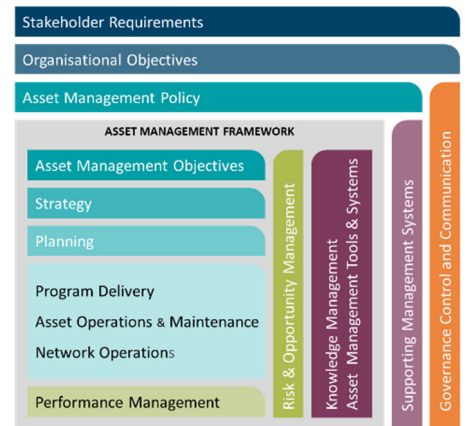


# Western Power's Asset Management System

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



Original Issue: December 2019

Content Owner/Custodian: Distribution Design and Standards

This Revision: 2 – December 2021

Date for Next Review: October 2024

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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

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Asset Operations – Network Operations

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Asset Operations – Operational Services

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Asset Operations – Customer Connection Services

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Business and Customer Service – Customer Service

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

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**Business Area / Function**

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Asset Management - Asset Performance

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Asset Management – Safety Environment Quality and Training

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Asset Management - Grid Transformation

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Asset Operations – Network Operations

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Asset Operations – Operational Services

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Asset Operations – Customer Connection Services

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Business and Customer Service – Customer Service

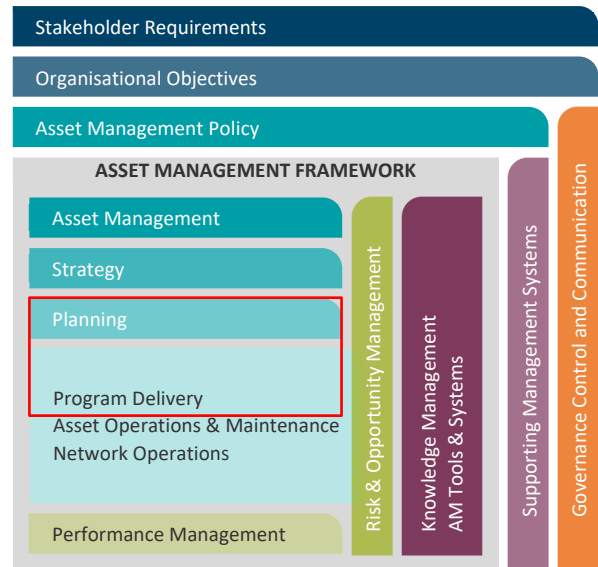
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This document must not be made available to personnel outside Western Power without the prior written approval of Western Power.

## 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](#).



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DSPM-4-01	B	2/7	TYREE 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx General Arrangement
DSPM-4-01	A	3/7	ETEL 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx General Arrangement
DSPM-4-01	A	4/7	TYREE & ETEL 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx Installation Guide
DSPM-4-01	B	5/7	TYREE & ETEL 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx Installation Guide
DSPM-4-01	A	6/7	TYREE 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx Cabling Arrangement
DSPM-4-01	A	7/7	ETEL 12.7/19.1, 22kV – 25 & 50kVA Spuds Tx Cabling Arrangement
DSPM-4-02	B	1/6	TYREE & ETEL MKII MPS 6/11, 22kV – 315 & 630kVA Residential Kiosk Single Line Diagram
DSPM-4-02	B	2/6	TYREE MKII MPS 6/11, 22kV – 315 & 630kVA Residential Area Kiosk General Arrangement
DSPM-4-02	A	3/6	ETEL MKII MPS 6/11, 22kV – 315 & 630kVA Residential Area Kiosk General Arrangement
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DSPM-4-04	B	3	T300 Installation Details for Schneider RM6 Switchgear in Outdoor Kiosk [Next G]
DSPM-4-04	A	4	Schneider RM6 Switchgear Outdoor Kiosk with T300 Installation Details Cable Box CT Wiring
DSPM-4-05	B	1/4	Public Electricity Network Distribution Assemblies (PENDA) Single Line Diagram
DSPM-4-05	B	2/4	Public Electricity Network Distribution Assemblies (PENDA) General Arrangements
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DSPM-4-06	A	1/6	TYREE & ETEL MKII Non MPS 6/11, 22kV – 315, 630 & 1MVA Commercial / Industrial Kiosk Single Line Diagram
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DSPM-4-06	B	5/6	TYREE & ETEL MKII Non MPS 6/11, 22kV – 315, 630 & 1MVA Commercial / Industrial Area Kiosk Installation Guide
DSPM-4-06	A	6/6	TYREE & ETEL Non MKII MPS 6/11, 22kV – 315, 630 & 1MVA Commercial / Industrial Area Kiosk Cable Terminations

## 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  $\pm 50\text{mm}$  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.

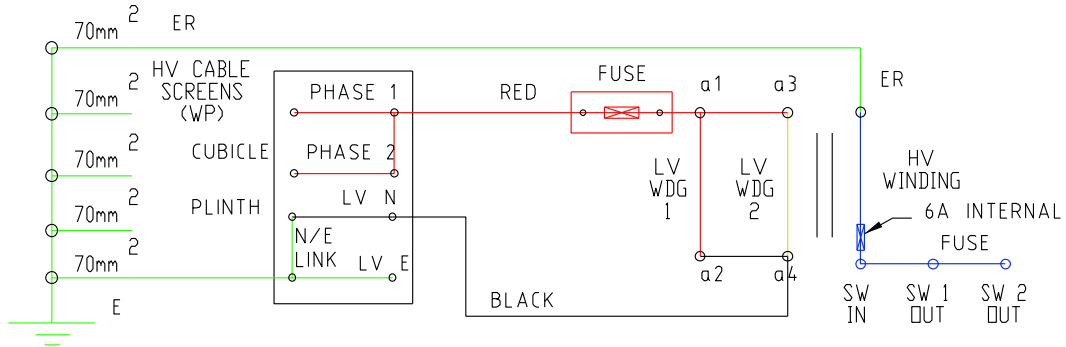
### **5. Drawings – General Arrangements and Installation Guide**

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

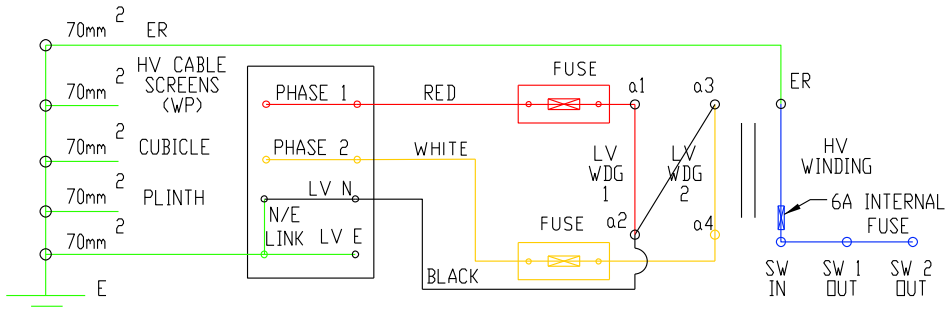
250V ARRANGEMENT



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

500V ARRANGEMENT



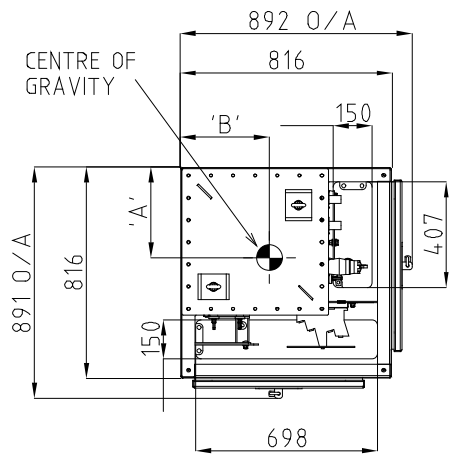
LV VOLTAGE SELECTION  
500V  
LINK a2 TO a3

