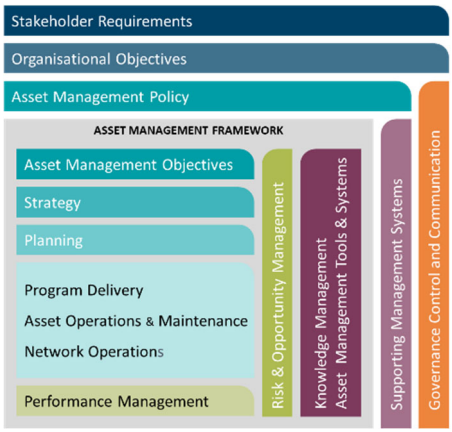
Western Power's Asset Management System



Distribution Substation Plant Manual Chapter 4 – Plant General Arrangements and Installation Guides, up to 22kV

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Content Owner/Custodian: Distribution Design and Standards

This Revision: 2 – December 2021

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Document control

Endorsement approvals

	Name	Title	Signature and Date
Author	Gareth Chadwick / Ken Tiong	Senior Standards and Technology Officer / Senior Distribution Design Engineer	Signature on file
Checked	Grant Stacy	Principal Engineer	Signature on file
Endorsed by	Lanka Thabrew	Engineering Team Leader	Signature on file
Approved by	Justin Marshall	Distribution Design & Standards Manager	Signature on file

Record of revisions

Revision No.	Date	EDM Version	Revised by	Description
0	December 2019	1	Gareth Chadwick	Original
1	October 2021	2	Ken Tiong	MKII Non MPS and fire risk mitigation measures implemented. 1000A switch added to PENDA and street light circuit for Type 1.1 PENDA
2	December 2021	3	Ken Tiong	Transformer installation guides updated

Key documents providing direction and influencing this document

Doc #	Title of document
DM# 40304923	Asset Management System
DM# 41965928	Safety in Design Guidelines
DM# 50473207	DSPM Governance and Technical Documents Register

This document gives direction to and influences the following documents

Doc #	Title of document
Various DQM documents	Distribution Substation Design Projects

Stakeholders (people that were consulted when document was updated)

Business Area / Function
Asset Management - Asset Performance
Asset Management – Safety Environment Quality and Training
Asset Management - Grid Transformation

Asset Operations – Network Operations
Asset Operations – Operational Services
Asset Operations – Customer Connection Services
Business and Customer Service – Customer Service

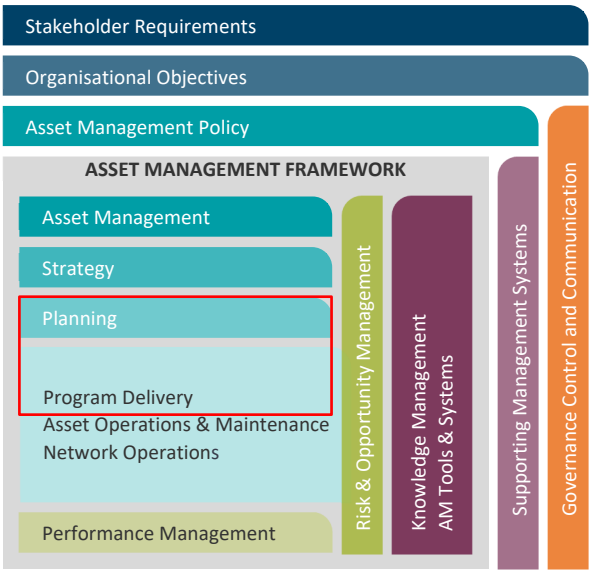
Notification list (people to be notified when document is updated)

Busines Area / Function
Asset Management - Asset Performance
Asset Management – Safety Environment Quality and Training
Asset Management - Grid Transformation
Asset Operations – Network Operations
Asset Operations – Operational Services
Asset Operations – Customer Connection Services
Business and Customer Service – Customer Service

Document classification and hierarchy

A key requirement of the Western Power Asset Management Policy (AMP) is to develop and maintain an Asset Management System (AMS). This Distribution Substation Plant Manual is defined as an overarching / technical / governance document within the AMS document classification and structure and sits within the Planning and Program Delivery component/s of the AMS.

The AMS and the interrelationships between the collection of documents, tools and systems that are used for asset management are described in the AMS document EDM# 40304923.



Contents

1. Introduction

This Chapter of the Distribution Substation Plant Manual (DSPM) contains substation plant related information and drawings showing the standard plant arrangements used within Western Power's distribution substations with Tyree and ETEL transformers. This Chapter is being updated progressively as the plant procurement process is being undertaken. As an interim measure this Chapter may contain Distribution Substation Manual (DSM) drawings where legacy plant is still being used and the drawing set has not been updated to demonstrate Western Power's compliance with AS5577.

2. Disclaimer

The information contained within these drawings shall not be used for anything other than their intended purpose (as stated within this Chapter). Other documents that refer to these drawings shall not change the intended purpose whether it is written or inferred.

This Chapter alone does not claim to demonstrate compliance with any Government Regulations or Industry Standards. These drawings are to be read in conjunction with the following Western Power documents:

i. Western Australian Service and Installation Requirements (WASIR)
ii. Underground Distribution Schemes Manual (UDSM)
iii. Distribution Overhead Line Design Manual (DOHLDM) for DSM 3-24 drawing.
iv. Distribution Design Catalogue (DDC)

The drawings within this Chapter are generic in nature and may not be suitable for all substation sites. It is the designer's responsibility to make sure that these drawings are suitable for the proposed substation site prior to use.

3. Compliance with this Manual

These substation installation drawings have been developed and enhanced over time based on feedback from contractors and field crews and trial installations. These drawings provide detail of the approved installation standard that should be suitable for most distribution substation sites.

Where a customer's site requires a non-standard substation arrangement (e.g., where non-load bearing soils exists), the drawings within this section can be made available to the customer. It is then the customer's responsibility, in conjunction with their architect and civil / structural engineers, to prepare an alternative design. This design must meet all Western Power's requirements and any relevant Australian Standards. The design must be submitted to Western Power with an explanation of how the proposed substation design is safe, fit for purpose and will facilitate installation of "standardised Western Power distribution equipment". Where non-load bearing soils exist, a suitable road may also need to be constructed to allow unrestricted access for Western Power personnel and operational vehicles.

The non-standard drawings register for Distribution Construction Standards Handbook (DCSH) and Distribution Substation Plant Manual (DSM / DSPM) is EDM# 34163616. Any non-standard design must be approved by a Team Leader and a Senior Engineer, and added to this register.

4. Information Provided on Drawings

This Chapter of the Distribution Substation Plant Manual contains drawings showing the general arrangements (GA) for distribution plant and the requirements for installation. The equipment is designed to be installed onto a precast concrete culvert or metallic base that acts as a pre-manufactured foundation for the equipment. Where a non-standard foundation or oil containment bund is required the designer or design

manager shall consult with Distribution Design & Standards Area of Western Power prior to finalising the design.

The following sections explain the typical information that is contained within each drawing sheet.

Designer's Notes:

1. All dimensions shown on drawings have been rounded up to the nearest 50mm. An equivalent building tolerance of ± 50mm should be permitted.

4.1 Plant single line diagram

This sheet is to show the electrical layout of the individual components that make up the item of plant.

The following information is provided on this drawing

- HV and LV Voltages
- HV tap ratio and range
- Number of primary and secondary phases
- Protection devices contained within the item of plant
- Number of outgoing circuits
- LV switchgear arrangements
- Isolation points
- Operational earthing points

4.2 General Arrangement

This sheet is to show the physical attributes of the equipment.

The following information is provided on this drawing:

- Name Plate kVA rating
- Voltage
- Number of HV bushings
- Dimensions
- Weight
- Oil quantity (if plant contains oil)
- Stock code
- Centre of gravity
- Lifting points
- LV Switchgear arrangements

4.3 Installation Guide (Drawing)

These drawing sheets show how to install the base or culvert within the substation site and how to position the equipment onto the base or culvert.

These drawings show:

- The size of the excavation in typical sandy soil.

- The compaction of the subsoil.
- Compaction of backfill.
- The position of the equipment on the base or culvert.

4.4 Installation Guide (Notes)

Where provided, this drawing contains:

- Additional design notes that are to be read in conjunction with the information shown on the installation drawing.
- Applicable Industry Standards to be used where the standard design is not suitable due to the specific location and a non-standard design is required.

4.5 Cabling Arrangements

Where provided, this drawing contains:

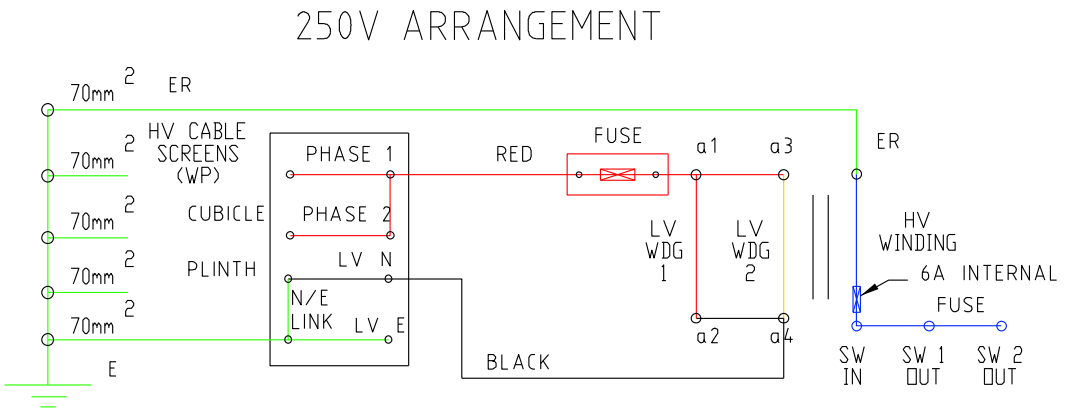
- Maximum size and number of LV cables that can be terminated onto the plant item
- Details of the bushing palm or LV bus
- Wiring for single phase 250V or split phase 500V where this option is available.

5. Drawings – General Arrangements and Installation Guide

This section contains drawings within the following categories:

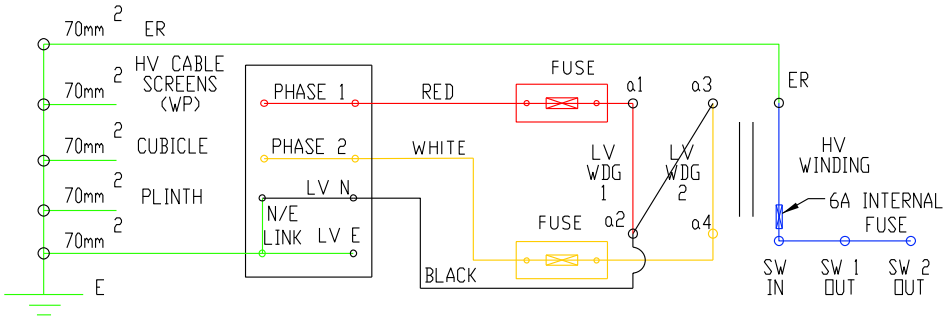
- Single Phase Underground Distribution Schemes (SPUDS)
- Modular Package Substation (MPS)
- Schneider RM6 Switchgear Kiosk
- Low Voltage Switchgear
- Non-Modular Package Substation (Non-MPS), cluster substation.

5.1 DSPM 4-01 SPUDS Transformers



LV VOLTAGE SELECTION
250V
LINK a1 TO a3 & a2 TO a4
(UNIT DISPATCHED AS SHOWN)

12.7 OR 19.1
5 TAPS WITH RANGE
OF + 2.5%
NOMINAL TAP 3



LV VOLTAGE SELECTION
500V
LINK a2 TO a3

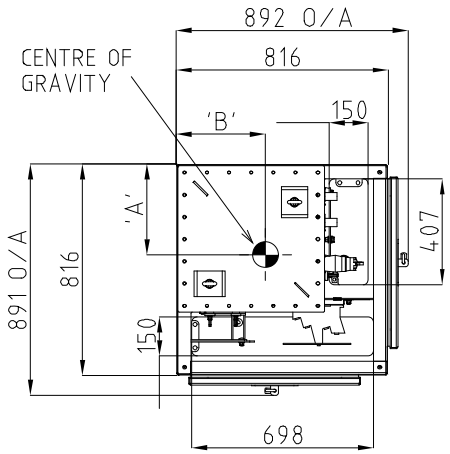
12.7 OR 19.1
5 TAPS WITH RANGE
OF + 2.5%
NOMINAL TAP 3

NOTES:-
1. 22kV VERSION AVAILABLE BUT NOT SHOWN

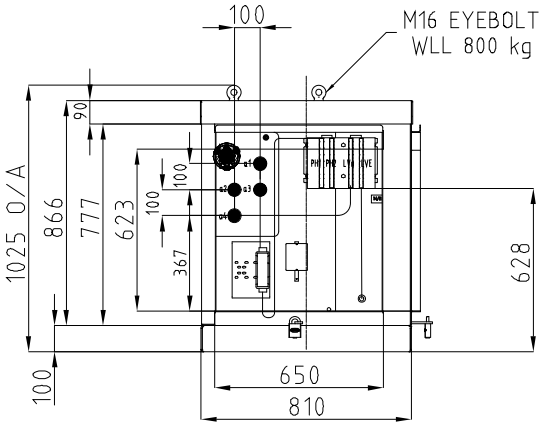
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APPRD.
B	06.09.21	TITLE REVISED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE: TYREE & ETEL
12.7/19.1, 22kV - 25 & 50kVA
SPUDS TRANSFORMER
SINGLE LINE DIAGRAM

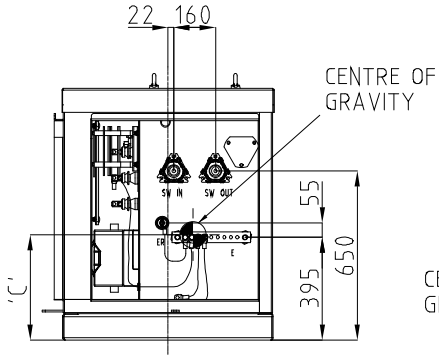
DISTRIBUTION SUBSTATION PLANT MANUAL
westernpower
DRAWN: JRR DATE: 18-11-2019
ORIGINATED GC SCALE. NTS
CHECKED: CO
APPROVED: GRANT STACY
DRG. No. DSPM-4-01
REV. B SHT. 1/7



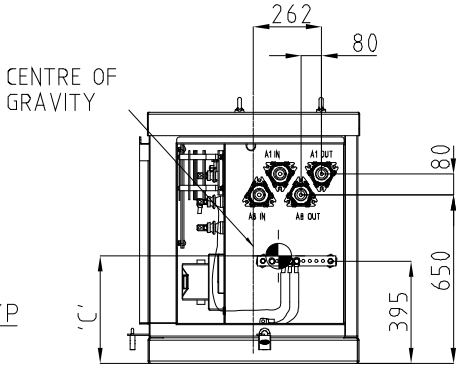
TOP VIEW
(TOP REMOVED)



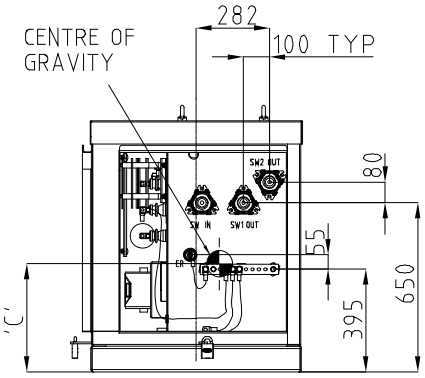
LV SIDE VIEW
(DOORS REMOVED)



2 BUSHINGS HV



4 BUSHINGS HV



3 BUSHINGS HV

HV SIDE VIEW (DOORS REMOVED)

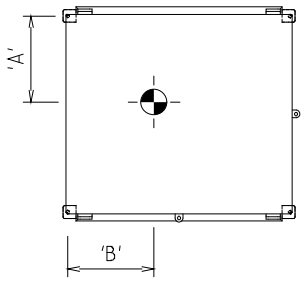
TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	BUSHINGS	DIMENSION 'A'	'B'	'C'	WEIGHT (kg)	OIL QTY (LITRES)	STOCK CODE	COMPATIBLE UNIT
25	12.7	3	350	344	416	405	170	XA2436	HU34
25	22	4	335	329	414	475	235	XA2438	HU35
50	12.7	2	313	308	404	460	145	XA2433	HU31
50	12.7	3	313	308	404	530	145	XA2434	HU34
50	19.1	2	333	327	401	455	145	XA2437	HU31
50	22	4	328	322	394	495	140	XA2439	HU35

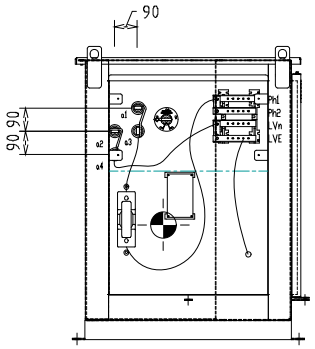
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TABLE REVISED	KT	CO	GS
A	05.12.19	ORIGINAL ISSUE	GC	CO	GS

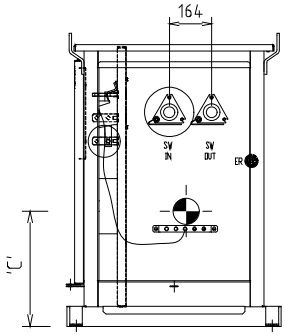
TITLE
TYREE
12.7/19.1, 22kV - 25 & 50kVA
SPUDS TRANSFORMER
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL
westernpower

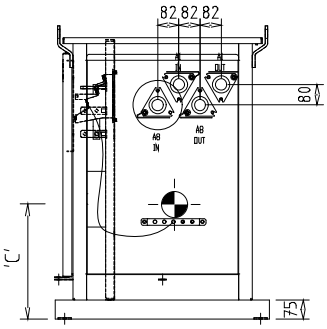
DRAWN: JRR	DATE: 14-11-2019	DRG. No.	
ORIGINATED GC	SCALE. NTS	DSPM-4-01	
CHECKED: CO			
APPROVED: GRANT STACY		REV. B	SHT. 2/7



