Triple Switch (CP/PAL)** |
| **GL601** | **Duct, HV Cable Entry (CP/PAL)** |
| **GL641** | **Slab, Reinforced Concrete (CP/PAL)** |
| **GL651** | **Lintel, Prestressed or Reinforced Concrete (CP/PAL)** |
| **GL661** | **Culvert, Box** |
| **GL662** | **Foundation, Box, Dual Tunnel** |
| **GL663** | **Slab, Concrete, RMU Switchgear** |
| **GL701** | **Feeder Strip, 600A DIN (CP/PAL)** |
| **GL711** | **LV Feeder Paralleling Kit (CP/PAL)** |
| **GS** | **UG LV Mains and Services** | **GS001** | **Underground LV Mains and Service – General Information (CP/PAL)** |
| **GS011** | **Underground LV Mains and Service – Cable (CP/PAL)** |
| **GS021** | **Underground LV Mains and Service – Pits & Pillars (CP/PAL)** |
| **GS031** | **Underground LV Mains and Service – Terminations (CP/PAL)** |
| **GS051** | **Underground LV Mains and Service – Tee Joints (CP/PAL)** |
| **GS061** | **Underground LV Mains and Service – Straight Joints (CP/PAL)** |
| **GS071** | **Underground LV Mains and Service – Distribution Cabinets (CP/PAL)** |
| **GS101** | **Cable Assembly – LV Mains and Service (CP/PAL)** |
| **GS201** | **Pit Assembly – Service (CP/PAL)** |
| **GS211** | **Pillar Assembly – LV Mains (CP/PAL)** |
| **GS221** | **LV Distribution Cabinet Assembly (CP/PAL)** |
| **GS301** | **Termination Assembly – Indoor (CP/PAL)** |
| **GS306** | **Termination Assembly – Outdoor (CP/PAL)** |
| **GS351** | **Insulated End Assembly – Heat shrink (CP/PAL)** |
| **GS401** | **Tee Joint Assembly – Service (CP/PAL)** |
| **GS411** | **Tee Joint Assembly – LV Mains (CP/PAL)** |
| **GS416** | **Straight Joint Assembly – Service (CP/PAL)** |
| **GS421** | **Straight Joint Assembly – LV Mains (CP/PAL)** |

|  |  |  |  |
| --- | --- | --- | --- |
| **VESI** | **Kiosk Substation** | **VX10/ 64/64** | **Earthwork and Footing Diagrams for Kiosk Type Substations 300kVA – 500kVA****General Layout and Site Requirement Notes** |

# Appendix C – HV and LV Master Plan