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

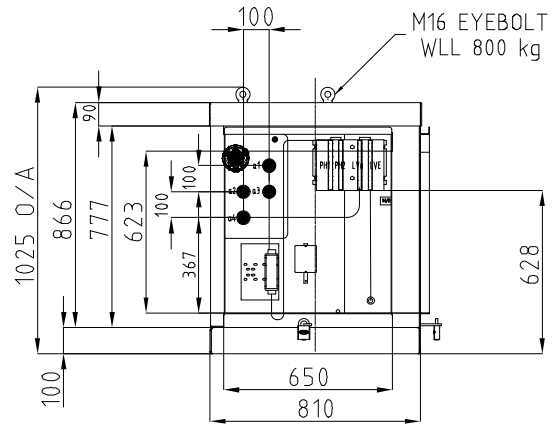
NOTES:-  
1. 22kV VERSION AVAILABLE BUT NOT SHOWN

				TITLE				DISTRIBUTION SUBSTATION PLANT MANUAL				westernpower	
				TYREE & ETEL									
				12.7/19.1, 22kV - 25 & 50kVA									
				SPUDS TRANSFORMER									
				SINGLE LINE DIAGRAM								DRG. No.	
												DSPM-4-01	
												REV. B	
												SHT. 1/7	
												GRANT STACY	

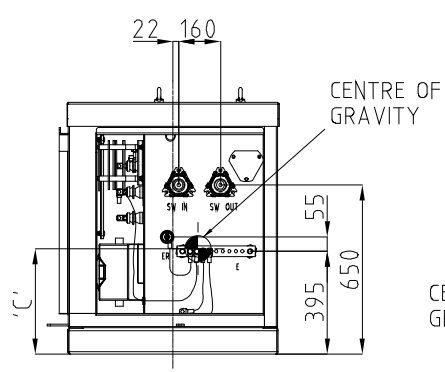




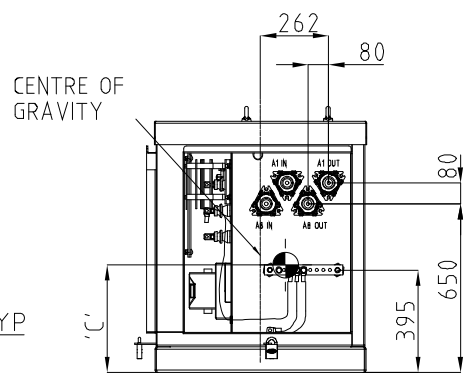
TOP VIEW  
(TOP REMOVED)



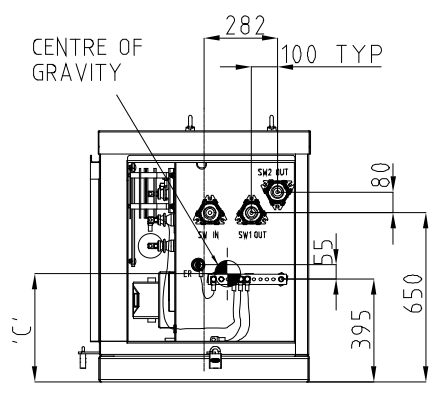
LV SIDE VIEW  
(DOORS REMOVED)



2 BUSHINGS HV



4 BUSHINGS HV



3 BUSHINGS HV

HV SIDE VIEW (DOORS REMOVED)

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	BUSHINGS	DIMENSION			WEIGHT (kg)	OIL QTY (LITRES)	STOCK CODE	COMPATIBLE UNIT
			'A'	'B'	'C'				
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

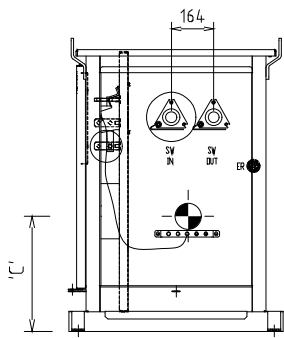
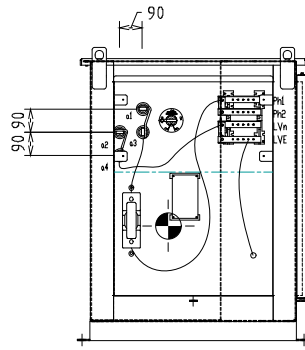
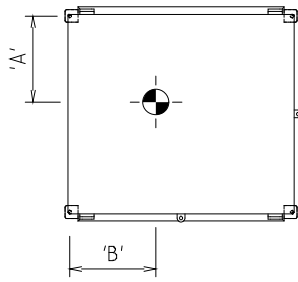
REV	DATE	DESCRIPTION	ORGD	CHKD	APRD
B	06.09.21	TABLE REVISED	KT	CO	GS
A	05.12.19	ORIGINAL ISSUE	GC	CO	GS

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

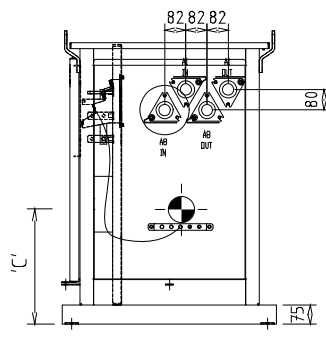
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ORIGINATED: GC		SCALE: NTS		DSPM-4-01	
CHECKED: CO		APPROVED: GRANT STACY		REV. B SHT. 2/7	

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Refer to DM for current version