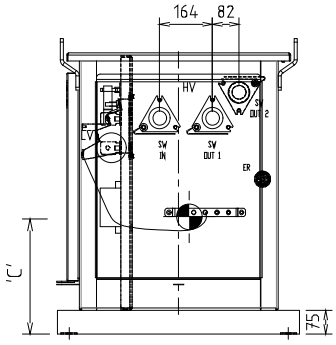




2 BUSHINGS HV



4 BUSHINGS HV



3 BUSHINGS HV

HV SIDE VIEW (DOORS REMOVED)

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	BUSHINGS	DIMENSION 'A'	'B'	'C'	WEIGHT (kg)	OIL QTY (LITRES)	STOCK CODE	COMPATIBLE UNIT
25	12.7	3	307	327	364	380	115	XA2436	HU34
25	22	4	288	299	354	390	115	XA2438	HU35
50	12.7	3	337	337	448	530	145	XA2434	HU34
50	19.1	2	334	332	446	575	180	XA2437	HU31
50	22	4	334	333	445	570	180	XA2439	HU35

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

TITLE

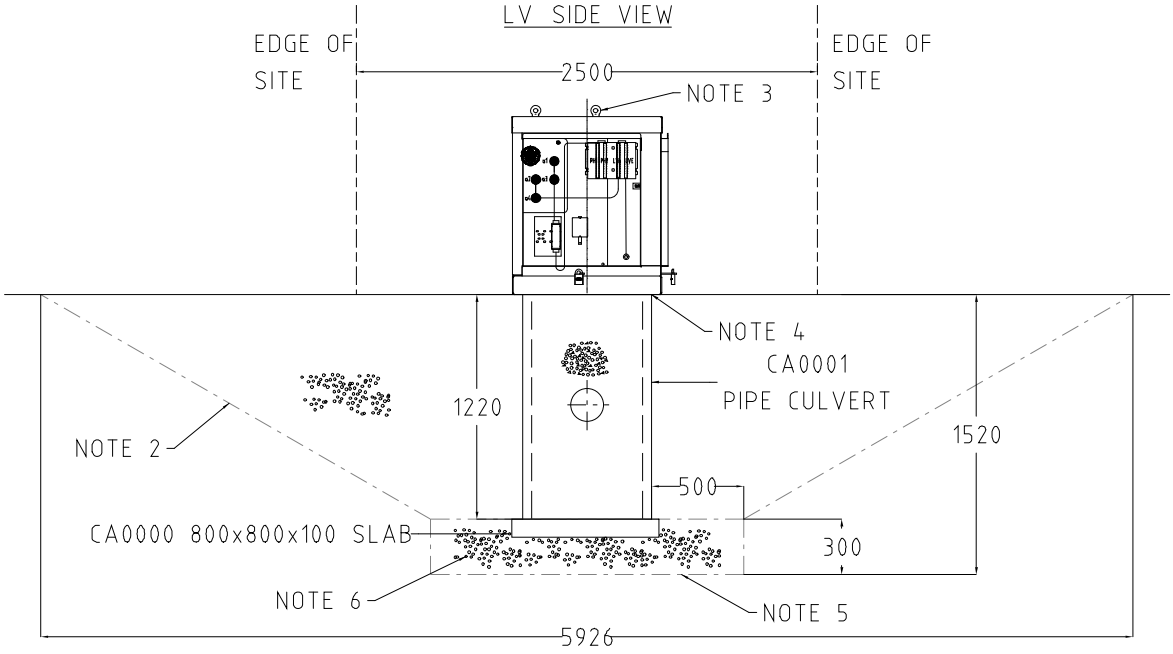
ETEL
12.7/19.1, 22kV – 25 & 50kVA
SPUDS TRANSFORMER
GENERAL ARRANGEMENT

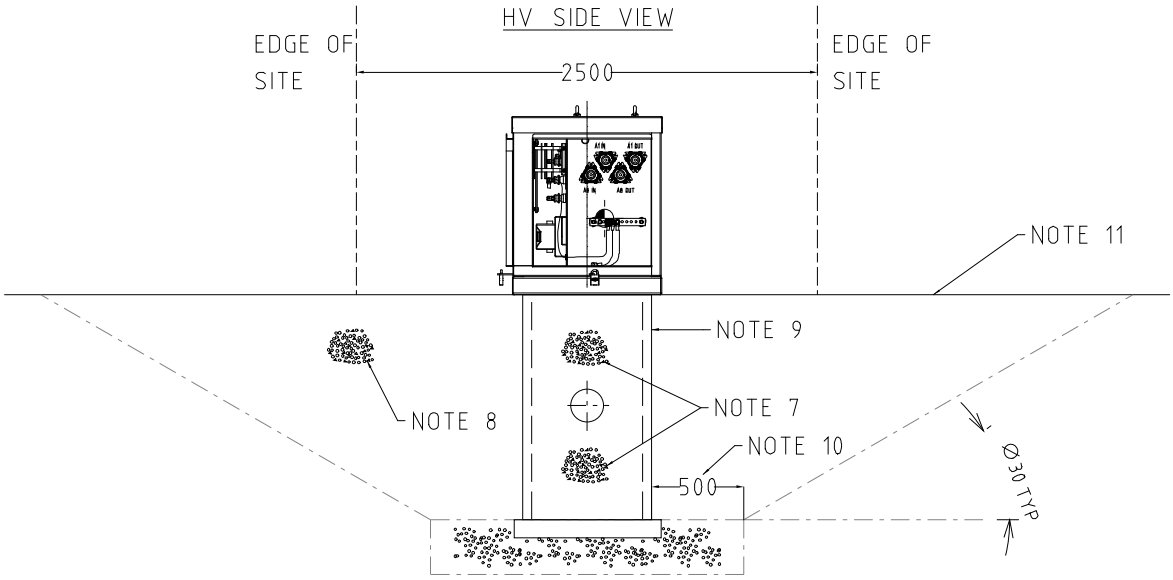
DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR | DATE: 14-11-2019
ORIGINATED KT | SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY

DRG. No. DSPM-4-01
REV. A | SHT. 3/7





NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON THE FOLLOWING SHEETS.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TITLE AND DRAWING NUMBER CHANGED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE: TYREE & ETEL 12.7/19.1, 22kV - 25 & 50kVA SPUDS TRANSFORMER INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR | DATE: 14-11-2019 | DRG. No. DSPM-4-01
ORIGINATED: GC | SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY | REV. A | SHT. 4/7

NOTES:-

1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS 3798 FOR EARTHWORKS, AS 4678 FOR EARTH RETAINING STRUCTURES AND AS 1597 FOR PRECAST CONCRETE CULVERTS.
2. EXCAVATION TO BE DONE IN ACCORDANCE WITH THE CODE OF PRACTICE FOR EXCAVATION. A COMPETENT PERSON MUST BE PRESENT AT ALL TIMES DURING THE EXCAVATION, FOUNDATION PREPARATION, INSTALLATION OF CULVERT AND BACK FILL. IF DUE TO SITE CONDITIONS AND CLOSE PROXIMITY TO OTHER STRUCTURES SAFE EXCAVATION CANNOT BE CARRIED OUT THEN TRENCH SHORING SHOULD BE USED.
3. LIFTING POINT FOR "TRANSFORMER" TO BE USED FOR TRANSFORMER REPLACEMENT AND TO LIFT COMPLETE ASSEMBLED SPUDS TRANSFORMER. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE OUTER FRAME.
4. THE SPUDS TRANSFORMER SHOULD STRADDLE THE PIPE AND THE WEIGHT OF THE TANK SHOULD BE FULLY SUPPORTED BY THE PIPE.
5. COMPACTION OF TRENCH BASE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 92 % TO AS 1289.6.3.2.
   THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
6. INFILL FROM THE BASE OF THE TRENCH TO THE LEVEL OF THE PIPE CULVERT BASE WITH 20mm DIAMETER ROAD BASE AND COMPACTED TO A MINIMUM MODIFIED DENSITY RATIO OF 95% TO AS 1289.6.3.2. THIS IS MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENETROMETER.
7. PIPE TO BE FILLED WITH SAND, COMPACTED TO UNDERSIDE OF CABLE ENTRIES. ABOVE CABLE ENTRIES HAND COMPACTION REQUIRED (NOT BY MACHINE).
8. COMPACTED BACKFILL MATERIAL IS TO BE CLEAN SAND. COMPACTION OF THE SAND IS TO BE CARRIED OUT IN LAYERS NOT EXCEEDING 300mm AND MUST ACHIEVE A MINIMUM MODIFIED DENSITY RATIO OF 92 % TO AS 1289.6.3.2. THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER
9. CONCRETE PIPE CULVERT 600 I/D x 1220 LONG. SN. CA0001, WITH CORED HOLES TO WP DRAWING. No. L98-1506. 800x800x100 CONCRETE BASE SLAB SN. CA0000
10. THE BASE OF THE EXCAVATION IS TO BE A MINIMUM OF 500 mm LARGER THAN THE BASE OF THE CULVERT, ON ALL SIDES. THE SIDES OF THE EXCAVATION ARE TO HAVE A SAFE SLOPE BASED ON SOIL TYPE AND MOISTURE CONTENT.
11. IN THE EVENT THAT THE SITE IS HIGHER THAN THE FINISHED LEVELS OF THE NEIGHBOURING AREAS, RETAINING WALLS, ACCESS STEPS AND DRAINAGE SHALL BE PROVIDED COMPLYING WITH AS 4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND WESTERN POWER. THIS WORK SHALL BE CERTIFIED BY A CHARTERED CIVIL ENGINEER (CPENG).
12. WHERE THERE IS A RISK OF FLOODING OR WHERE GROUND WATER EXISTS, THE SUBSTATION SITE SHALL BE ELEVATED AND RETAINED SO THAT THE CULVERT BASE IS ABOVE THE PREDICTED FLOODING OR HIGHEST POSSIBLE GROUND WATER LEVEL. THE FOUNDATION DESIGN, BACK FILL AND COMPACTION IS TO BE APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER. REFER TO WASIR CLAUSE 14.4.6.
13. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS 1289.6.3.2 IS REQUIRED BY WESTERN POWER FOR ALL SUBSTATION INSTALLATIONS.

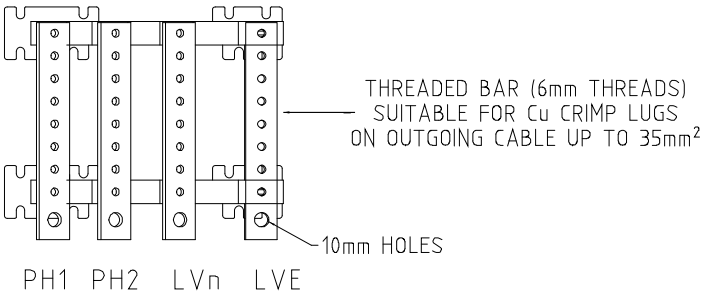
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	NOTES AND DRAWING NUMBER REVISED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE: TYREE & ETEL 12.7/19.1, 22kV - 25 & 50kVA SPUDS TRANSFORMER INSTALLATION GUIDE

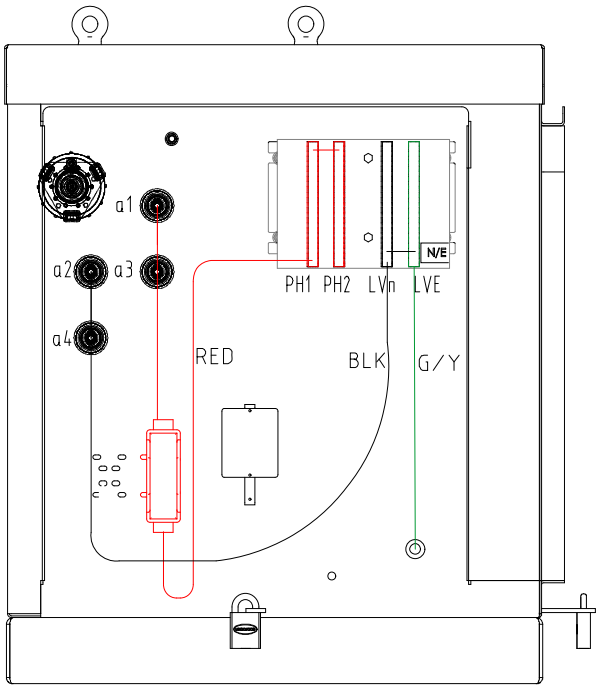
DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: JRR	DATE: 14-11-2019	DRG. No. DSPM-4-01
ORIGINATED: GC	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. B / SHT. 5/7

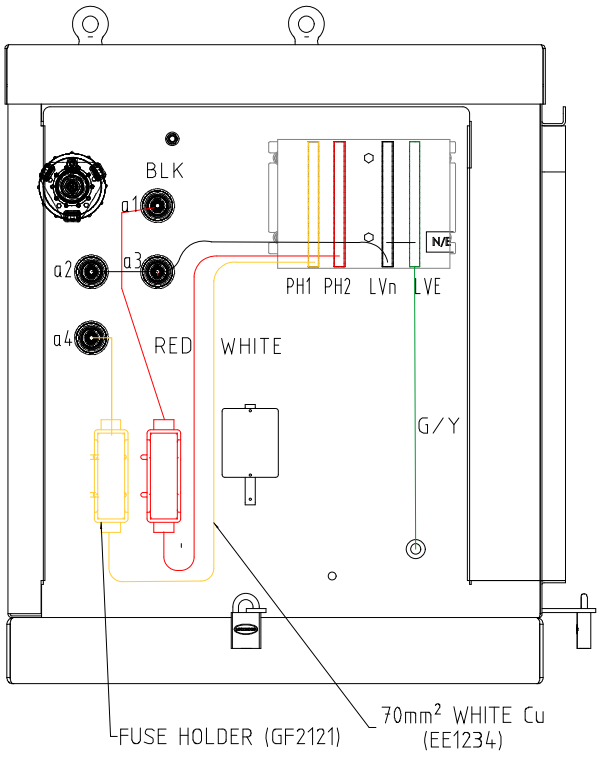
LV ASSEMBLY



250V ARRANGEMENT



500V ARRANGEMENT



REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	DRAWING NUMBER CHANGED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

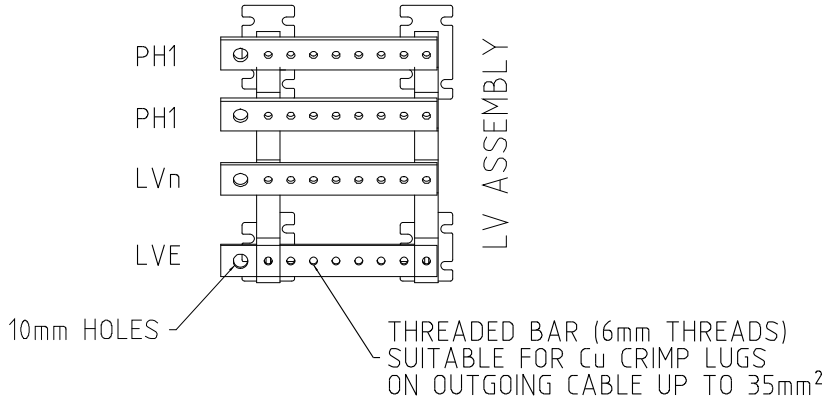
TITLE

TYREE
12.7/19.1, 22kV - 25 & 50kVA
SPUDS TRANSFORMER
CABLING ARRANGEMENT

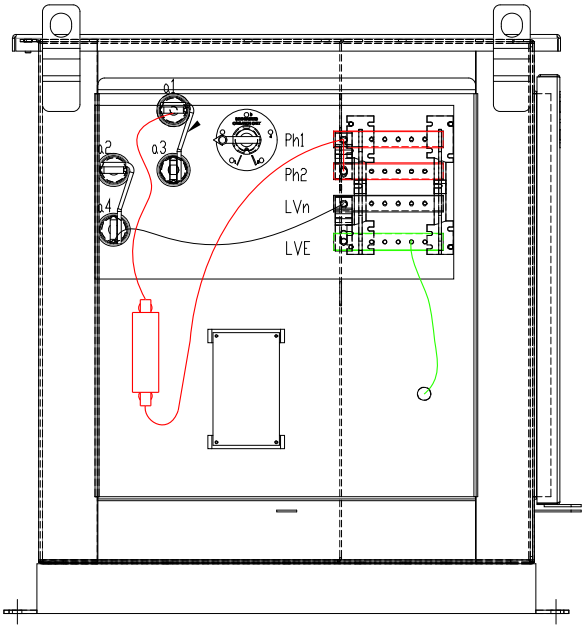
DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

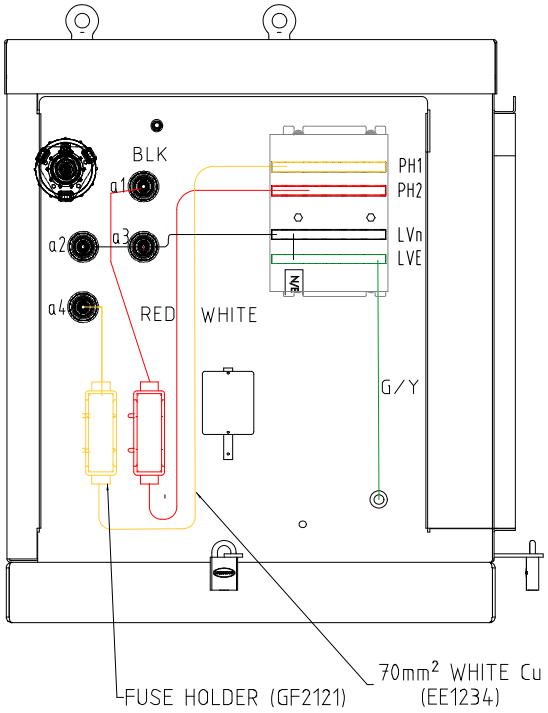
DRAWN: JRR | DATE: 14-11-2019 | DRG. No. DSPM-4-01
ORIGINATED: GC | SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY | REV. B | SHT. 6/7



250V ARRANGEMENT



500V ARRANGEMENT



REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

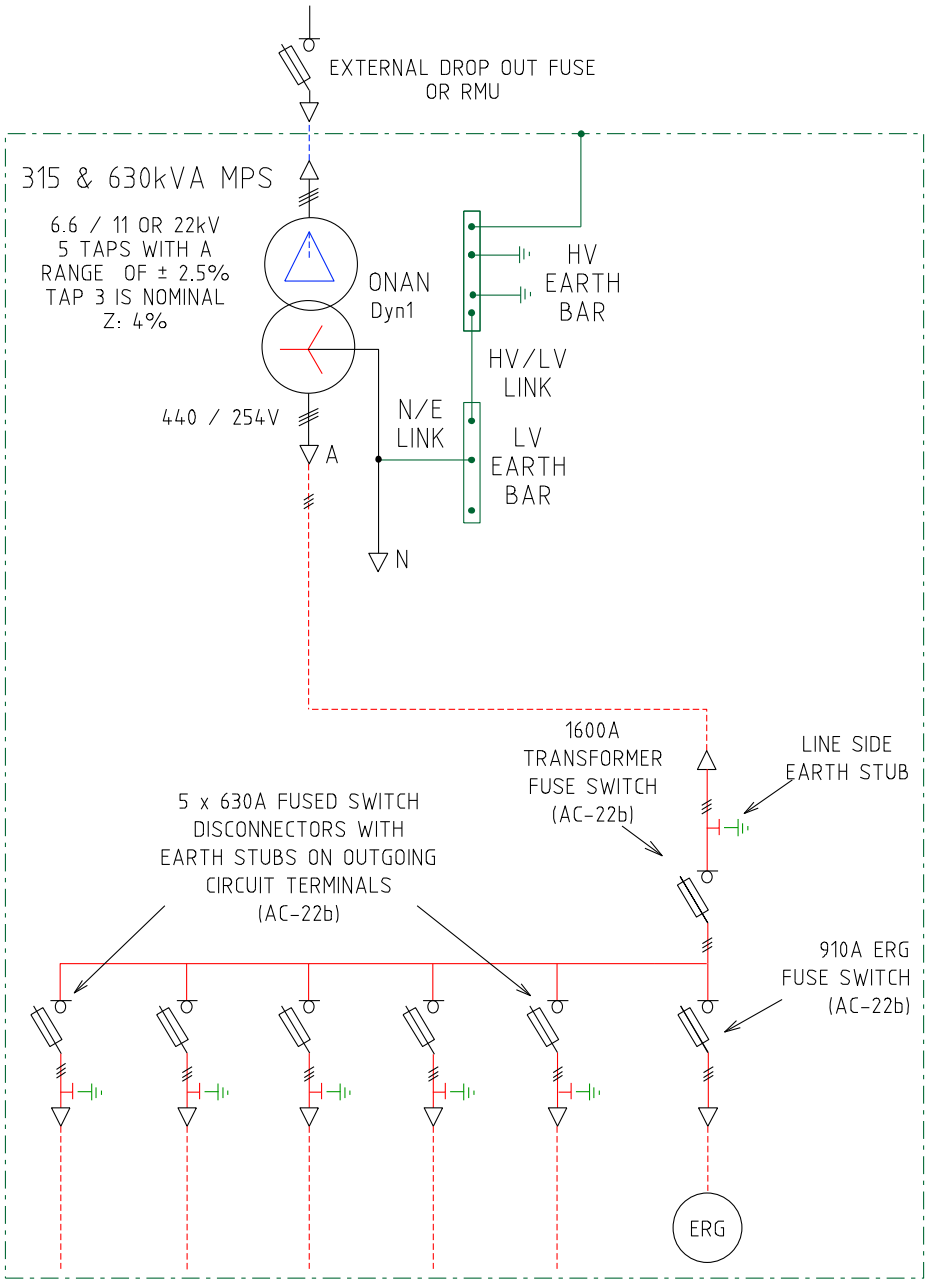
TITLE

ETEL
12.7/19.1, 22kV - 25 & 50kVA
SPUDS TRANSFORMER
CABLING ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: JRR	DATE: 30-08-2021	DRG. No. DSPM-4-01
ORIGINATED: KT	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. A / SHT. 7/7

5.2 DSPM 4-02 MPS Transformers



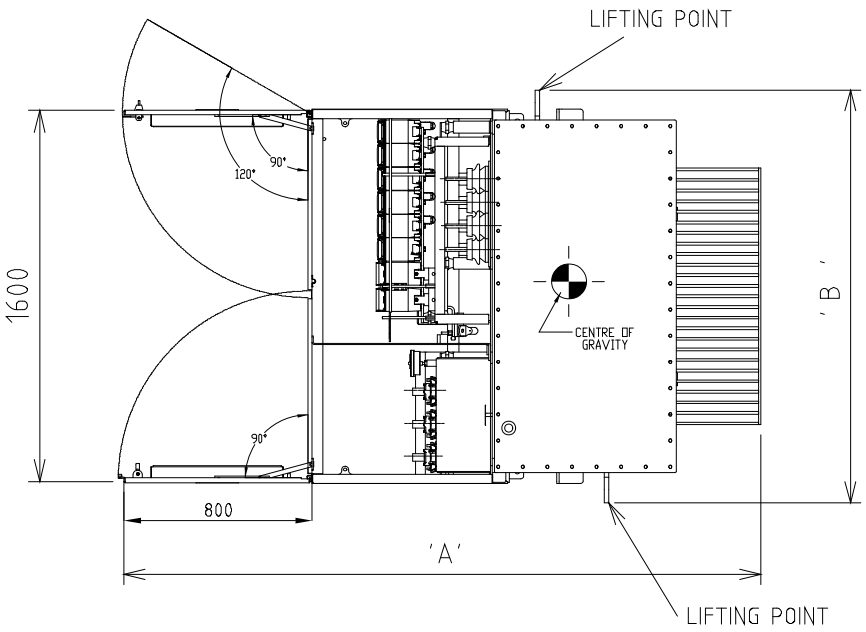
NOTES:-
1. REFER DCCR FOR FUSE SELECTION AND SUPPLY ARRANGEMENTS
2. AC-22b = LOAD MAKE AND BREAK IN ACCORDANCE WITH AS/NZS 60947.3
3. ERG = WESTERN POWER EMERGENCY RESPONSE GENERATOR

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TRANSFORMER DETAILS AND NOTES UPDATED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

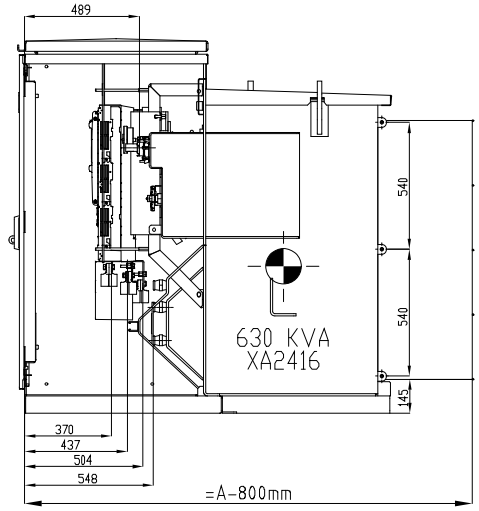
TITLE: TYREE AND ETEL MKII MPS
6/11, 22kV - 315 & 630kVA
RESIDENTIAL KIOSK
SINGLE LINE DIAGRAM

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

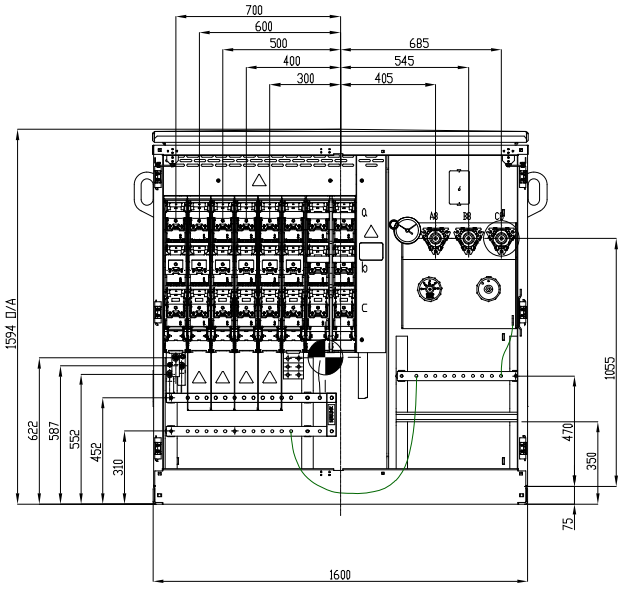
DRAWN: JRR	DATE: 14-11-2019	DRG. No. DSPM-4-02
ORIGINATED: GC	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. B SHT. 1/6



PLAN



SIDE ELEVATION



FRONT ELEVATION

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION 'A'	'B'	OIL QTY (L)	WEIGHT (kg)	STOCK CODE	COMPATIBLE UNIT TRANSFORMER & LV CAB
315	6.6/11	2545	1456	635	2445	XA2414	HU61
315	22	2360	1463	535	2205	XA2420	HU61
630	6.6/11	2715	1756	880	3470	XA2416	HU61
630	22	2622	1551	715	2815	XA2422	HU61

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TABLE REVISED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

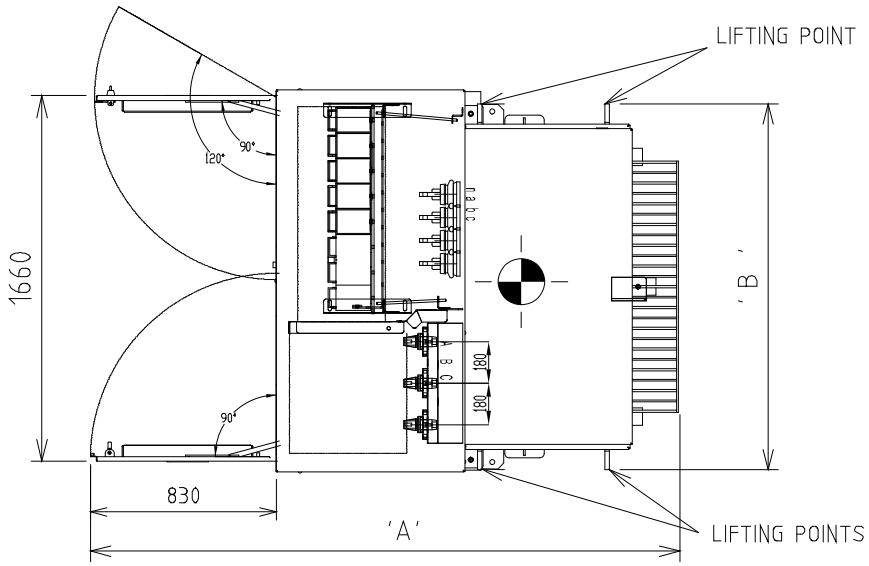
TITLE

TYREE MKII MPS
6/11, 22kV - 315 & 630kVA
RESIDENTIAL AREA KIOSK
GENERAL ARRANGEMENT

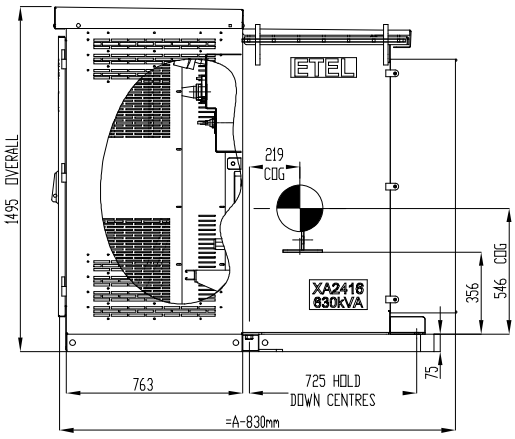
DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

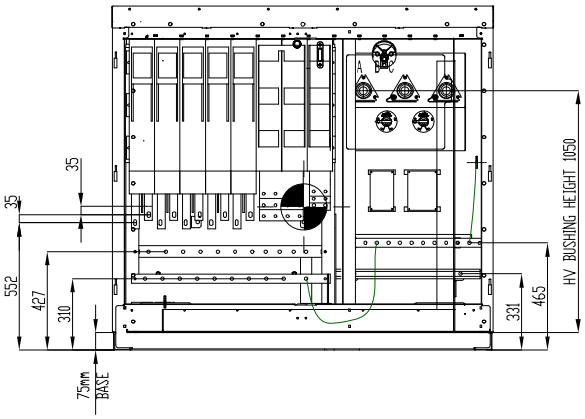
DRAWN: JRR | DATE: 14-11-2019 | DRG. No. DSPM-4-02
ORIGINATED: GC | SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY
REV. B | SHT. 2/6



PLAN



SIDE ELEVATION



FRONT ELEVATION

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION 'A'	DIMENSION 'B'	OIL QTY (L)	WEIGHT (kg)	STOCK CODE	COMPATIBLE UNIT TRANSFORMER & LV CAB
315	6.6/11	2420	1536	650	2080	XA2414	HU61
315	22	2320	1536	540	2040	XA2420	HU61
630	6.6/11	2540	1586	727	2700	XA2416	HU61
630	22	2540	1586	705	2760	XA2422	HU61

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	GC	CO	GS

TITLE

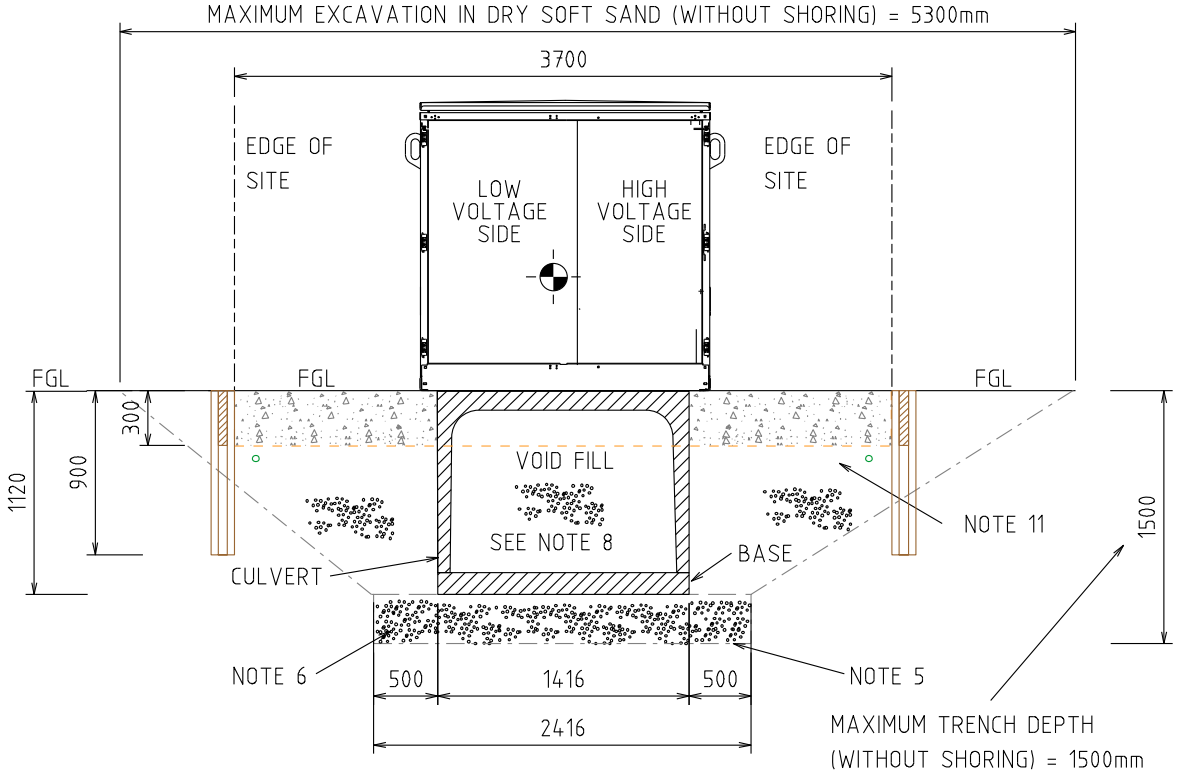
ETEL MKII MPS
6/11, 22kV - 315 & 630kVA
RESIDENTIAL AREA KIOSK
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL

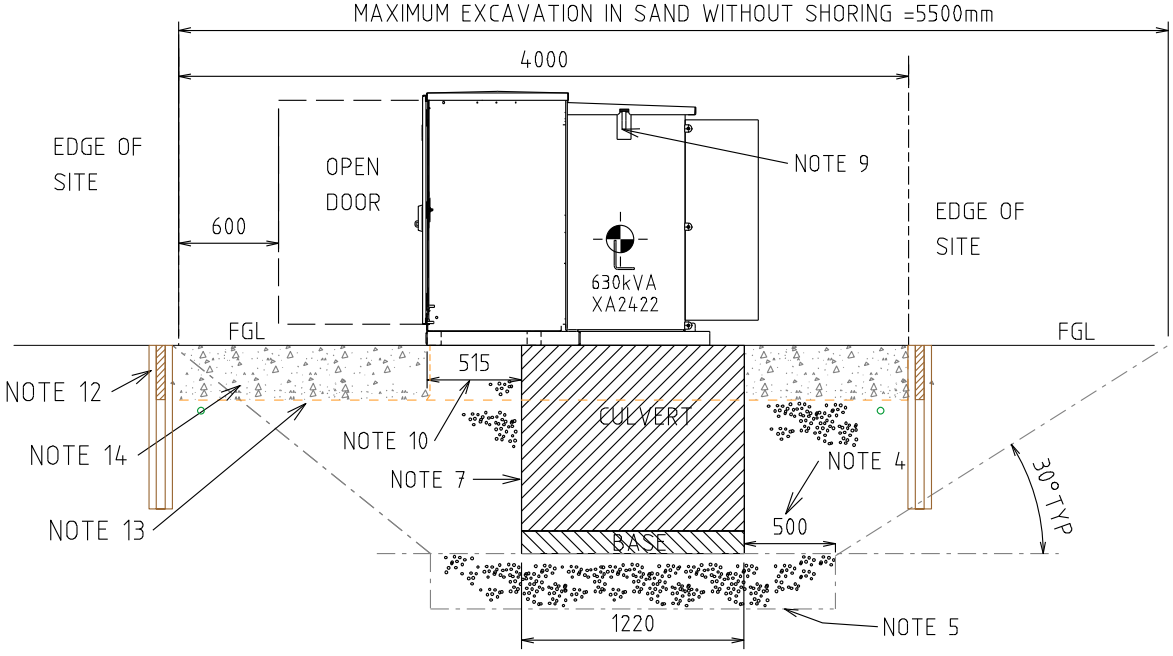
westernpower

DRAWN: JRR | DATE: 14-11-2019 | DRG. No.
ORIGINATED: GC | SCALE: NTS | DSPM-4-02
CHECKED: CO
APPROVED: GRANT STACY | REV. A | SHT. 3/6