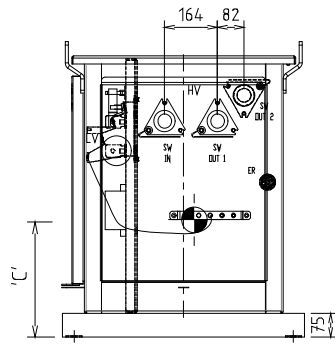




2 BUSHINGS HV



4 BUSHINGS HV



3 BUSHINGS HV

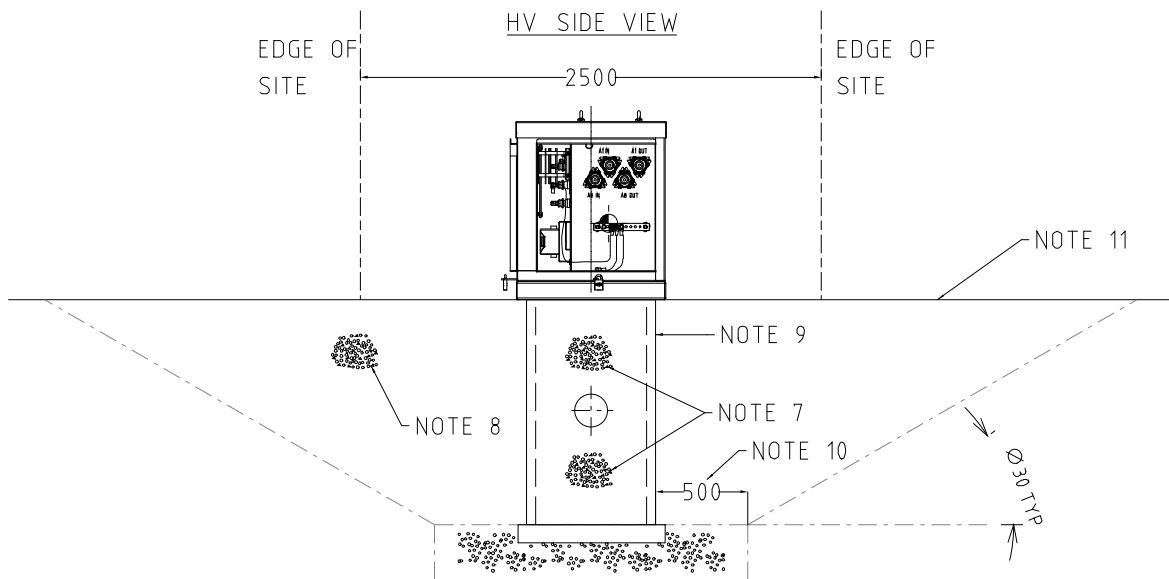
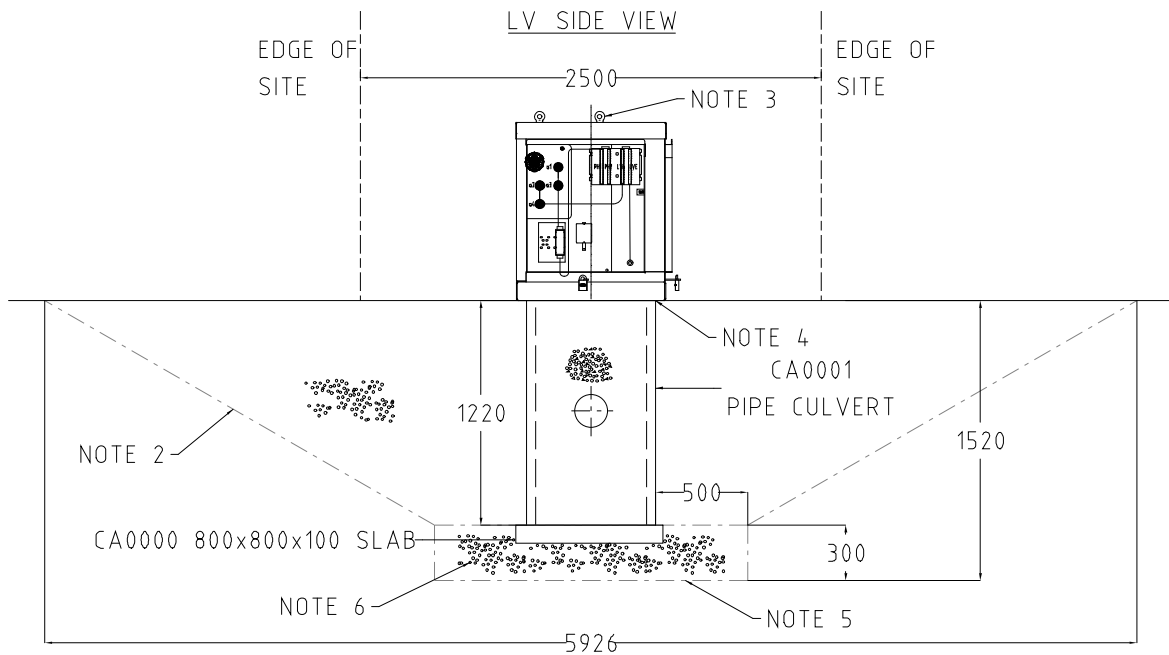
HV SIDE VIEW (DOORS REMOVED)

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	BUSHINGS	DIMENSION			WEIGHT (kg)	OIL QTY (LITRES)	STOCK CODE	COMPATIBLE UNIT
			'A'	'B'	'C'				
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

				TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL		westernpower	
				ETEL			DRAWN: JRR		DATE: 14-11-2019	
				12.7/19.1, 22kV - 25 & 50kVA			ORIGINATED: KT		SCALE: NTS	
				SPUDS TRANSFORMER			CHECKED: CO		DRG. No. DSPM-4-01	
				GENERAL ARRANGEMENT			APPROVED: GRANT STACY		REV. A	
									SHT. 3/7	
A	06.09.21	ORIGINAL ISSUE		KT	CO	GS				
REV	DATE	DESCRIPTION		ORGD.	CHKD.	APRD.				

Uncontrolled document when printed  
Refer to DM for current version





NOTES:-

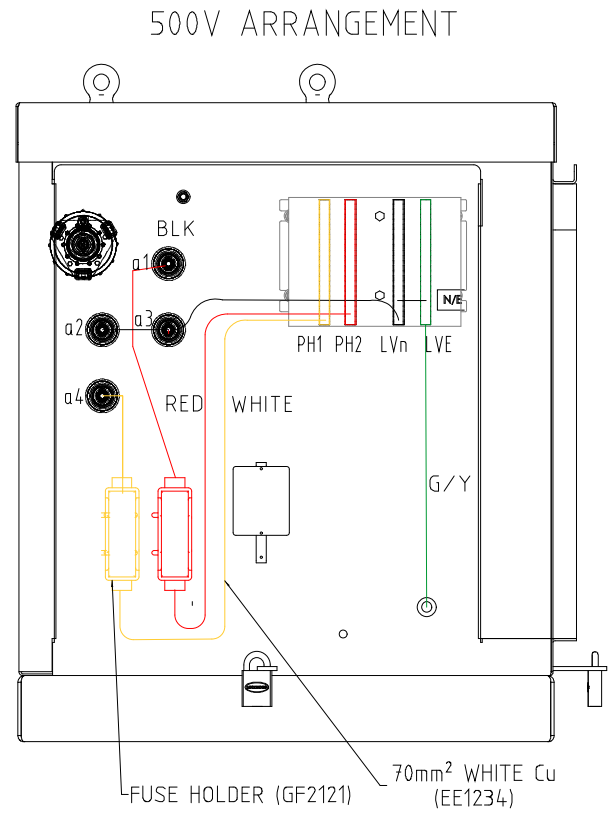
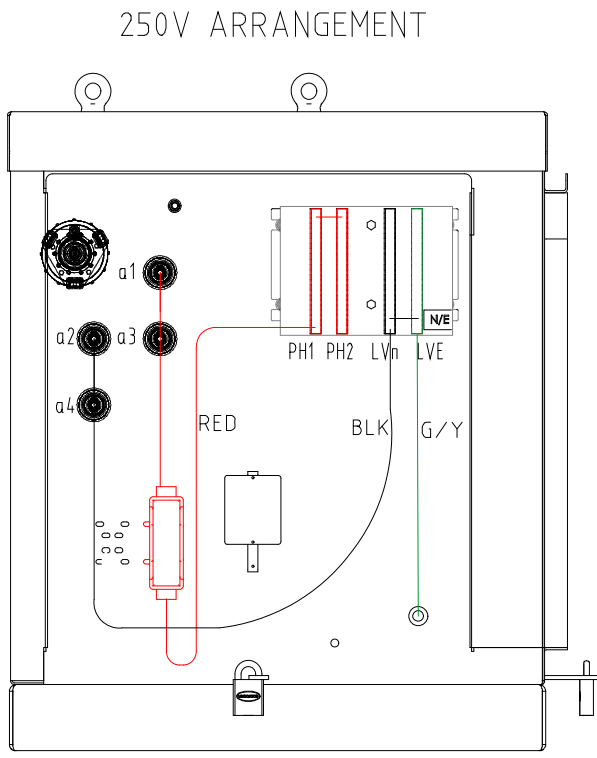
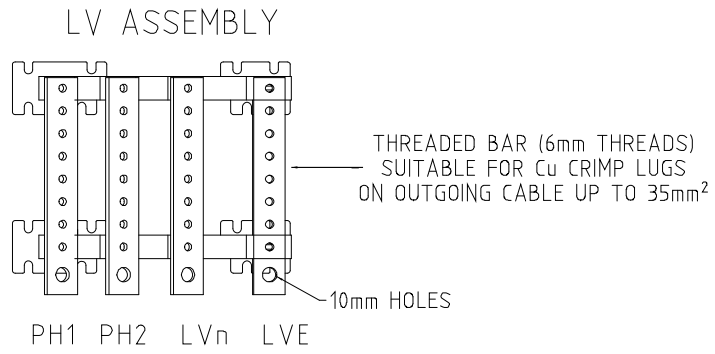
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON THE FOLLOWING SHEETS.