FRONT VIEW



SIDE VIEW



NOTES:-
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES SHEET 5/6.
2. SEE CHAPTER 3 FOR EQUIPMENT SELECTION AND SUBSTATION LAYOUT.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
D	20.12.21	NOTES RE-ARRANGED	KT	GC	GS
C	06.09.21	CONCRETE PANEL AND RETAINING WALL DETAILS REVISED	KT	CO	GS
B	07/2020	FLAME TRAP IN ACCORDANCE WITH DSPM CHAPTER 5	GC	LT	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE: TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: JRR	DATE: 14-11-2019	DRG. No.	
ORIGINATED: GC	SCALE: NTS	DSPM-4-02	
CHECKED: CO			
APPROVED: GRANT STACY		REV. D	SHT. 4/6

NOTES:-

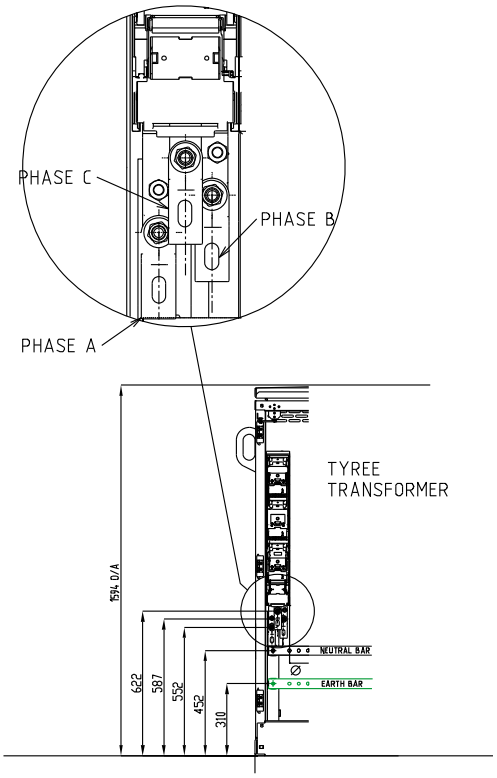
1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS 3798 FOR EARTHWORKS, AS 4678 FOR EARTH RETAINING STRUCTURES AND AS 1597 FOR PRECAST CONCRETE CULVERTS.
2. EXCAVATION TO A DEPTH OF UP TO 1500 mm BE DONE IN ACCORDANCE WITH THE CODE OF PRACTICE FOR EXCAVATION. A COMPETENT PERSON MUST BE PRESENT AT ALL TIMES DURING THE EXCAVATION, FOUNDATION PREPARATION, INSTALLATION OF CULVERT AND BACK FILL. IF DUE TO SITE CONDITIONS AND CLOSE PROXIMITY TO OTHER STRUCTURES SAFE EXCAVATION CANNOT BE CARRIED OUT THEN TRENCH SHORING SHOULD BE USED.
3. WHERE THERE IS A RISK OF FLOODING OR WHERE GROUND WATER EXISTS, THE SUBSTATION SITE SHALL BE ELEVATED AND RETAINED SO THAT THE CULVERT BASE IS ABOVE THE PREDICTED FLOODING OR HIGHEST POSSIBLE GROUND WATER LEVEL. THE FOUNDATION DESIGN, BACK FILL AND COMPACTION IS TO BE APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER (NPER).
4. THE BASE OF THE EXCAVATION IS TO BE A MINIMUM OF 500 mm LARGER THAN THE BASE OF THE CULVERT, ON ALL SIDES. THE SIDES OF THE EXCAVATION ARE TO HAVE A SAFE SLOPE BASED ON SOIL TYPE AND MOISTURE CONTENT.
5. COMPACTION OF TRENCH BASE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 92% TO AS 1289.6.3.2 THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
6. INFILL FROM THE BASE OF THE TRENCH TO THE LEVEL OF THE CULVERT BASE WITH 20mm DIAMETER ROAD BASE AND COMPACTED TO A MINIMUM MODIFIED DENSITY RATIO OF 95 % TO AS 1289.6.3.2 THIS IS MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENETROMETER.
7. INSTALL PRECAST REINFORCED BOX CULVERT AND BASE TO AS 1597 (100kN) STOCK CODE CA0002. NOMINAL (INTERNAL) SIZE OF CULVERT 1244 wide x 914 high x 1220 long. TO BE INSTALLED AS PER AS 1597 AND LEVEL TO WITHIN 1% . EXTERNAL SIZE 1416 X 1022 X 1220
8. VOID TO BE FILLED WITH SAND, HAND COMPACTION REQUIRED (NOT BY MACHINE).
9. LIFTING POINT FOR "TRANSFORMER" TO BE USED FOR TRANSFORMER REPLACEMENT AND TO LIFT COMPLETE ASSEMBLED MPS UNIT. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE LV FRAME.
10. WHEN LANDING THE MPS TRANSFORMER THE EDGE OF THE CULVERT SHOULD BE LOCATED 515mm FROM THE FRONT EDGE OF THE LV FRAME BASE.
11. BACKFILL WITH CLEAN SAND TO A DEPTH OF 400mm BELOW FGL. COMPACTION OF THE SAND IS TO BE CARRIED OUT IN LAYERS NOT EXCEEDING 300mm AND MUST ACHIEVE A MODIFIED DENSITY RATIO OF 92 % TO AS 1289.6.3.2. INSTALL EARTH GRID AND STAKES AND COVER WITH 100mm OF COMPACTED BACKFILL. THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
12. RAILWAY BALLAST OR FLAME TRAP TO BE CONTAINED WITHIN THE SITE USING A RETAINING WALL COMPLYING WITH AS 4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND WESTERN POWER. WESTERN POWER HAS A PREFERENCE FOR PRECAST CONCRETE PANEL AND POST RETAINING WALL SYSTEMS THAT CAN BE EASILY REMOVED AND REINSTATED IF FUTURE EXCAVATION IS REQUIRED WITHIN THE SUBSTATION SITE.
13. INSTALL PERMEABLE GEOTEXTILE MEMBRANE (SUCH AS GRUNT GRGT0361) TO SEPARATE THE INFILL FROM THE RAILWAY BALLAST/FLAME TRAP.
14. INFILL TO F.G.L OR FINISHED HEIGHT OF THE RETAINING WALL WITH RAILWAY BALLAST/FLAME TRAP (MINIMUM DEPTH OF 300mm) .RAILWAY BALLAST (TO AS2758.7) WITH A SIZE OF BETWEEN 30 - 50mm TO BE USED AS A FLAME TRAP. OTHER ALTERNATIVES CAN BE USED IF:
    - THE MATERIAL IS NON COMBUSTIBLE
    - HAS A MINIMUM VOID RATIO OF 40%
15. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS 1289.6.3.2 IS REQUIRED BY WESTERN POWER FOR ALL SUBSTATION INSTALLATIONS.
16. IN THE EVENT THAT THE SITE IS HIGHER THAN THE FINISHED LEVELS OF THE NEIGHBORING AREAS, RETAINING WALLS, ACCESS STEPS AND DRAINAGE SHALL BE PROVIDED COMPLYING WITH AS 4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND WESTERN POWER. THIS WORK SHALL BE CERTIFIED BY A CHARTERED CIVIL ENGINEER (CPENG).

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
D	20.12.21	NOTES AMENDED	KT	GC	GS
C	06.09.21	NOTE 13 REVISED	KT	CO	GS
B	07/2020	NOTES 13, 14 & 15 ADDED	GC	LT	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

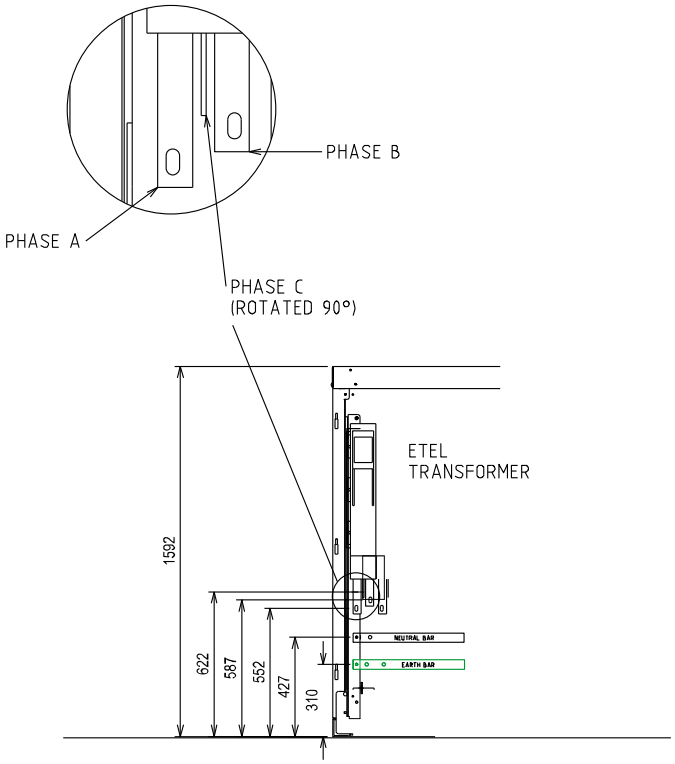
TITLE: TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESEDENTIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: JRR	DATE: 14-11-2019	DRG. No. DSPM-4-02
ORIGINATED: GC	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. D / SHT. 5/6



TYREE MPS



ETEL MPS

MANUFACTURER	TYREE	ETEL
SWITCHGEAR COMPONENT	PRONUTEC 630A FUSE SWITCH DISCONNECTOR	WEBER SOUTH PACIFIC 630A FUSE SWITCH DISCONNECTOR
MAXIMUM PHASE CABLE SIZE & QTY	UP TO 2 x 240mm AL WAVECON PER PHASE (BACK TO BACK) PER CIRCUIT	UP TO 2 x 240mm AL WAVECON PER PHASE (BACK TO BACK) PER CIRCUIT
NEUTRAL CABLES	1 x Cu WAVECON SCREENS PER CIRCUIT	1 x Cu WAVECON SCREENS PER CIRCUIT
FASTENERS	M12 STAINLESS STEEL (GREASED).	M12 STAINLESS STEEL (GREASED).
TORQUE SETTING	48NM	48NM

NOTES:

1. LV CABLES MUST BE CLAMPED IN PLACE

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	NOTES ADDED	GC	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

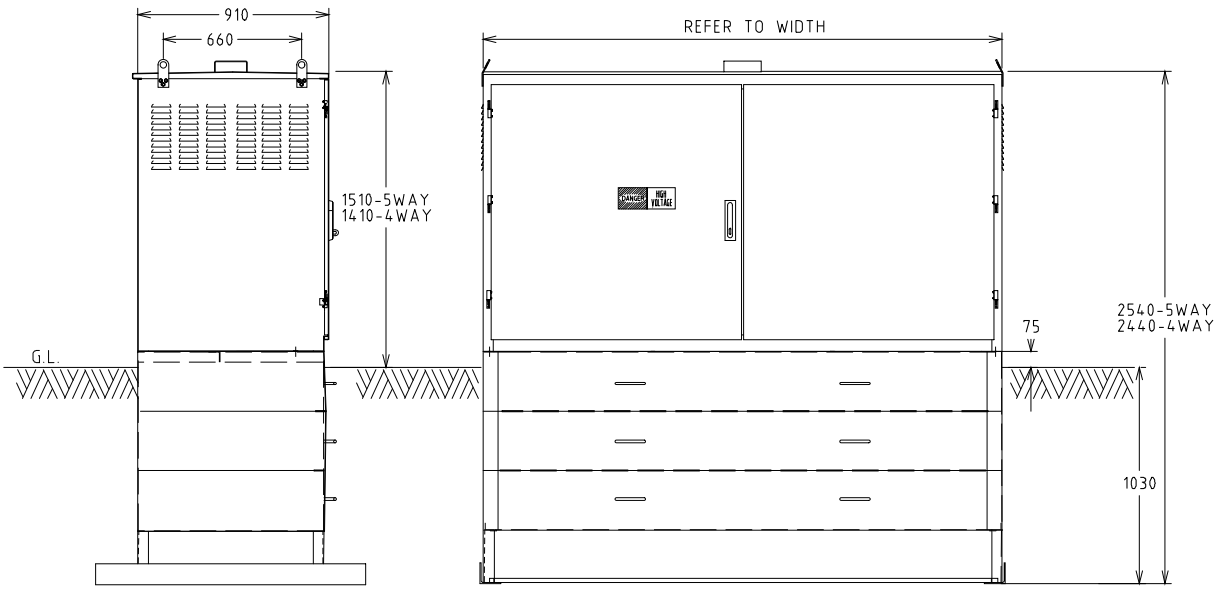
TITLE: TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL AREA KIOSK LV CABLE TERMINATIONS

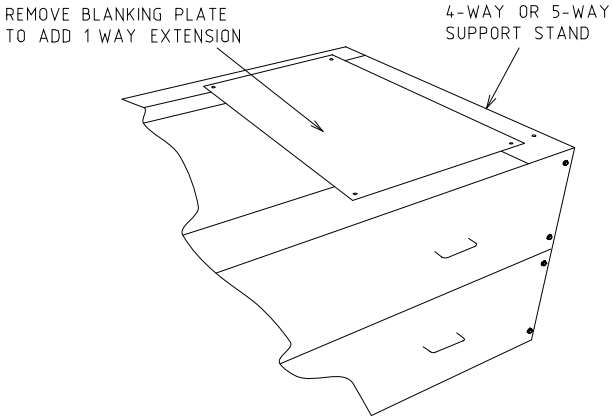
DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: JRR | DATE: 14-11-2019 | DRG. No.
ORIGINATED: GC | SCALE: NTS | DSPM-4-02
CHECKED: CO
APPROVED: GRANT STACY | REV. B | SHT. 6/6

5.3 DSPM 4-03 Not yet used

5.4 DSM 4-04 Schneider RM6 switchgear kiosk





SWITCH FUNCTION	STOCK CODE KIOSK/STAND	DIMENSION (WIDTH mm)	COMPATIBLE UNIT
3+0	XA2650 - 4 WAY	1976	HU5
2+1	XA2650 - 4 WAY	1976	HU6
2+2	XA2651 - 5 WAY	2409	HU7
3+1	XA2651 - 5 WAY	2409	HU8
4+0	XA2651 - 5 WAY	2409	HU9
2+3	XA2561 - 5 WAY	2409	HU80
3+2	XA2651 - 5 WAY	2409	HU81

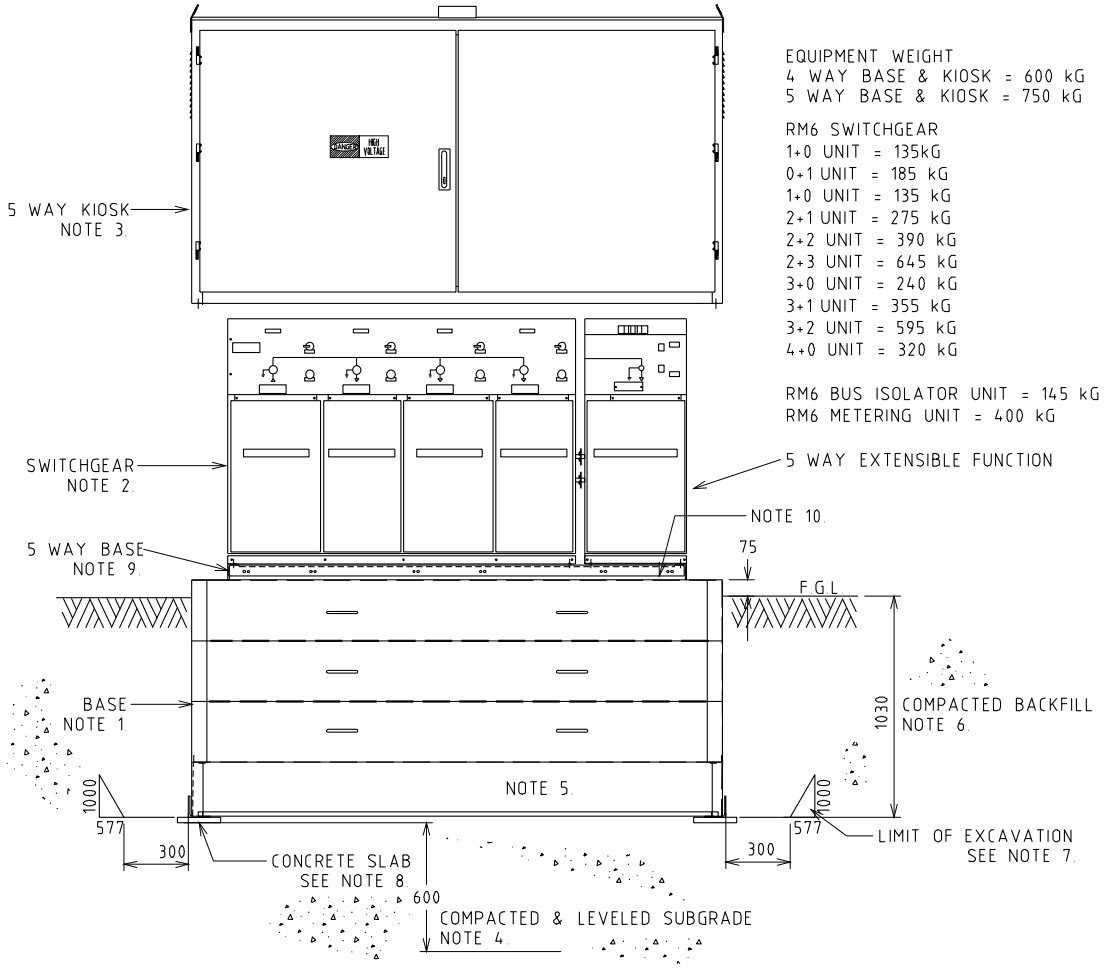
NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. KIOSK AND STAND CAN BE LIFTED AT EYELETS WITHOUT RMU INSIDE.
3. DO NOT LIFT KIOSK & STAND WITH RMU INSIDE.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TABLE REVISED	KT	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE: SCHNEIDER RM6 SWITCHGEAR KIOSK AND STAND GENERAL ARRANGEMENT INSTALLATION DETAILS