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				TYREE & ETEL		DRAWN: JRR		DATE: 14-11-2019	
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				INSTALLATION GUIDE		APPROVED: GRANT STACY		DSPM-4-01	
								REV. A	
								SHT. 4/7	
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.				
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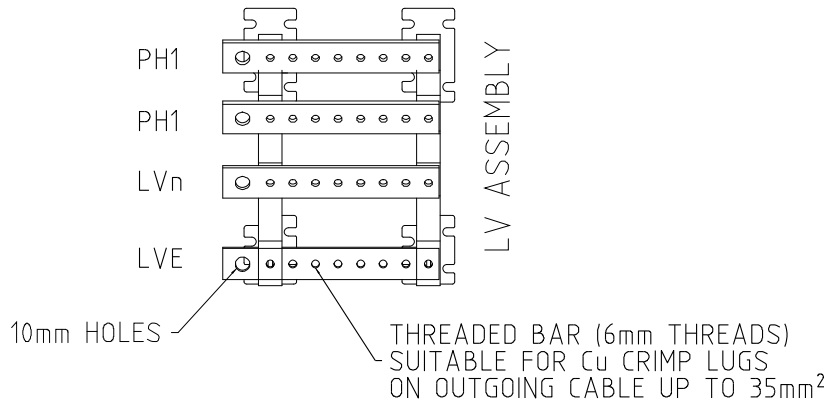
**NOTES:-**

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.

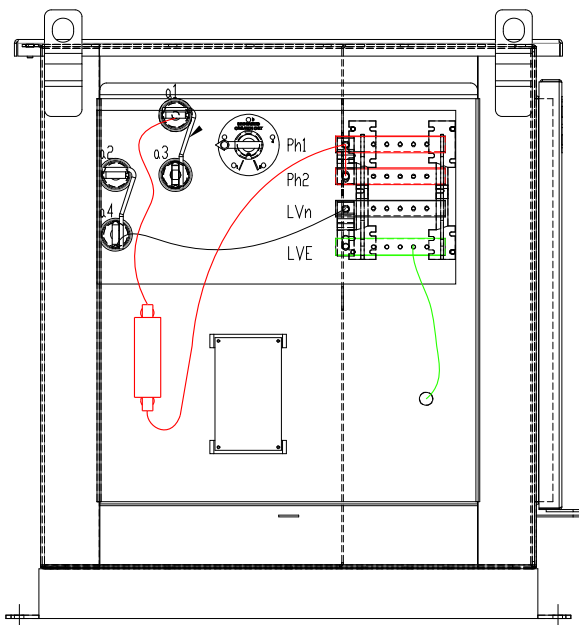
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			TYREE & ETEL 12.7/19.1, 22kV - 25 & 50kVA SPUDS TRANSFORMER INSTALLATION GUIDE			DRAWN: JRR DATE: 14-11-2019		DRG. No.	
						ORIGINATED: GC SCALE: NTS		DSPM-4-01	
						CHECKED: CO			
						APPROVED:		REV. SHT.	
						GRANT STACY		B 5/7	
B	06.09.21	NOTES AND DRAWING NUMBER REVISED	KT	CO	GS				
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS				
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APROD.				



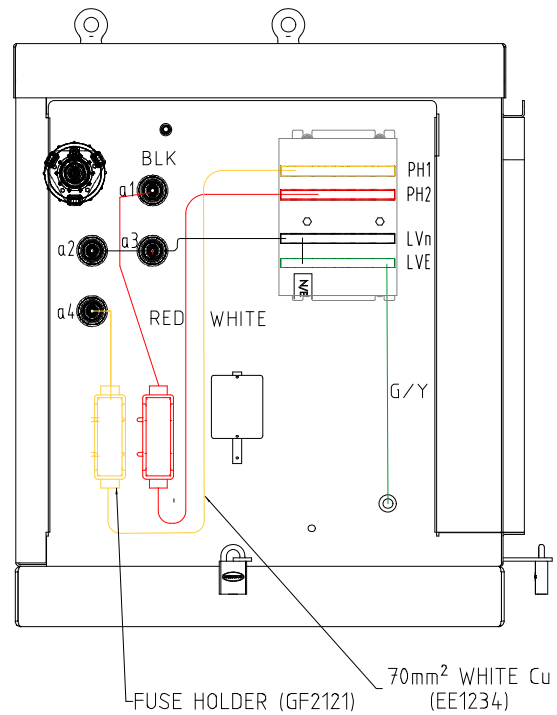
			TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL					
			TYREE 12.7/19.1, 22kV - 25 & 50kVA SPUDS TRANSFORMER CABLING ARRANGEMENT						DRG. No.		
						DRAWN: JRR			DATE: 14-11-2019		
						ORIGINATED: GC			SCALE: NTS		
						CHECKED: CO			DSPM-4-01		
						APPROVED: GRANT STACY			REV. B		
									SHT. 6/7		
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						



250V ARRANGEMENT



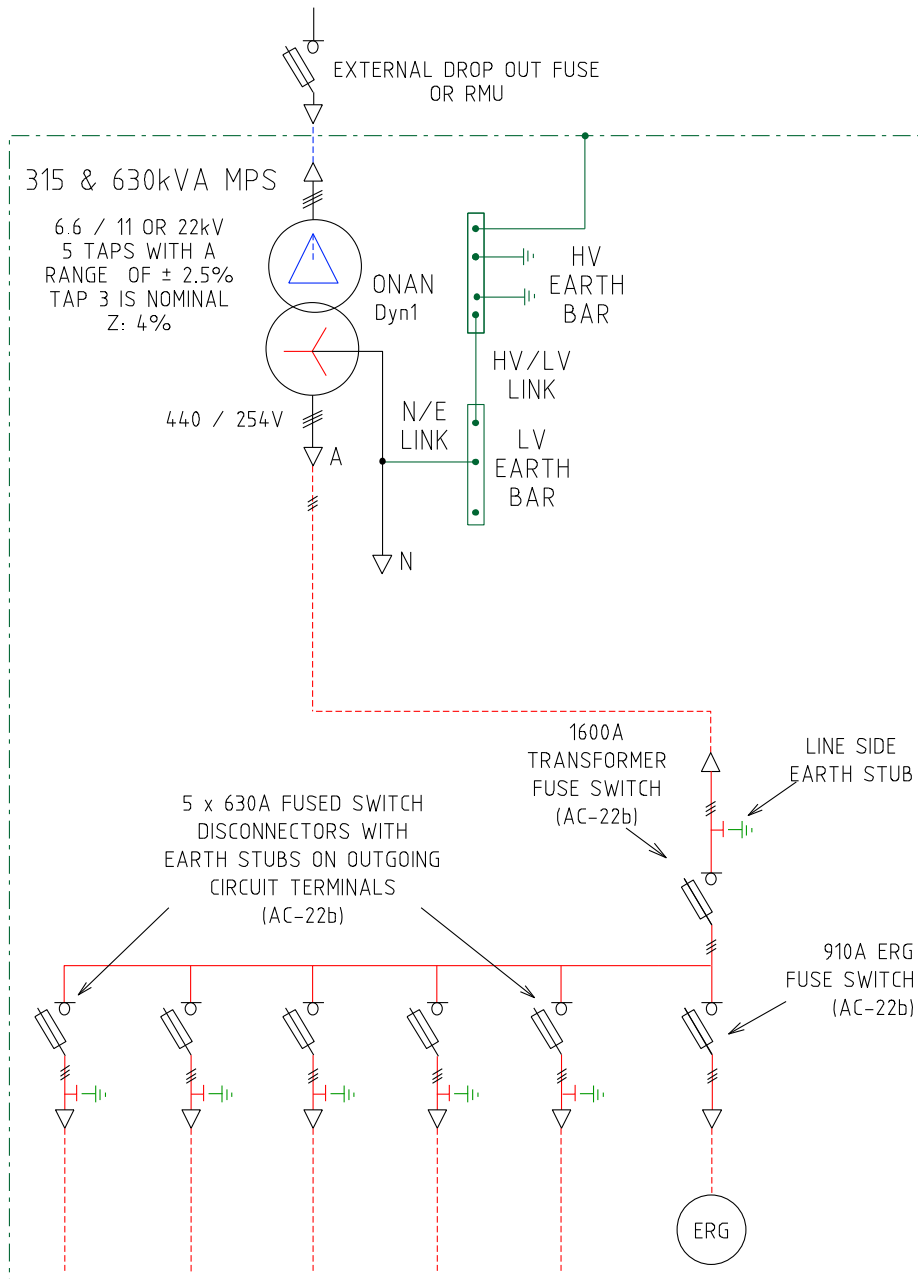
500V ARRANGEMENT



				TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL			
				ETEL			DRAWN: JRR		DATE: 30-08-2021	
				12.7/19.1, 22kV - 25 & 50kVA			ORIGINATED: KT		SCALE: NTS	
				SPUDS TRANSFORMER			CHECKED: CO		DRG. No.	
				CABLING ARRANGEMENT			APPROVED: GRANT STACY		DSPM-4-01	
							REV. A		SHT. 7/7	
A	06.09.21	ORIGINAL ISSUE		KT	CO	GS				
REV	DATE	DESCRIPTION		ORGD.	CHKD.	APRD.				



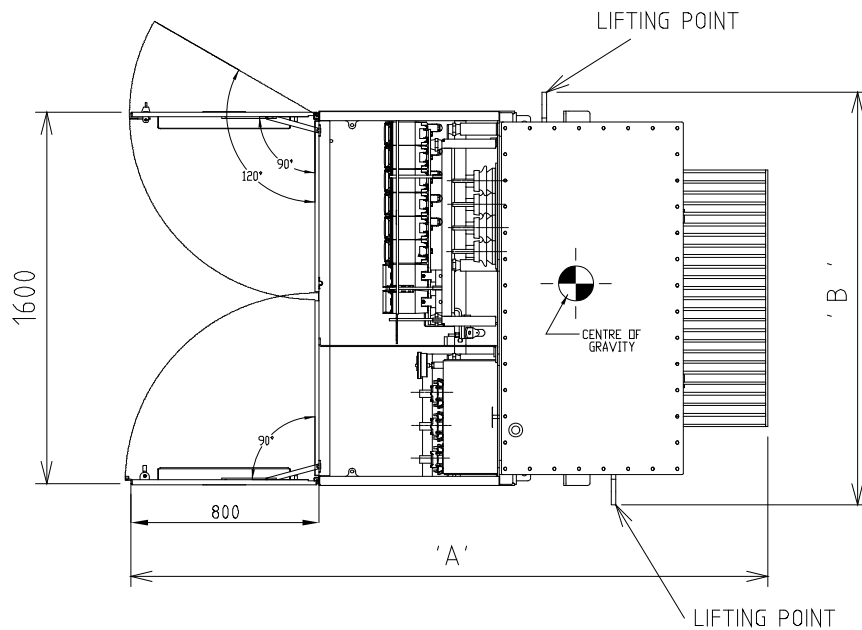
## 5.2 DSPM 4-02 MPS Transformers



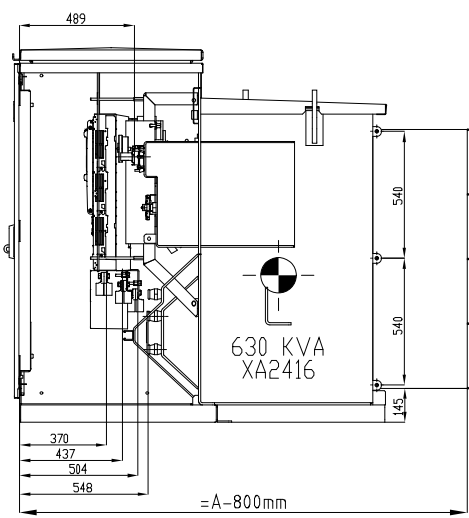
### NOTES:-

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

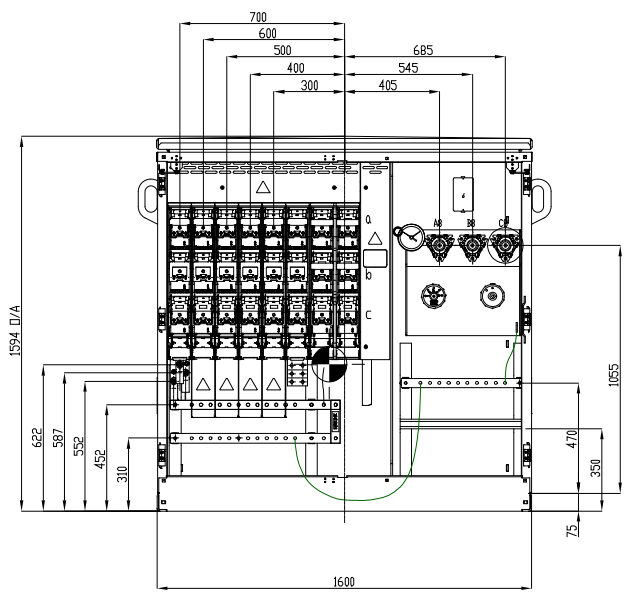
REV	DATE	DESCRIPTION	ORGO.	CHKD.	APPRO.	TITLE	DISTRIBUTION SUBSTATION PLANT MANUAL	westernpower	DRG. No.
B	06/09/21	TRANSFORMER DETAILS AND NOTES UPDATED	KT	CO	GS	TYREE AND ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL KIOSK SINGLE LINE DIAGRAM	DRAWN: JRR	DATE: 14-11-2019	DRG. No.
A	06/12/19	ORIGINAL ISSUE	GC	CO	GS		ORIGINATED: GC	SCALE: NTS	DSPM-4-02
							CHECKED: CD	APPROVED: GRANT STACY	REV. B



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	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