DISTRIBUTION SUBSTATION MANUAL — westernpower

DRAWN: JRR | DATE: 18-11-2019 | DRG. No. DSM-4-04
ORIGINATED: GC | SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY | REV. B | SHT. 1/2



NOTES:-

1. GALVANISED STEEL SUPPORT STAND BURIED INTO GROUND, EXPOSE 75mm ABOVE GROUND LEVEL.
2. SWITCHGEAR BOLTED TO SUPPORT STAND AND FITTED WITH DUST COVER.
3. ALUMINIUM CABINET OVER SWITCHGEAR AND BOLTED TO SUPPORT STAND AT FRONT.
4. COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 92% TO AS1289.5.2.1
5. VOID NOT TO BE FILLED WITH SAND, NATURAL FALL-IN THROUGH OPENINGS IS ACCEPTABLE COMPACTION NOT NECESSARY.
6. COMPACTED BACKFILL MATERIAL IS TO BE SAND, COMPACTION OF THE SAND IS TO BE CARRIED OUT IN LAYERS NOT EXCEEDING 300mm. COMPACTION LEVEL TO ACHIEVE A MINIMUM MODIFIED DENSITY RATIO OF 92% TO AS1289.5.2.1.
   THIS MAY BE MEASURED AS 8 BLOWS/300mm WITH A STANDARD PENTROMETER
7. THE BASE OF THE EXCAVATION IS TO BE A MINIMUM OF 300mm LARGER THAN THE BASE OF THE STEEL FRAME, ON ALL SIDES.
   THE SIDES OF THE EXCAVATION ARE TO HAVE A SLOPE OF OF NOT LESS THAN 30°
8. CONCRETE SLABS UNDER SUPPORT STAND FEET, SLABS TYPICALLY 500*200*25 THICK.
9. 5 WAY PLINTH NOT REQUIRED, IF RM6 WAS EXTENDED FROM 4 WAY TO 5 WAY
10. FOR 3 WAY RM6 IN 4 WAY KIOSK OR 4 WAY RM6 IN 5 WAY KIOSK
    THE UNUSED BAY RESERVED FOR FUTURE EXPANSION IS BLANKED OUT WITH A REMOVABLE BLANKING PLATE FIXED TO THE TOP OF THE ARC FILTER BOX

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	GC	CO	GS

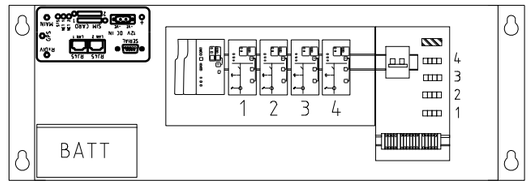
TITLE

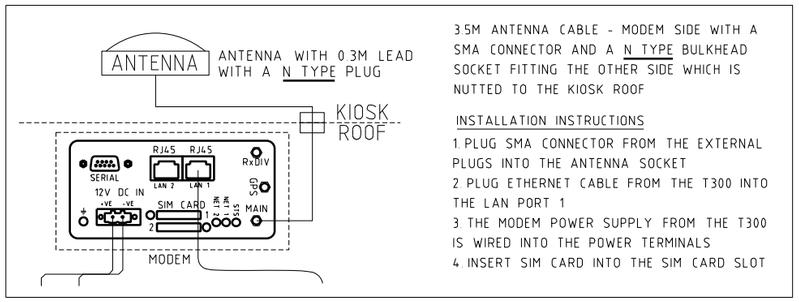
SCHNEIDER RM6
OUTDOOR EXTENSIBLE SWITCHGEAR
GENERAL ARRANGEMENT
INSTALLATION DETAILS

DISTRIBUTION SUBSTATION MANUAL

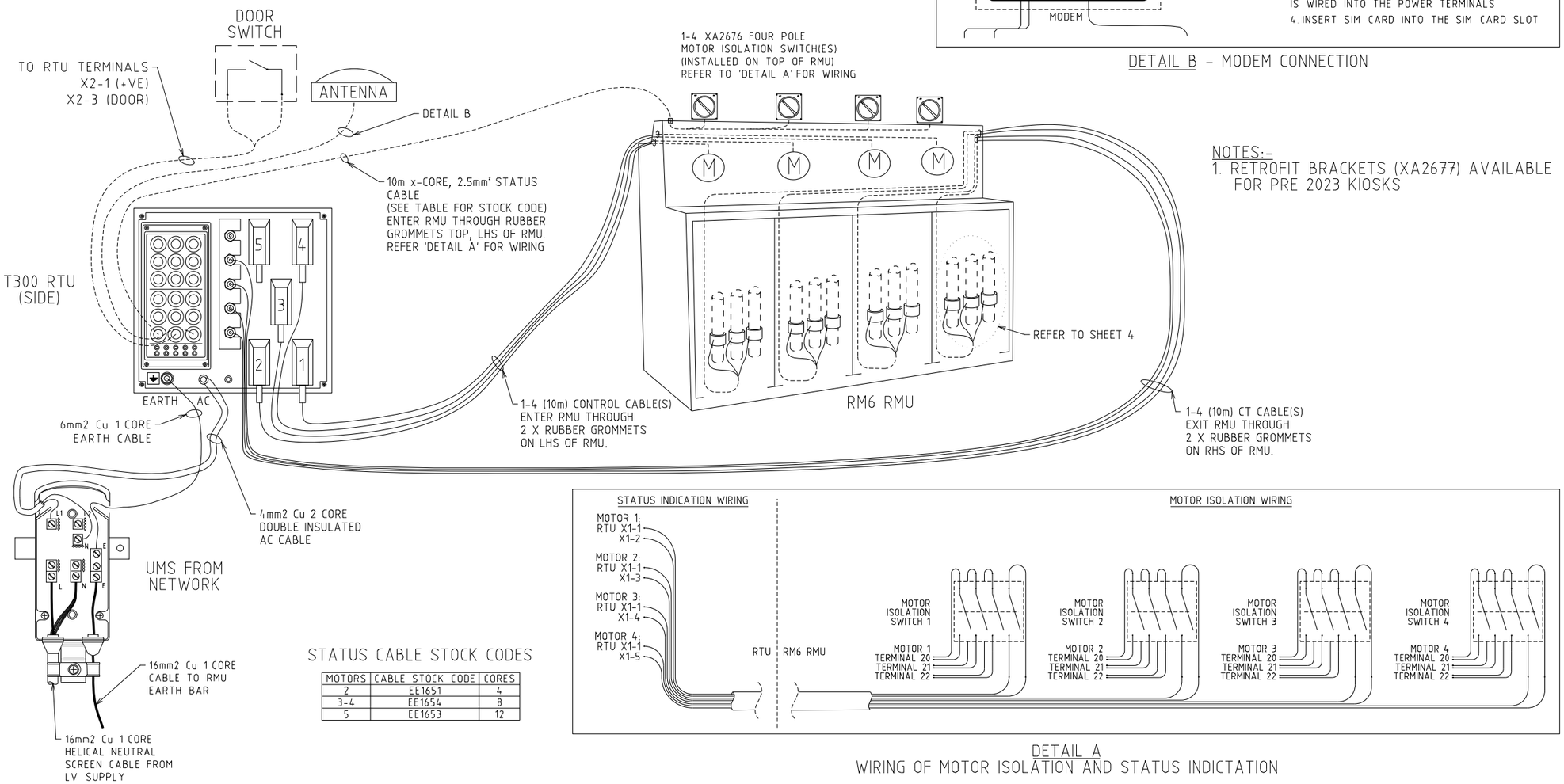
westernpower

DRAWN: JRR	DATE: 18-11-2019	DRG. No. DSM-4-04
ORIGINATED: GC	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. A
		SHT. 2/2





DETAIL B – MODEM CONNECTION



NOTES:-
1. RETROFIT BRACKETS (XA2677) AVAILABLE FOR PRE 2023 KIOSKS

STATUS CABLE STOCK CODES

MOTORS	CABLE STOCK CODE	CORES
2	EE1651	4
3-4	EE1654	8
5	EE1653	12

DETAIL A
WIRING OF MOTOR ISOLATION AND STATUS INDICTATION

REV.	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	28.07.23	ORIGINAL ISSUE	JT	TM	CO

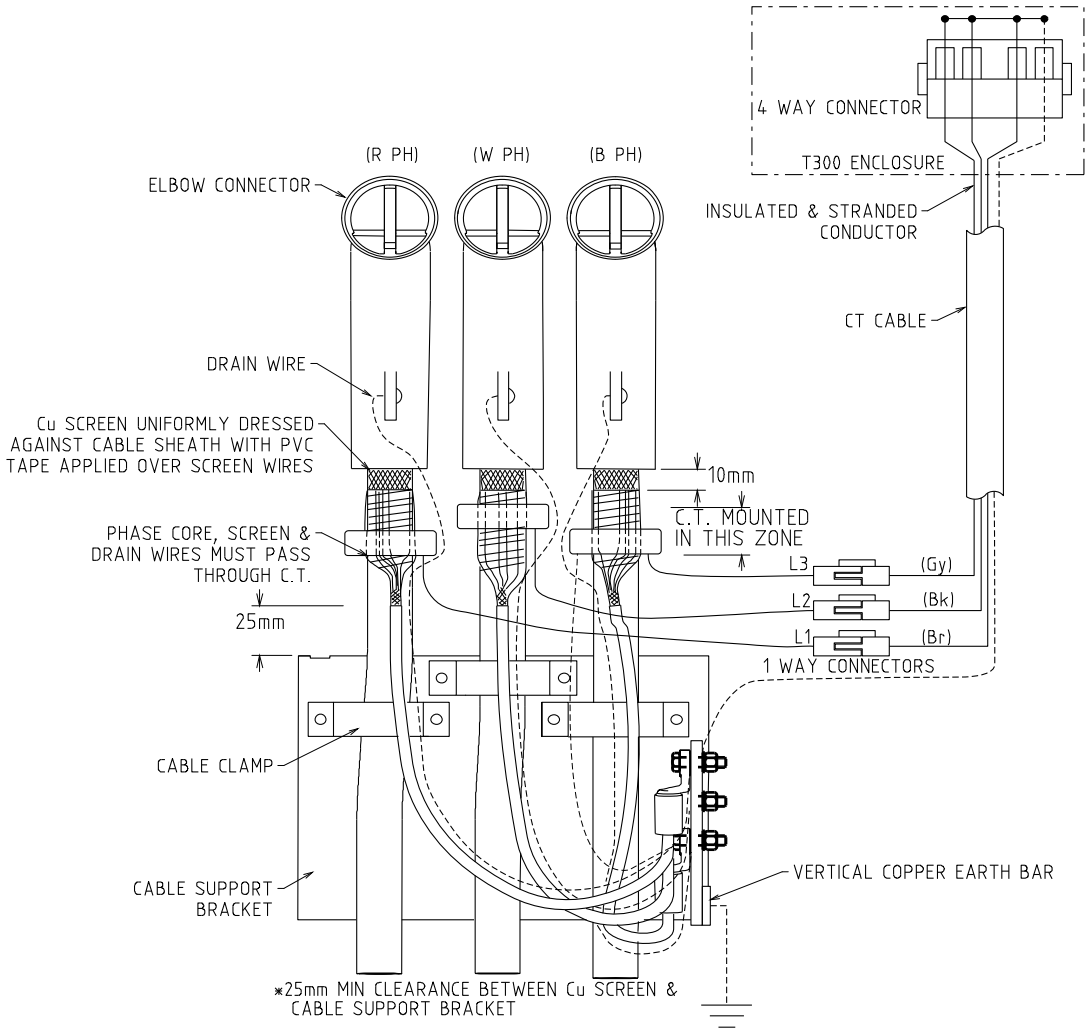
TITLE

T300 INSTALLATION DETAILS FOR SCHNEIDER RM6 SWITCHGEAR IN OUTDOOR KIOSK

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR	DATE: 12-02-2023	DRG. No. DSPM-4-04
ORIGINATED: JT	SCALE: NTS	
CHECKED: TM		
APPROVED: CHRIS OMODEI		REV. A / SHT. 3



NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.

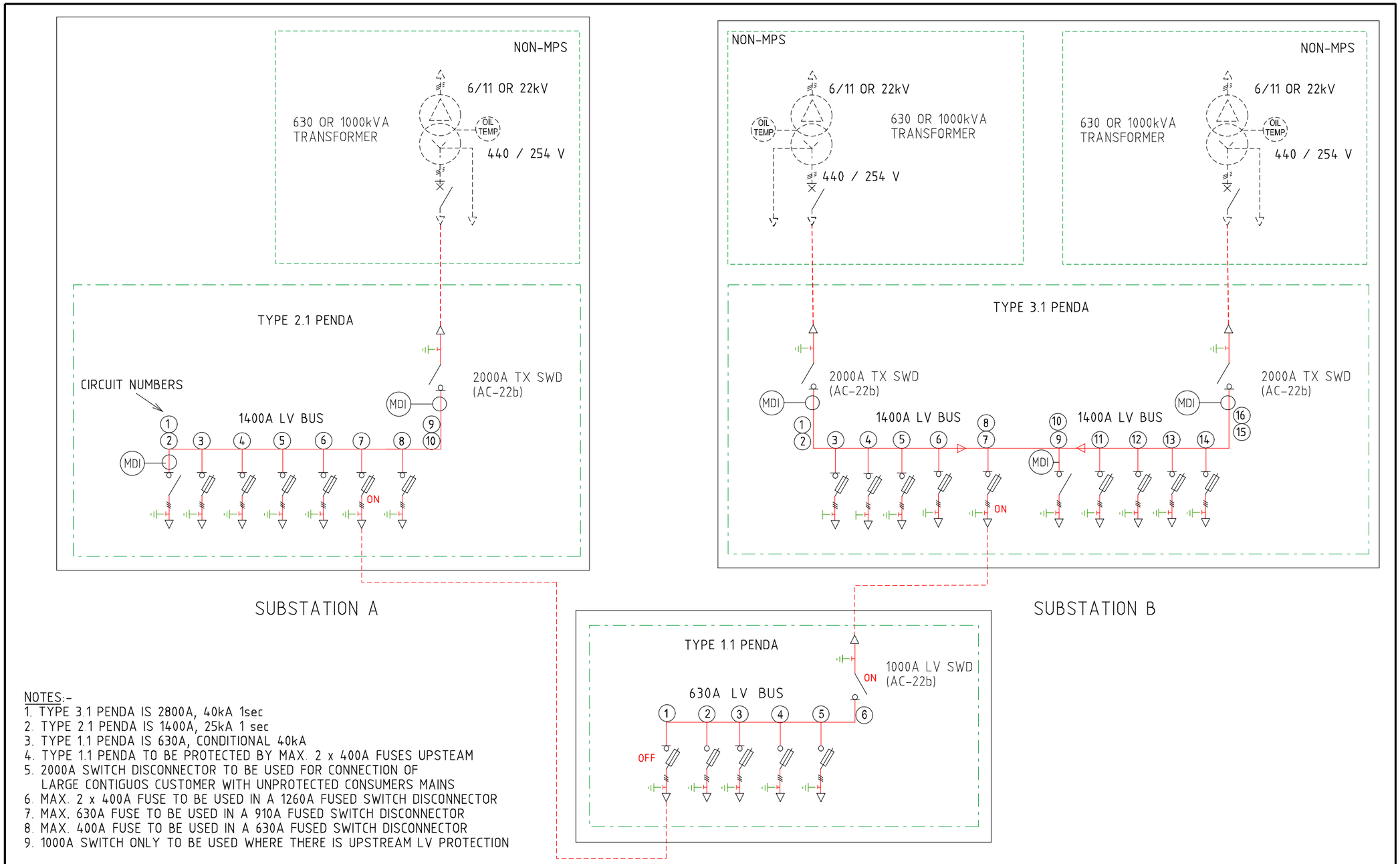
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	28.07.23	ORIGINAL ISSUE	JT	TM	CO

TITLE: SCHNEIDER RM6 SWITCHGEAR OUTDOOR KIOSK WITH T300 INSTALLATION DETAILS CABLE BOX CT WIRING

DISTRIBUTION SUBSTATION MANUAL

westernpower

DRAWN: JRR	DATE: 10-05-2023	DRG. No. DSPM-4-04
ORIGINATED: JT	SCALE: NTS	
CHECKED: TM		
APPROVED: CHRIS OMODEI		REV. A / SHT. 4



NOTES:-
1. TYPE 3.1 PENDA IS 2800A, 40kA 1sec
2. TYPE 2.1 PENDA IS 1400A, 25kA 1 sec
3. TYPE 1.1 PENDA IS 630A, CONDITIONAL 40kA
4. TYPE 1.1 PENDA TO BE PROTECTED BY MAX. 2 x 400A FUSES UPSTEAM
5. 2000A SWITCH DISCONNECTOR TO BE USED FOR CONNECTION OF LARGE CONTIGUOS CUSTOMER WITH UNPROTECTED CONSUMERS MAINS
6. MAX. 2 x 400A FUSE TO BE USED IN A 1260A FUSED SWITCH DISCONNECTOR
7. MAX. 630A FUSE TO BE USED IN A 910A FUSED SWITCH DISCONNECTOR
8. MAX. 400A FUSE TO BE USED IN A 630A FUSED SWITCH DISCONNECTOR
9. 1000A SWITCH ONLY TO BE USED WHERE THERE IS UPSTREAM LV PROTECTION

REV.	DATE	DESCRIPTION	DRGD	CHKD	APRD
B	06 09 21	MCCB ADDED TO UPSTREAM NON MPS TRANSFORMER	GC	CO	GS
A	09.12 19	ORIGINAL ISSUE	GC	CO	GS

TITLE

PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) SINGLE LINE DIAGRAMS

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

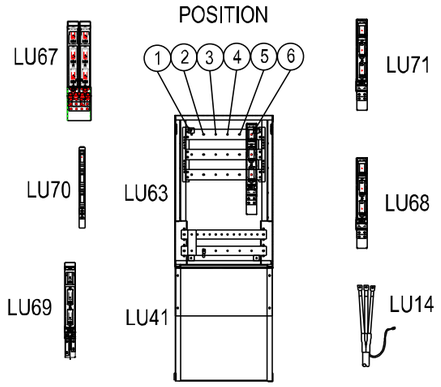
DRAWN: JRR	DATE 19-11-2019	DRG. No.	DSPM-4-05
ORIGINATED: GC	SCALE: NTS		
CHECKED. CO			
APPROVED: GRANT STACY		REV. B	SHT. 1/4

TYPE 1.1 PENDA LAYOUT

SWG	MAX FUSE	CU	1	2	3	4	5	6
TYPE 1.1 PENDA		LU63						
PENDA BASE		LU41						
160A FSD	1 X 63A DIN 00	LU70			L L			
630 FSD	1 X 400A NH2	LU69	C/S	C/S	C/S	C/S	C/S	C/S
910A FSD	1 X 630A NH3	LU68						
1260A FSD	2 X 400A NH2	LU67	C					
1000A SWD	LINKS SUPPLIED	LU71	C					LV
FSD CABLE TERM	FUSES SUPPLIED	LU14	S	S	S	S	S	S

LV = LV FEEDER
C = CUSTOMER
E = EMERGENCY RESPONSE GENERATOR

L = LIGHTING CIRCUIT
S= STREET CIRCUIT



NOTES:-

1. LU71 SWITCH CAN BE USED FOR THE DUAL FEEDER SUPPLY FROM THE UPSTREAM SUBSTATION (FEEDERS FUSED AT THE SOURCE) AND A LARGE CUSTOMER
2. 1 X LU14 NEEDED WITH EACH LU69 STREET FEEDER
3. LU69 CAN BE USED FOR A STREET FEEDER OR A FUSED CUSTOMER SUPPLY .
4. STANDARD DUAL FEEDER SUPPLY ARRANGEMENT SHOWN (HERITAGE SITES ONLY). DESIGNER MAY DESIGN AN ALTERNATIVE PENDA LAYOUT.

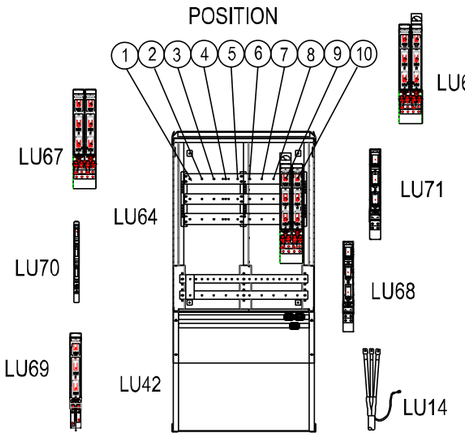
TYPE 2.1 PENDA LAYOUT

SWG	MAX FUSE	CU	1	2	3	4	5	6	7	8	9	10
TYPE 2.1 PENDA		LU64										
PENDA BASE		LU42										
160A FSD	1 X 63A DIN 00	LU70				L L						
630 FSD	1 X 400A NH2	LU69	C / S	C / S	C / S	C / S	C / S	C / S	C / S			
910A FSD	1 X 630A NH3	LU68								E		
1260A FSD	2 X 400A NH2	LU67	C		C							
1000A SWD	LINKS SUPPLIED	LU71	C									
2000A SWD	LINKS SUPPLIED	LU66	C1								T1	
FSD CABLE TERM	FUSES SUPPLIED	LU14	S	S	S	L/S	S	S	S			
TX CABLE TERM	TX MCCB	LU16									T1	

T = TRANSFORMER
C = CUSTOMER

L = LIGHTING CIRCUIT
S= STREET CIRCUIT

E = EMERGENCY RESPONSE GENERATOR



NOTES:-

1. LU66 CAN BE USED FOR THE TRANSFORMER AND CONTIGUOS CUSTOMER
2. EVERY INSTALLATION SHALL INCLUDE AN ERG CONNECTION LU68
3. 2 x LU70 OR 1 x LU69 CAN BE USED IN POSITION 4
4. 1 X LU14 NEEDED WITH EACH LU69 STREET FEEDER OR LU70 LIGHTING CIRCUIT.
5. 1 X LU16 NEEDED WITH EACH LU66_TX IN PENDA AND 1 X LU16 FOR LU59 (NON-MPS).
6. LU66_TX WILL DEFAULT TO POSITIONS 9 & 10 UNLESS POSITION 1 & 2 IS SPECIFIED BY THE DESIGNER.
7. STANDARD PENDA LAYOUT SHOWN. DESIGNER MAY DESIGN AN ALTERNATIVE PENDA LAYOUT.
8. NO GANGED FSD OR SWD PERMITTED SPANING POSITIONS 5 & 6 OR 6 & 7.
9. LU71 ONLY TO BE USED WHERE THERE IS UPSTREAM LV PROTECTION (I.E. MKII NON MPS).

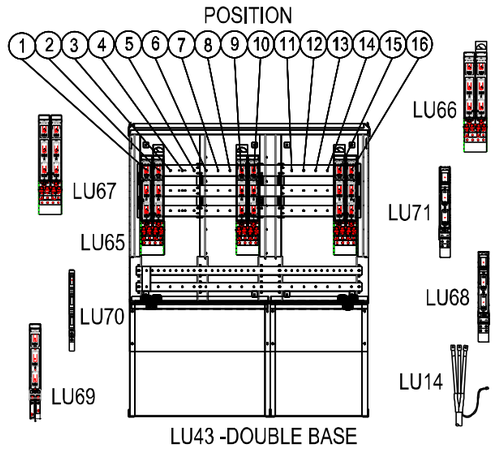
TYPE 3.1 PENDA LAYOUT

SWG	MAX FUSE	CU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TYPE 3.1 PENDA		LU65																
PENDA BASE		LU43																
160A FSD	1 X 63A DIN 00	LU70				L L												
630 FSD	1 X 400A NH2	LU69				C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S			
910A FSD	1 X 630A NH3	LU68			E											E		
1260A FSD	2 X 400A NH2	LU67				C			C		C		C					
1000A SWD	LINKS SUPPLIED	LU71			C	C	C	C	C	C	C	C	C	C	C	C		
2000A SWD	LINKS SUPPLIED	LU66	T2								C1						T1	
FSD CABLE TERM	FUSES SUPPLIED	LU14				L/S	S	S	S	S	S	S	S	S	S			
TX CABLE TERM	TX MCCB	LU16	T2														T1	

T = TRANSFORMER
C = CUSTOMER

L = LIGHTING CIRCUIT
S= STREET CIRCUIT

E = EMERGENCY RESPONSE GENERATOR



NOTES:-

1. LU66 CAN BE USED FOR THE TRANSFORMER AND CONTIGUOS CUSTOMER
2. EVERY INSTALLATION SHALL INCLUDE AN ERG CONNECTION 2 x LU68
3. 2 x LU70 OR 1 x LU69 CAN BE USED IN POSITION 4
4. 1 X LU14 NEEDED WITH EACH LU69 STREET FEEDER OR LU70 LIGHTING CIRCUIT.
5. 1 X LU16 NEEDED WITH EACH LU66_TX IN PENDA AND 1 X LU16 FOR EACH LU59 (NON-MPS)
6. LARGE CUSTOMER CONNECTED VIA A 2000A SWITCH (LU66) MUST ALWAYS BE IN POSITIONS 7 & 8 OR 9 & 10
7. STANDARD PENDA LAYOUT SHOWN. DESIGNER MAY DESIGN AN ALTERNATIVE PENDA LAYOUT.
8. NO GANGED FSD OR SWD PERMITTED SPANNING POSITIONS 5 & 6, 6 & 7 OR 10 & 11.
8. LU71 CAN ONLY BE USED WHERE THERE IS UPSTREAM LV PROTECTION (I.E. MKII NON MPS)

REV.	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	LU70 ADDED TO TYPE 1.1 PENDA, LU71 (1000A SWITCH) ADDED TO ALL PENDA	KT	CO	GS
A	X	ORIGINAL ISSUE	GC	CO	GS

TITLE

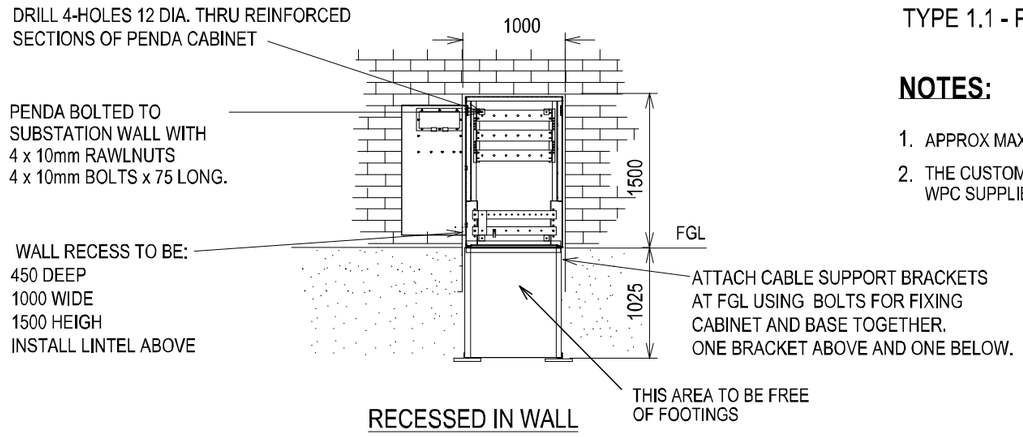
PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) GENERAL ARRANGEMENTS

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR	DATE: 19-11-2019	DRG. No.	DSPM-4-05
ORIGINATED: GC	SCALE: NTS		
CHECKED: CO			
APPROVED: GRANT STACY		REV. B	SHT. 2/4

TYPE 1.1 - PENDA INSTALLATION REQUIREMENTS



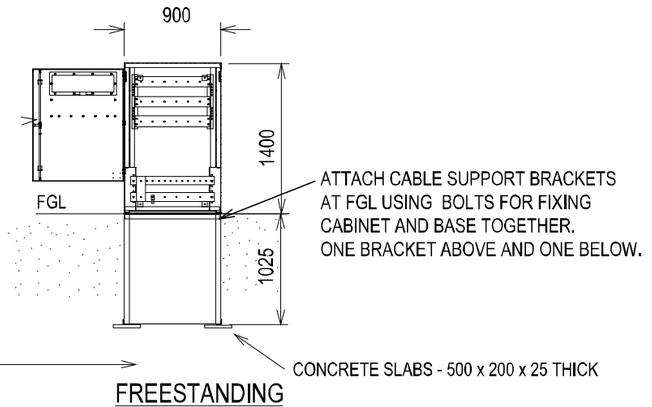
RECESSED IN WALL

6 FUSEWAYS = 200kg

NOTES:

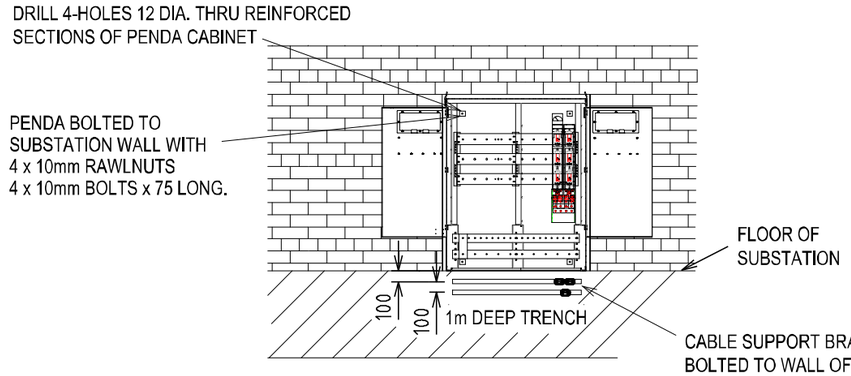
1. APPROX MAX. WEIGHT WITH 6 FUSE WAYS = 200kg
2. THE CUSTOMER IS RESPONSIBLE FOR THE INSTALLATION OF THE WPC SUPPLIED PENDA, TO BE RECESSED IN THE WALL

COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATION OF 95% TO AS 1289.5.2.1 FOR A DEPTH OF 1000mm BELOW PENDA BASE. THIS CAN BE MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENTROMETER



FREESTANDING

TYPE 2.1 PENDA - INSTALLATION REQUIREMENTS

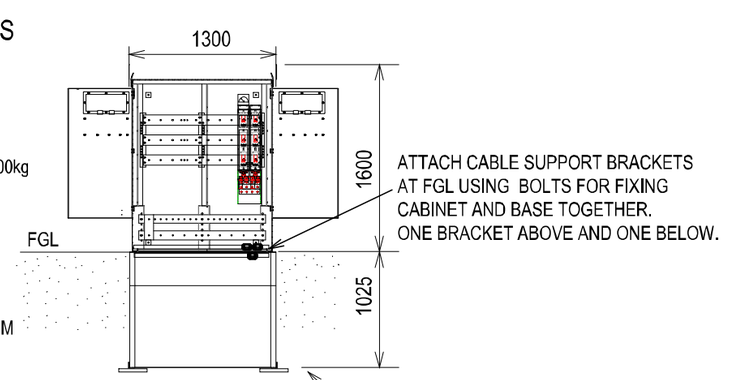


IN 2HR FIRE RATED SUBSTATION

NOTES:

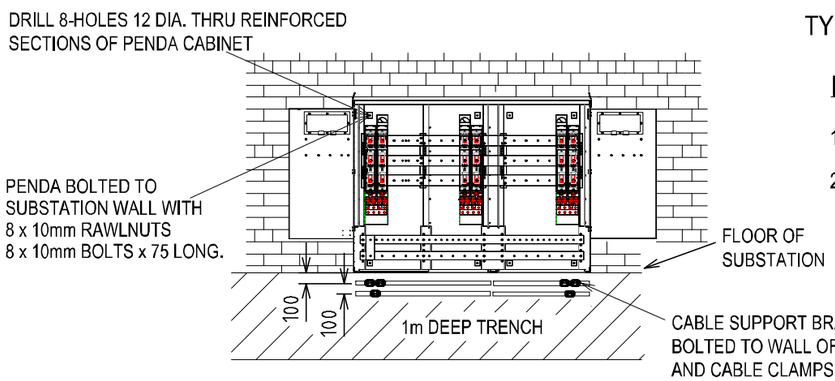
1. APPROX MAX. WEIGHT WITH 2 TX SWD AND 5 FUSE WAYS = 300kg
2. SUN SHEILD TO BE USED FOR OUTDOOR INSTALLATIONS

COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATION OF 95% TO AS 1289.5.2.1 FOR A DEPTH OF 1000mm BELOW PENDA BASE. THIS CAN BE MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENTROMETER



FREESTANDING

TYPE 3.1 PENDA - INSTALLATION REQUIREMENTS

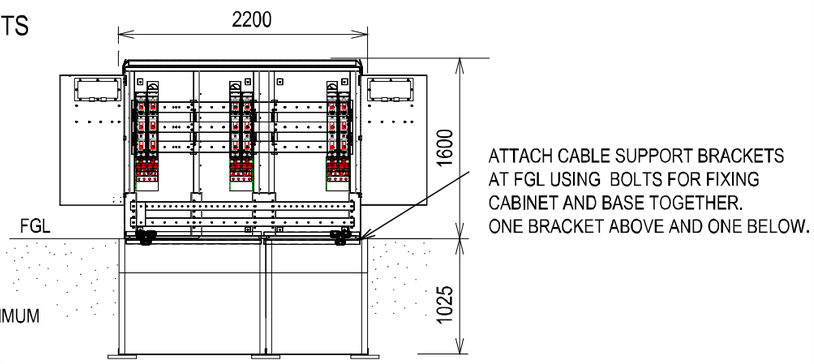


IN 2HR FIRE RATED SUBSTATION

NOTES:

1. APPROX MAX. WEIGHT WITH 2 TX & 1 CUST SWD AND 5 FUSE WAYS = 520kg
2. SUN SHEILD TO BE USED FOR OUTDOOR INSTALLATIONS

COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATION OF 95% TO AS 1289.5.2.1 FOR A DEPTH OF 1000mm BELOW PENDA BASE. THIS CAN BE MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENTROMETER



FREESTANDING

REV.	DATE	DESCRIPTION	DRGD.	CHKD.	APRD
B	14.06.22	MORE DETAILS ADDED	CO	GC	GS
A	06.09.21	ORIGINAL ISSUE	GC	CO	GS

TITLE

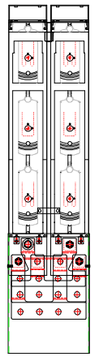
PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) INSTALLATION REQUIREMENTS

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR	DATE: 19-11-2019	DRG. No. DSPM-4-05
ORIGINATED: GC	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. B / SHT. 3/4