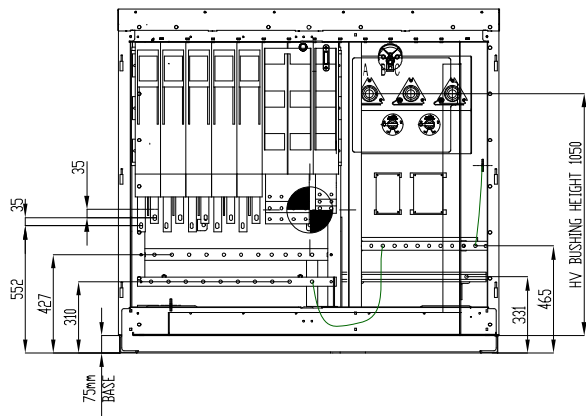
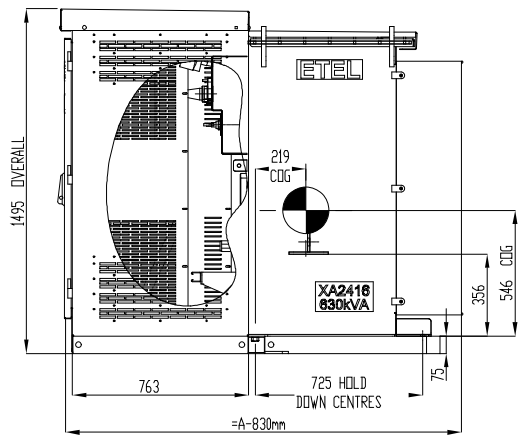
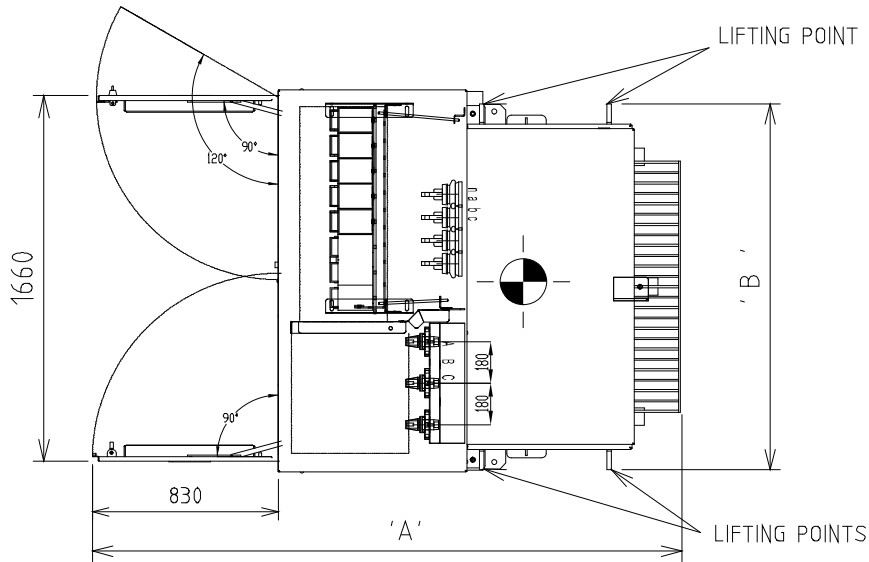
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	TABLE REVISED	KT	EO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

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

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



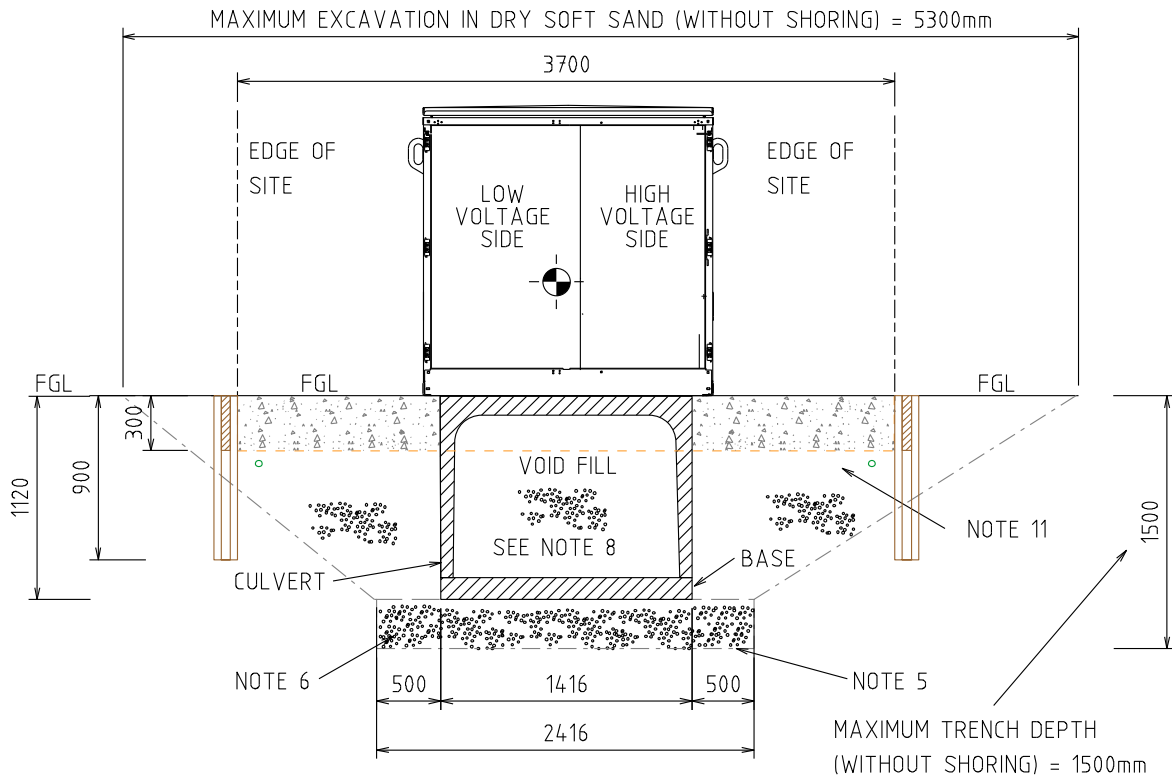
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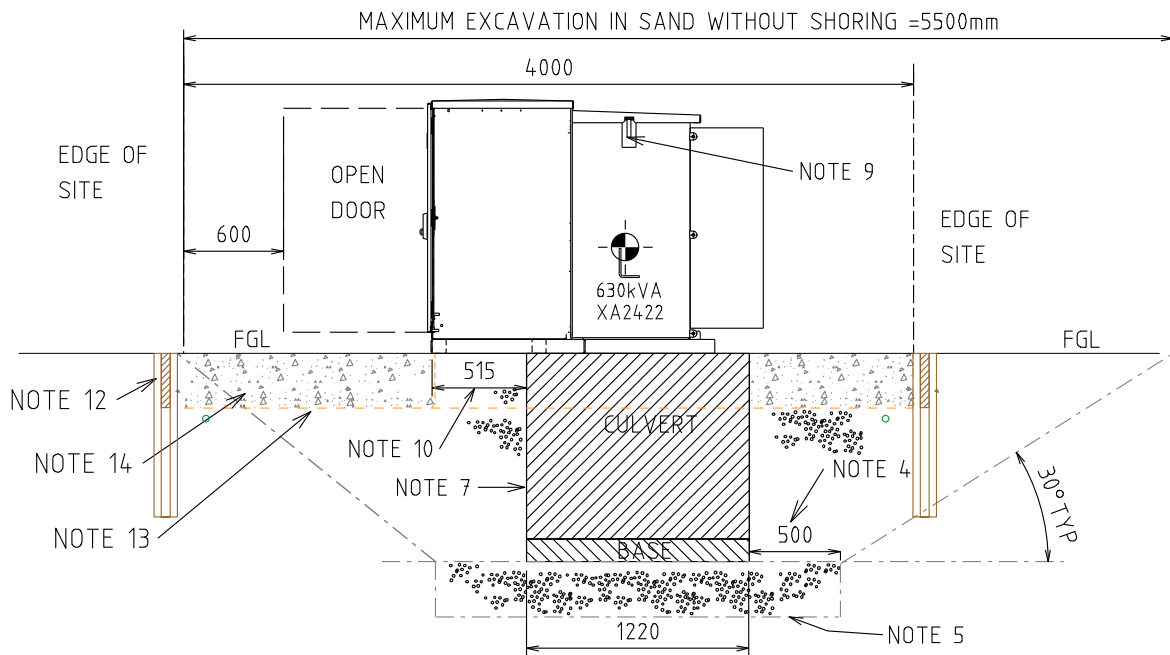
TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION 'A'	DIMENSION 'B'	OIL QTY (L)	WEIGHT (kg)	STOCK CODE	COMPATIBLE UNIT TRANSFORMER & LV CAB
315	6.6/11	2420	1536	650	2080	XA2414	HU61
315	22	2320	1536	540	2040	XA2420	HU61
630	6.6/11	2540	1586	727	2700	XA2416	HU61
630	22	2540	1586	705	2760	XA2422	HU61

				TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL			westernpower	
				ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL AREA KIOSK GENERAL ARRANGEMENT						DRAWN: JRR DATE: 14-11-2019 DRG. No.	
										ORIGINATED: GC SCALE: NTS	
										CHECKED: CO	
										APPROVED: GRANT STACY	
										REV. A SHT. 3/6	
A	06.09.21	ORIGINAL ISSUE		GC	CO	GS					
REV	DATE	DESCRIPTION		ORGD.	CHKD.	APRD.					

### FRONT VIEW



### SIDE VIEW



**NOTES:-**

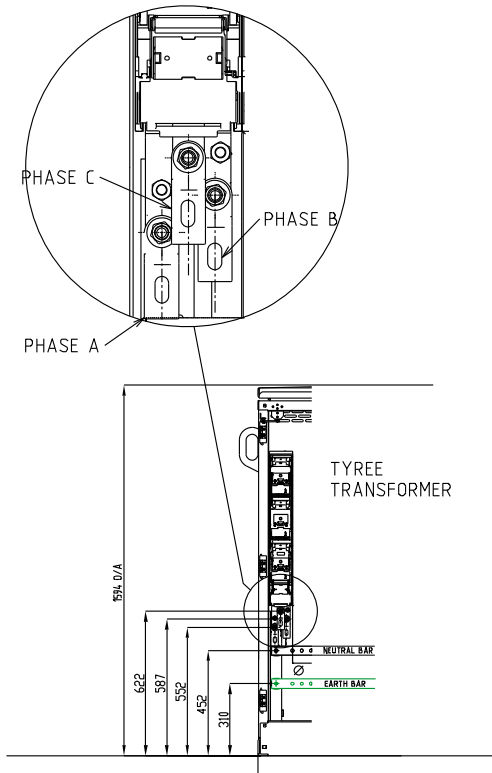
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES SHEET 5/6.
2. SEE CHAPTER 3 FOR EQUIPMENT SELECTION AND SUBSTATION LAYOUT.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APPROV.	TITLE	DISTRIBUTION SUBSTATION PLANT MANUAL	westernpower	
D	20.12.21	NOTES RE-ARRANGED	KT	GC	GS	TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL AREA KIOSK INSTALLATION GUIDE	DRAWN: JRR	DATE: 14-11-2019	DRG. No.
C	06.09.21	CONCRETE PANEL AND RETAINING WALL DETAILS REVISED	KT	CO	GS		ORIGINATED: GC	SCALE: NTS	DSPM-4-02
B	07/2020	FLAME TRAP IN ACCORDANCE WITH DSPM CHAPTER 5	GC	LT	GS		CHECKED: CO		
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS		APPROVED:		
							GRANT STACY	REV. D	SHT. 4/6

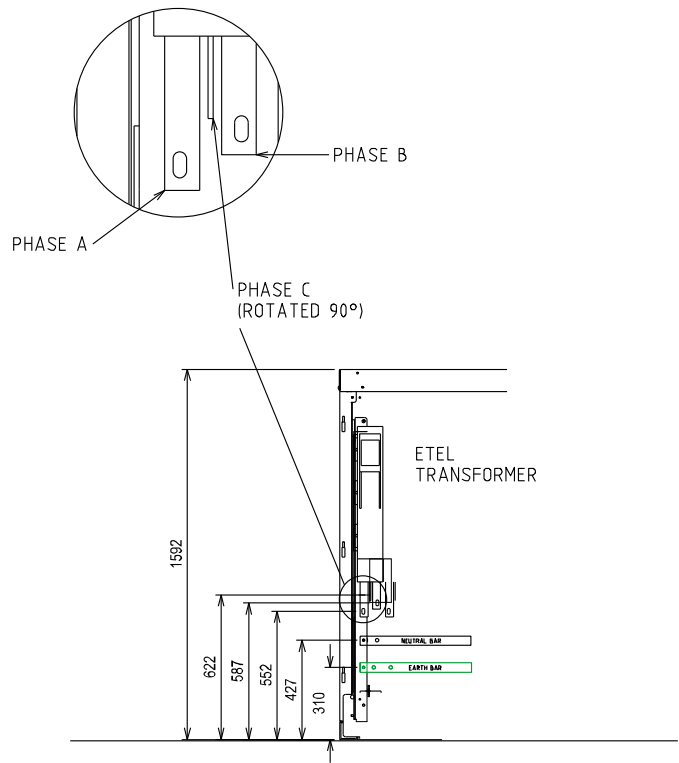
**NOTES:-**

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).

			TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL			
			TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESDENTIAL AREA KIOSK INSTALLATION GUIDE			DRAWN: JRR DATE: 14-11-2019		DRG. No.	
D 20.12.21 NOTES AMENDED			KT	GC	GS	ORIGINATED: GC SCALE: NTS		DSPM-4-02	
C 06.09.21 NOTE 13 REVISED			KT	CO	GS	CHECKED: CO			
B 07/2020 NOTES 13, 14 & 15 ADDED			GC	LT	GS	APPROVED:		REV. SHT.	
A 06.12.19 ORIGINAL ISSUE			GC	CO	GS	GRANT STACY		D 5/6	
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APPRO				