NOTES:-
1. TYPE 3.1 PENDA SHOWN AS AN EXAMPLE ONLY.
2. INFORMATION IS APPLICABLE TO ALL PENDA CABLE TERMINATIONS

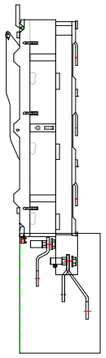


LU67

USE M12 SS MOUNTING
BOLTS 2 x KITS OF FB0872
TORQUE TO 48NM

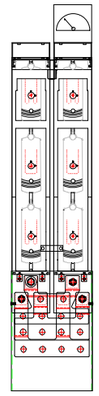
FOR CABLE TERMINATIONS USE
M12 SS FASTERNERS, 1 KIT OF
FB0873 PER 3 PHASE CABLE
TORQUE TO 48NM

MAXIMUM OF 4 x 400mm
COPPER CABLES PER PHASE



FOR OPERATIONAL EARTHING AND SHORTING KITS:

USE EARTHING KIT ADAPTOR KIT (FB0871)
WITH HYLEC EARTHING AND SHORTING KIT
ATTACH TO PREFITTED EARTH STUBS ON
SWITCHGEAR

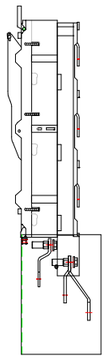


LU66

USE M12 SS MOUNTING
BOLTS 1 x KIT OF FB0872
TORQUE TO 48NM

FOR CABLE TERMINATIONS USE
M12 SS FASTERNERS, 1 KIT (FB0873)
PER 3 PHASE CABLE
TIGHTEN TO 48NM

MAXIMUM OF 4 x 400mm
COPPER CABLES PER PHASE

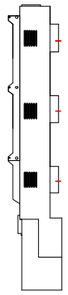


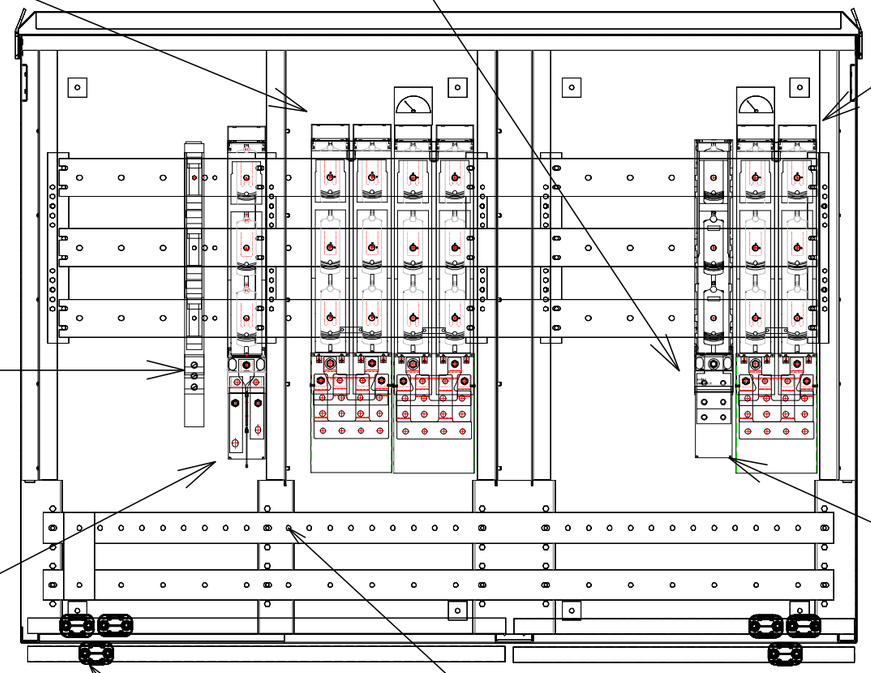
LU70

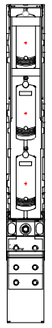
USE M8 SS MOUNTING
BOLTS 1 x KIT OF FB0874
TORQUE TO 20NM

FOR CABLE TERMINATIONS USE
M8 SS FASTERNERS SUPPLIED
WITH SWITCH
TORQUE TO 20NM

MAXIMUM OF 1 x 25mm
COPPER CABLES PER PHASE.
MINIMUM OF 10mm





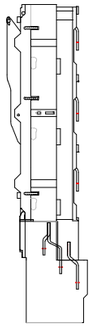


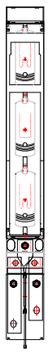
LU71

USE M12 SS MOUNTING
BOLTS 1 x KIT OF FB0872
TORQUE TO 48NM

FOR CABLE TERMINATIONS USE
M12 SS FASTERNERS SUPPLIED
WITH SWITCH
TIGHTEN TO 48NM

MAXIMUM OF 2 x 240mm
COPPER CABLES PER PHASE



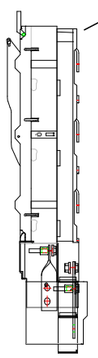


LU69

USE M12 SS MOUNTING
BOLTS 1 x KIT OF FB0872
TORQUE TO 48NM

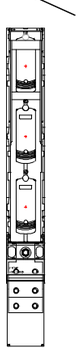
FOR CABLE TERMINATIONS USE
M12 SS FASTERNERS, 1 KIT (FB0873)
PER 3 PHASE CABLE
TORQUE TO 48NM

MAXIMUM OF 2 x 240mm
COPPER CABLES PER PHASE



M12 HOLES PRE DRILLED
INTO EARTH AND NEUTRAL BARS.

CABLE CLAMPS TO BE FITTED TO
INCOMING AND OUTGOING CABLES
SUPPLIED WITH EACH SWITCH

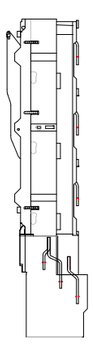


LU68

USE M12 SS MOUNTING
BOLTS 1 x KIT OF FB0872
TORQUE TO 48NM

FOR CABLE TERMINATIONS USE
M12 SS FASTERNERS SUPPLIED
WITH FUSED SWITCH
TIGHTEN TO 48NM

MAXIMUM OF 2 x 240mm
COPPER CABLES PER PHASE



REV.	DATE	DESCRIPTION	DRGD.	CHKD.	APRD.
B	06.09.21	LU71 1000A SWITCH DISCONNECTOR ADDED	GC	CO	GS
A	06.12 19	ORIGINAL ISSUE	GC	CO	GS

TITLE

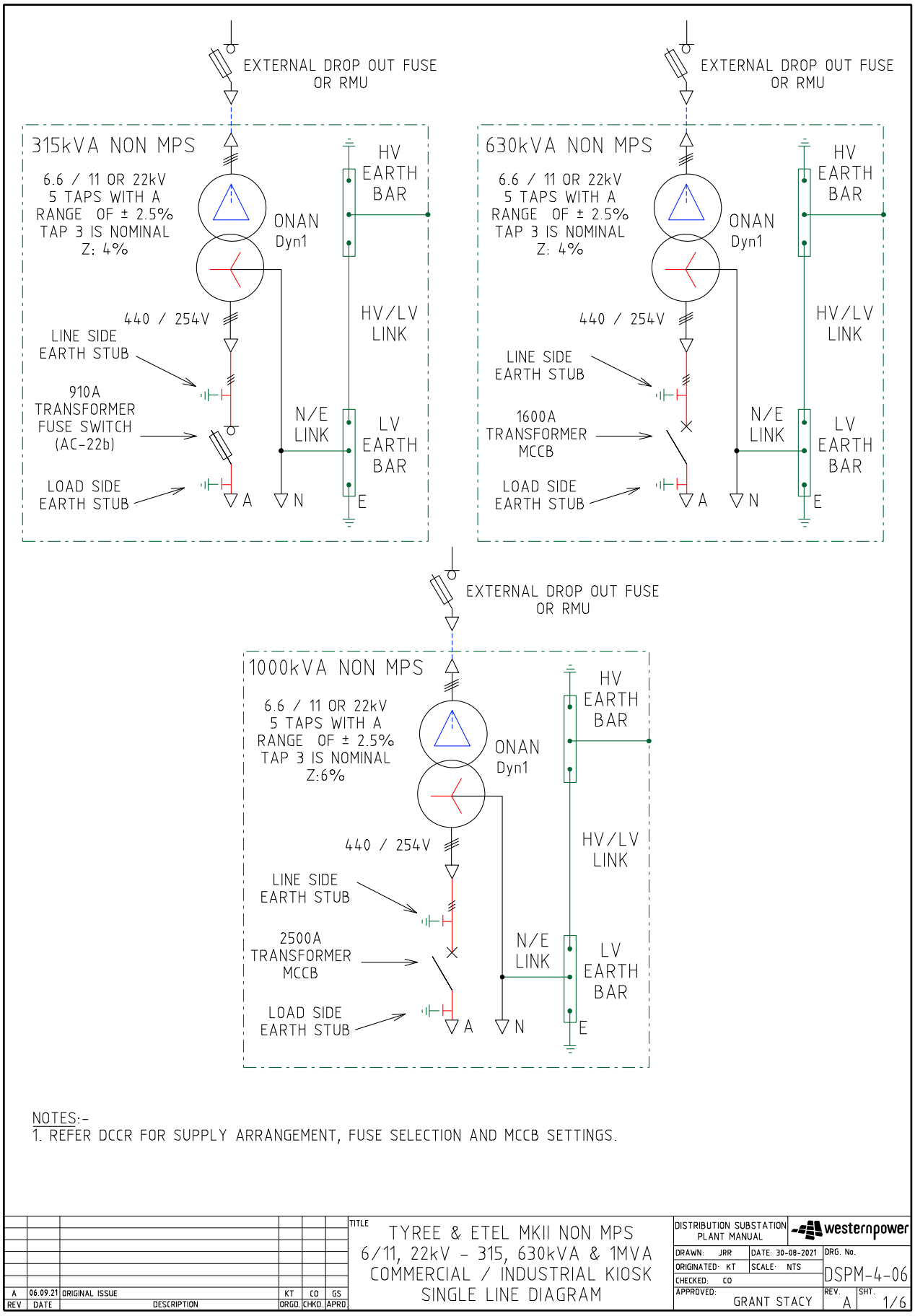
PUBLIC ELECTRICITY NETWORK DISTRIBUTION
ASSEMBLIES (PENDA)
CABLE TERMINATION DETAILS

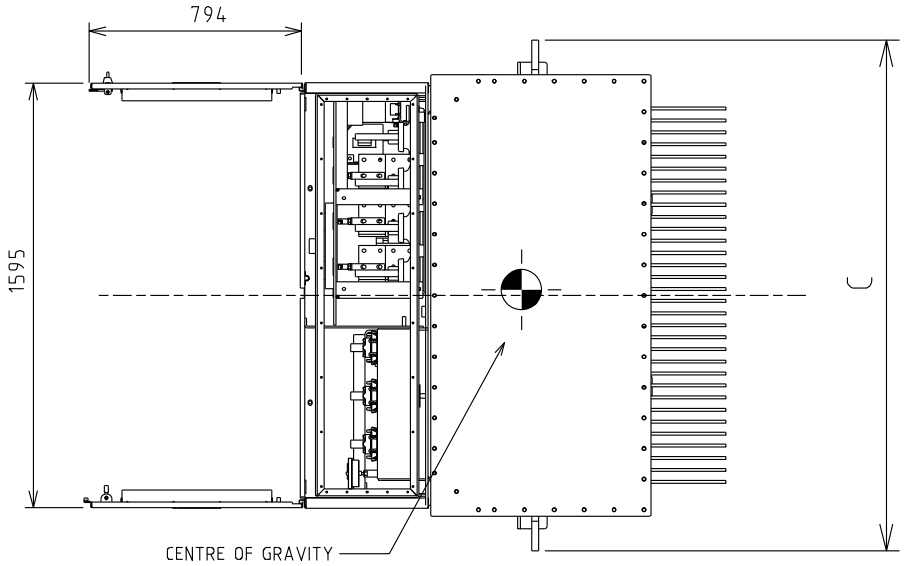
DISTRIBUTION SUBSTATION PLANT MANUAL

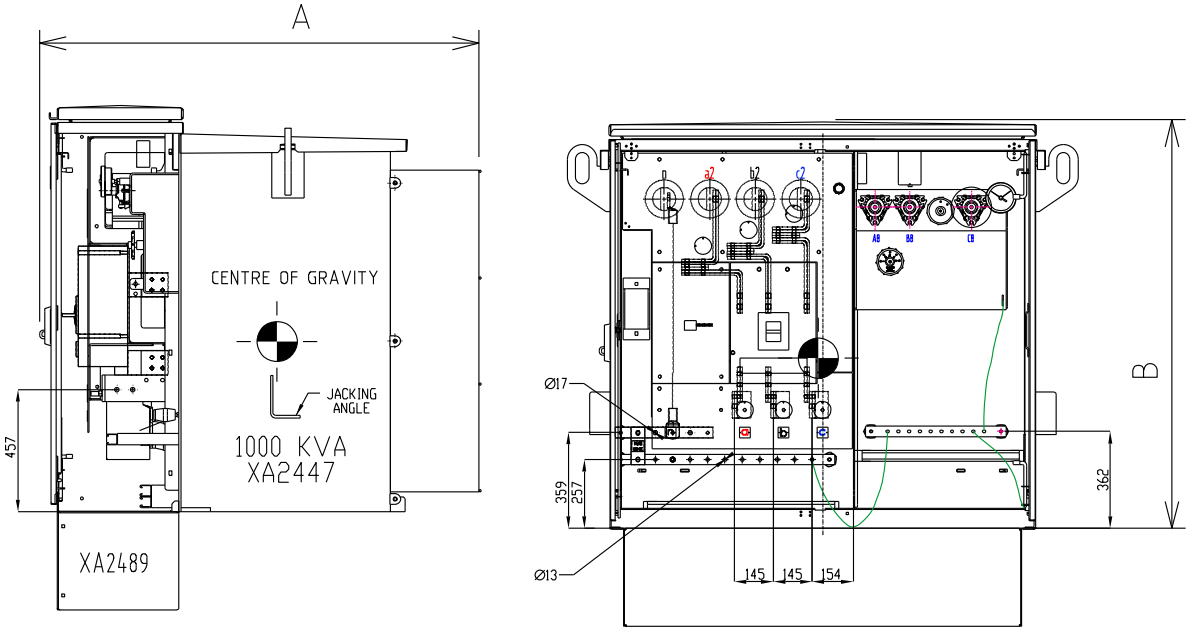
westernpower

DRAWN: JRR	DATE 19-11-2019	DRG. No.	DSPM-4-05
ORIGINATED: GC	SCALE: NTS		
CHECKED: CO			
APPROVED: GRANT STACY		REV. B	SHT. 4/4

5.6 DSM 4-06 Non-MPS Transformer







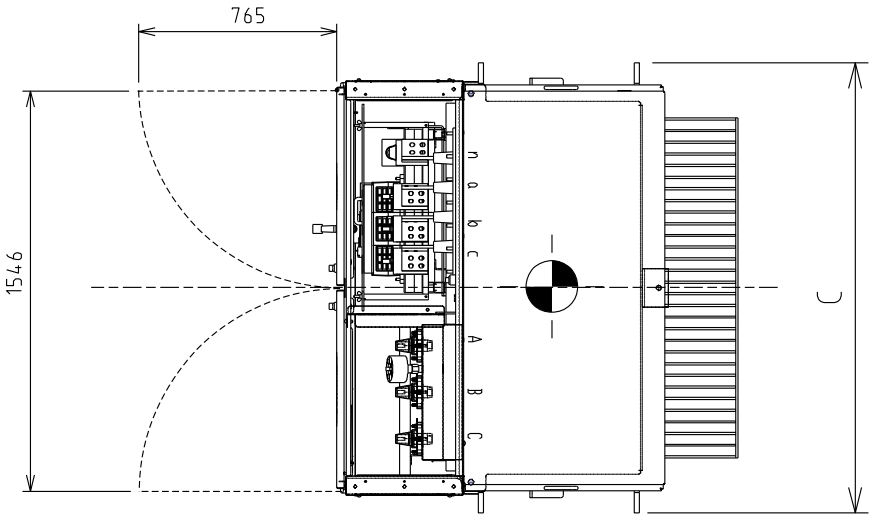
TRANSFORMER	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT DISTRICT	SOLE USE
315	6.6/11	1506	1518	1463	XA2445	2390	675	HU59	HU60
315	22	1506	1518	1463	XA2448	2095	555	HU59	HU60
630	6.6/11	1661	1518	1756	XA2446	3200	930	HU59	HU60
630	22	1576	1518	1551	XA2449	2740	730	HU59	HU60
1000	6.6/11	1641	1518	1906	XA2447	4155	985	HU59	HU60
1000	22	1641	1518	1906	XA2450	3937	980	HU59	HU60

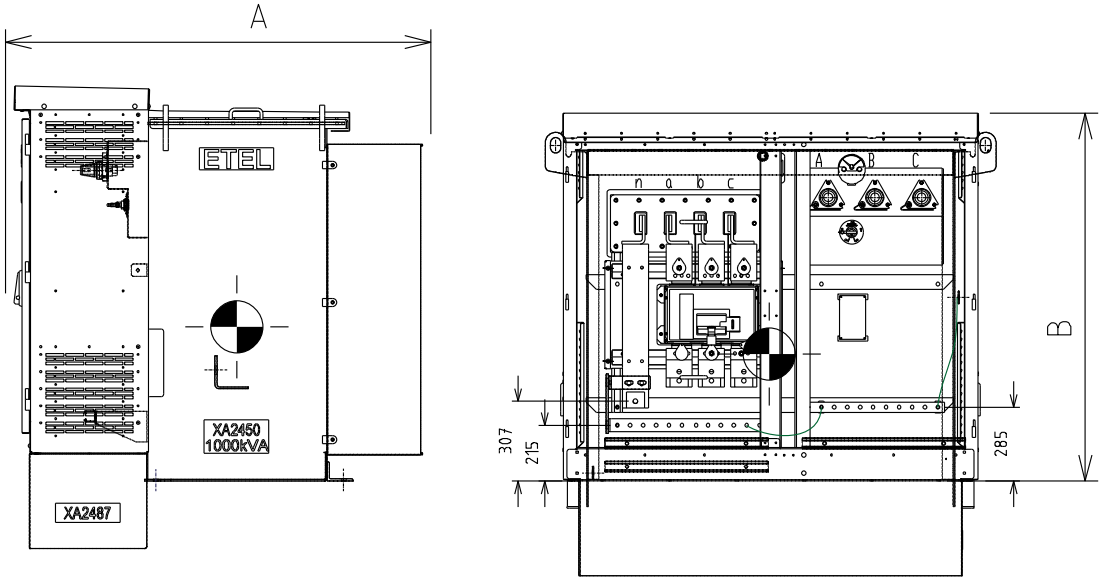
NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

TITLE
TYREE MKII NON MPS
6/11, 22kV - 315, 630kVA & 1MVA
COMMERCIAL / INDUSTRIAL KIOSK
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL
westernpower
DRAWN: JRR DATE: 30-08-2021
ORIGINATED: KT SCALE: NTS
CHECKED: CO
APPROVED: GRANT STACY
DRG. No. DSPM-4-06
REV. A SHT. 2/6





TRANSFORMER	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT DISTRICT	SOLE USE
315	22	1330	1425	1610	XA2448	1890	615	HU59	HU60
630	6.6/11	1460	1425	1610	XA2446	2620	725	HU59	HU60
630	22	1460	1425	1610	XA2449	2660	705	HU59	HU60
1000	6.6/11	1580	1530	1760	XA2447	3470	905	HU59	HU60
1000	22	1580	1530	1760	XA2450	3450	930	HU59	HU60

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

TITLE

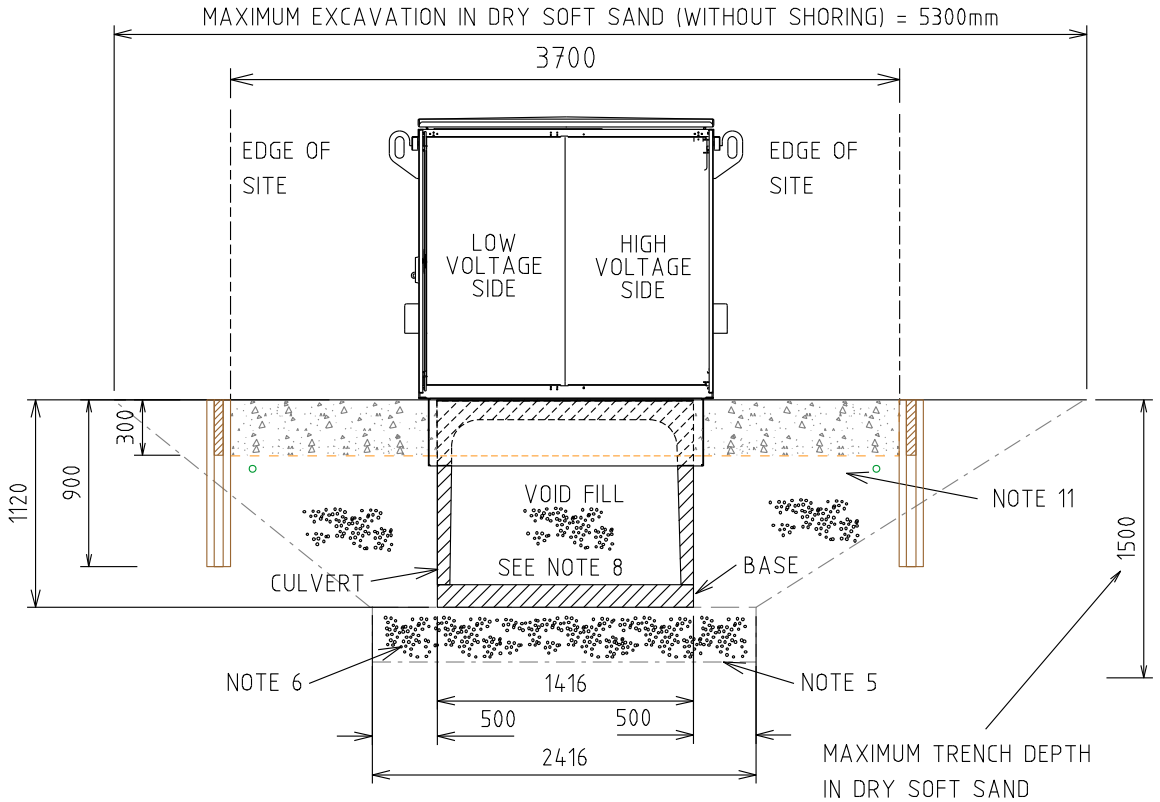
ETEL MKII NON MPS
6/11, 22kV - 315, 630kVA & 1MVA
COMMERCIAL / INDUSTRIAL KIOSK
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL

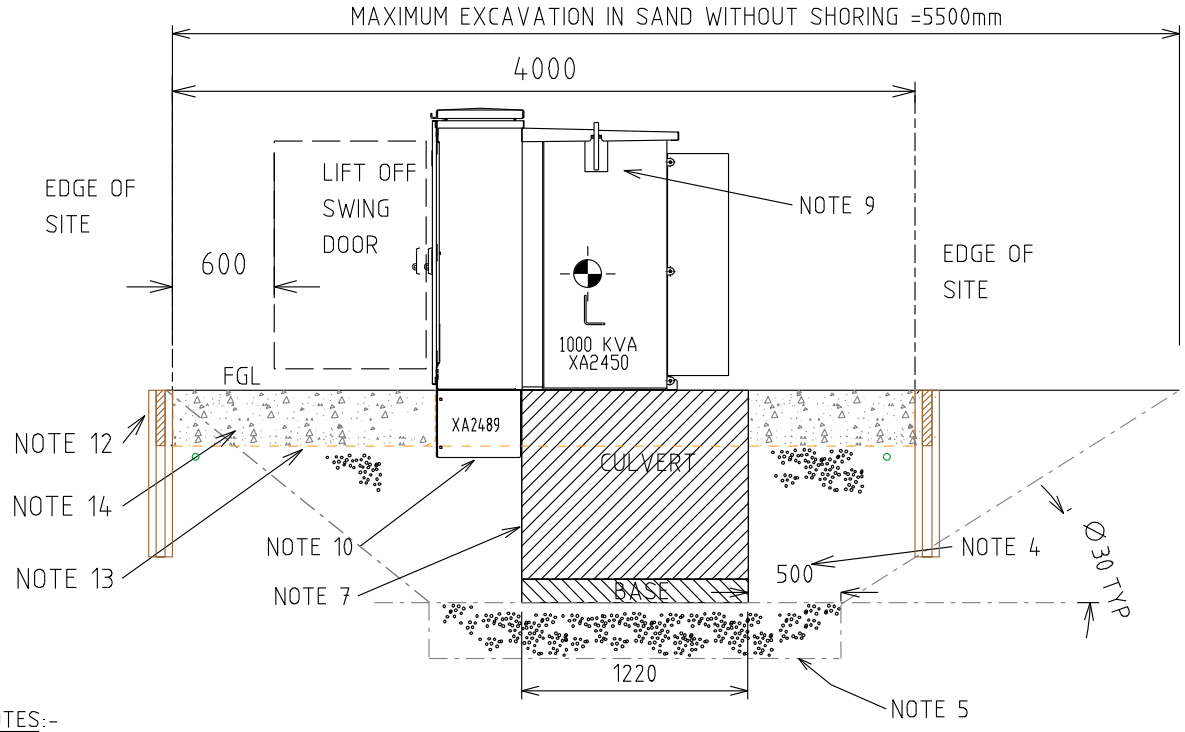
westernpower

DRAWN: JRR	DATE: 03/2021	DRG. No. DSPM-4-06
ORIGINATED: KT	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. A / SHT. 3/6

FRONT VIEW



SIDE VIEW



NOTES:-
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON THE NEXT SHEET
2. SEE CHAPTER 3 FOR EQUIPMENT SELECTION AND SUBSTATION LAYOUT

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	20.12.21	NOTES RE-ARRANGED	KT	GC	GS
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE & ETEL MKII NON MPS 6/11, 22kV - 315, 630 & 1000kVA COMERCIAL/ INDUSTRIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

DRAWN: JRR | DATE: 30-08-2021 | DRG. No.
ORIGINATED: KT | SCALE: NTS | DSPM-4-06
CHECKED: CO
APPROVED: GRANT STACY | REV: B | SHT. 4/6

NOTES:-

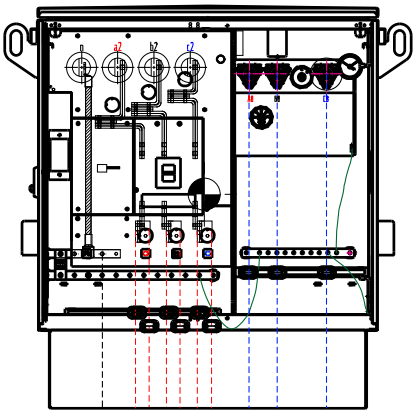
1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS 3798 FOR EARTHWORKS, AS 4678 FOR EARTH RETAINING STRUCTURES AND AS 1597 FOR PRECAST CONCRETE CULVERTS.
2. EXCAVATION TO A DEPTH OF UP TO 1500 mm BE DONE IN ACCORDANCE WITH THE CODE OF PRACTICE FOR EXCAVATION. A COMPETENT PERSON MUST BE PRESENT AT ALL TIMES DURING THE EXCAVATION, FOUNDATION PREPARATION, INSTALLATION OF CULVERT AND BACK FILL. IF DUE TO SITE CONDITIONS AND CLOSE PROXIMITY TO OTHER STRUCTURES SAFE EXCAVATION CANNOT BE CARRIED OUT THEN TRENCH SHORING SHOULD BE USED.
3. WHERE THERE IS A RISK OF FLOODING OR WHERE GROUND WATER EXISTS, THE SUBSTATION SITE SHALL BE ELEVATED AND RETAINED SO THAT THE CULVERT BASE IS ABOVE THE PREDICTED FLOODING OR HIGHEST POSSIBLE GROUND WATER LEVEL. THE FOUNDATION DESIGN, BACK FILL AND COMPACTION IS TO BE APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER (NPER).
4. THE BASE OF THE EXCAVATION IS TO BE A MINIMUM OF 500 mm LARGER THAN THE BASE OF THE CULVERT, ON ALL SIDES. THE SIDES OF THE EXCAVATION ARE TO HAVE A SAFE SLOPE BASED ON SOIL TYPE AND MOISTURE CONTENT.
5. COMPACTION OF TRENCH BASE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 92% TO AS 1289.6.3.2 THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
6. INFILL FROM THE BASE OF THE TRENCH TO THE LEVEL OF THE CULVERT BASE WITH 20mm DIAMETER ROAD BASE AND COMPACTED TO A MINIMUM MODIFIED DENSITY RATIO OF 95 % TO AS 1289.6.3.2 THIS IS MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENETROMETER.
7. INSTALL PRECAST REINFORCED BOX CULVERT AND BASE TO AS 1597 (100kN) STOCK CODE CA0002. NOMINAL (INTERNAL) SIZE OF CULVERT 1244 wide x 914 high x 1220 long. TO BE INSTALLED AS PER AS 1597 AND LEVEL TO WITHIN 1% . EXTERNAL SIZE 1416 X 1022 X 1220
8. VOID TO BE FILLED WITH SAND, HAND COMPACTION REQUIRED (NOT BY MACHINE).
9. LIFTING POINT FOR "TRANSFORMER" TO BE USED FOR TRANSFORMER REPLACEMENT AND TO LIFT COMPLETE ASSEMBLED MPS UNIT. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE LV FRAME.
10. WHEN LANDING THE MPS TRANSFORMER THE EDGE OF THE CULVERT SHOULD BE LOCATED 450mm FROM THE FRONT EDGE OF THE LV FRAME BASE.
11. BACKFILL WITH CLEAN SAND TO A DEPTH OF 400mm BELOW FGL. COMPACTION OF THE SAND IS TO BE CARRIED OUT IN LAYERS NOT EXCEEDING 300mm AND MUST ACHIEVE A MODIFIED DENSITY RATIO OF 92 % TO AS 1289.6.3.2. INSTALL EARTH GRID AND STAKES AND COVER WITH 100mm OF COMPACTED BACKFILL. THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
12. RAILWAY BALLAST OR FLAME TRAP TO BE CONTAINED WITHIN THE SITE USING A RETAINING WALL COMPLYING WITH AS 4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND WESTERN POWER. WESTERN POWER HAS A PREFERENCE FOR PRECAST CONCRETE PANEL AND POST RETAINING WALL SYSTEMS THAT CAN BE EASILY REMOVED AND REINSTATED IF FUTURE EXCAVATION IS REQUIRED WITHIN THE SUBSTATION SITE.
13. INSTALL PERMEABLE GEOTEXTILE MEMBRANE (SUCH AS GRUNT GRGT0361) TO SEPARATE THE INFILL FROM THE RAILWAY BALLAST/FLAME TRAP.
14. INFILL TO F.G.L OR FINISHED HEIGHT OF THE RETAINING WALL WITH RAILWAY BALLAST/FLAME TRAP (MINIMUM DEPTH OF 300mm) .RAILWAY BALLAST (TO AS2758.7) WITH A SIZE OF BETWEEN 30 - 50mm TO BE USED AS A FLAME TRAP. OTHER ALTERNATIVES CAN BE USED IF:
    - THE MATERIAL IS NON COMBUSTIBLE
    - HAS A MINIMUM VOID RATIO OF 40%
15. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS 1289.6.3.2 IS REQUIRED BY WESTERN POWER FOR ALL SUBSTATION INSTALLATIONS.
16. IN THE EVENT THAT THE SITE IS HIGHER THAN THE FINISHED LEVELS OF THE NEIGHBORING AREAS, RETAINING WALLS, ACCESS STEPS AND DRAINAGE SHALL BE PROVIDED COMPLYING WITH AS 4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND WESTERN POWER. THIS WORK SHALL BE CERTIFIED BY A CHARTERED CIVIL ENGINEER (CPENG).

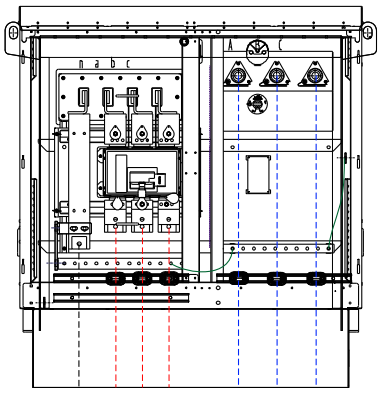
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	xx.xx xx	NOTES AMENDED	KT	GC	GS
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

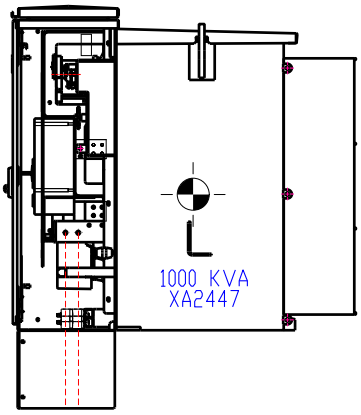
TITLE: TYREE & ETEL MKII NON MPS 6/11, 22kV - 315, 630 & 1000kVA COMERCIAL / INDUSTRIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL — western power

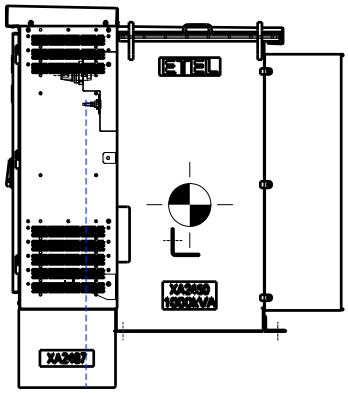
DRAWN: JRR	DATE: 30-08-2021	DRG. No. DSPM-4-06
ORIGINATED: KT	SCALE: NTS	
CHECKED: CO		
APPROVED: GRANT STACY		REV. B / SHT. 5/6







TYREE MKII NON MPS



ETEL MKII NON MPS

MANUFACTURER		TYREE	ETEL
SWITCHGEAR COMPONENT	315 kVA	PRONUTEC 930A FUSED SWITCH DISCO	WEBER 930A FUSED SWITCH DISCO
	630 kVA	TERASAKI TEMBREAK 2 1600A MCCB	SCHNEIDER NS 1600A MCCB
	1000 kVA	TERASAKI TEMBREAK 2500A MCCB	SCHNEIDER NS 2500A MCCB
MAXIMUM PHASE CABLE SIZE & QTY		FSD & MCCB = UP TO 3 x 630mm AL PER PHASE (BACK TO BACK)	FSD & MCCB = UP TO 3 x 630mm AL PER PHASE (BACK TO BACK)
NEUTRAL CABLES		FSD & MCCB = UP TO 2 x 630 AL	FSD & MCCB = UP TO 2 x 630 AL
FASTENERS		FSD & MCCB = M16 SS (GREASED)	FSD & MCCB = M16 SS (GREASED)
TORQUE SETTING		M16 SS = 68Nm	M16 SS = 68Nm

NOTES:-
1. CABLE CLAMPS TO BE USED ON HV AND LV CABLES
2. DESIGNER TO LIASE WITH CUSTOMER TO DETERMINE SUITABLE CLAMPS FOR CONSUMER MAINS CABLES
3. WHERE WESTERN POWER DOES NOT HAVE SUITABLE CLAMPS FOR CONSUMER MAINS CABLES, CUSTOMER IS TO PROVIDE CLAMPS
4. HV CABLES TERMINATED USING 200A TYPE A SEPERABLE CONNECTOR ELBOWS
5. CUSTOMER TO PROVIDE SUITABLE LUGS AND CRIMP TOOL FOR THEIR CONSUMER MAINS CABLES

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE & ETEL MKII NON MPS 6/11, 22kV - 315, 630 & 1000kVA COMMERCIAL / INDUSTRIAL AREA KIOSK CABLE TERMINATIONS

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