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

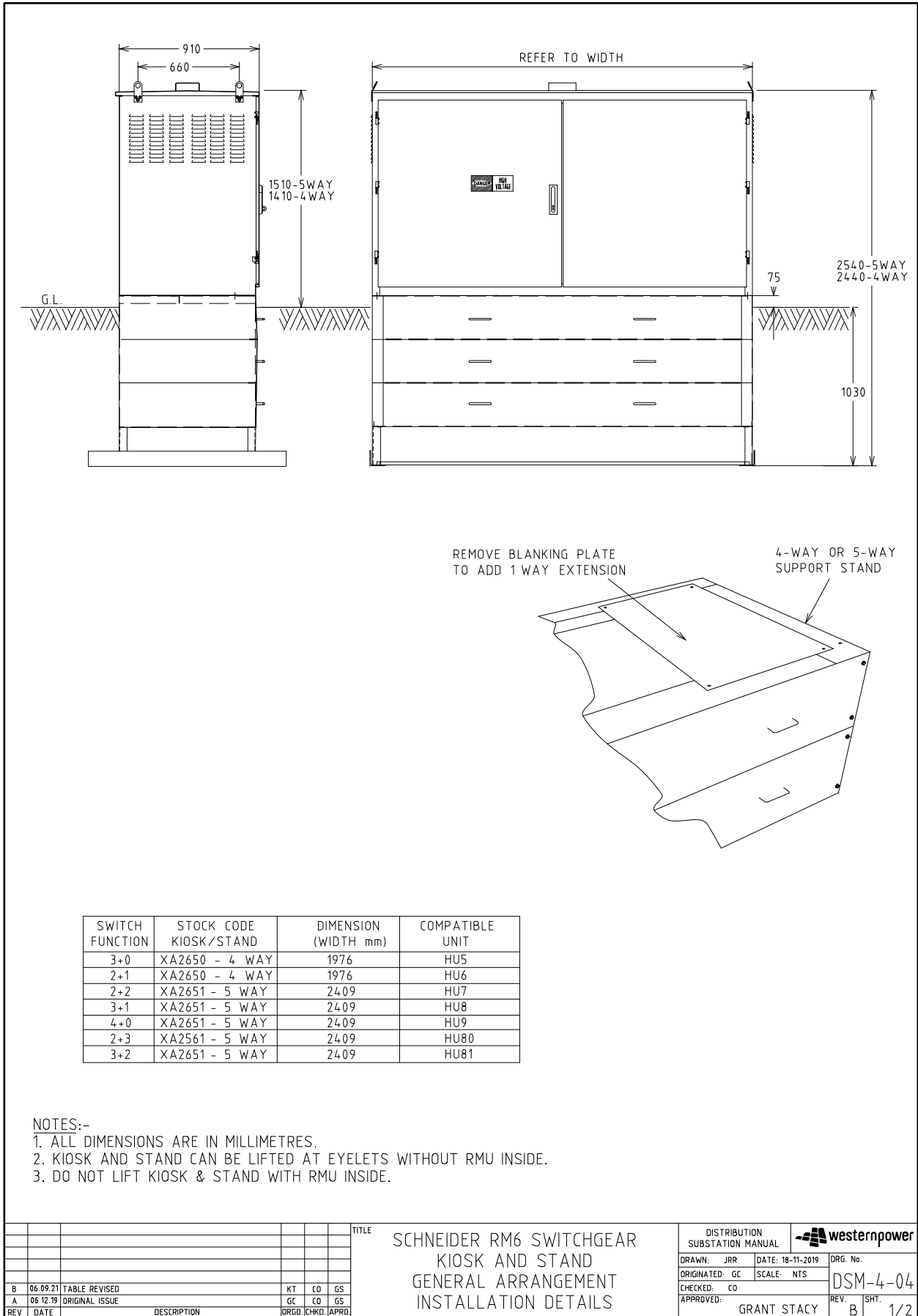
NOTES:

1. LV CABLES MUST BE CLAMPED IN PLACE

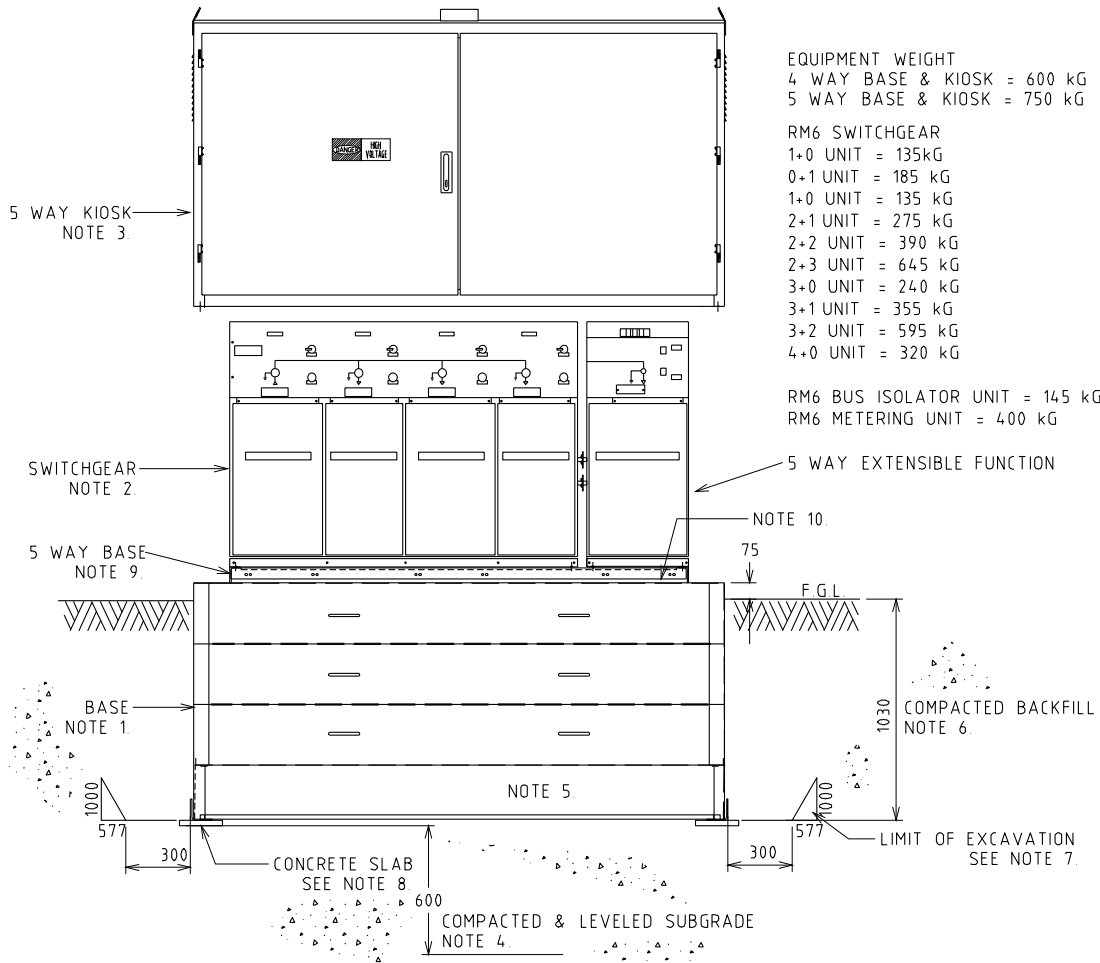
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.	TITLE	DISTRIBUTION SUBSTATION PLANT MANUAL	westernpower	
B	06.09.21	NOTES ADDED	GC	CO	GS	TYREE & ETEL MKII MPS 6/11, 22kV - 315 & 630kVA RESIDENTIAL AREA KIOSK LV CABLE TERMINATIONS	DRAWN: JRR	DATE: 14-11-2019	DRG. No.
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS		ORIGINATED: GC	SCALE: NTS	DSPM-4-02
							CHECKED: CO	APPROVED: GRANT STACY	REV: B

**5.3 DSPM 4-03 Not yet used**

## 5.4 DSM 4-04 Schneider RM6 switchgear kiosk







EQUIPMENT WEIGHT  
 4 WAY BASE & KIOSK = 600 kG  
 5 WAY BASE & KIOSK = 750 kG

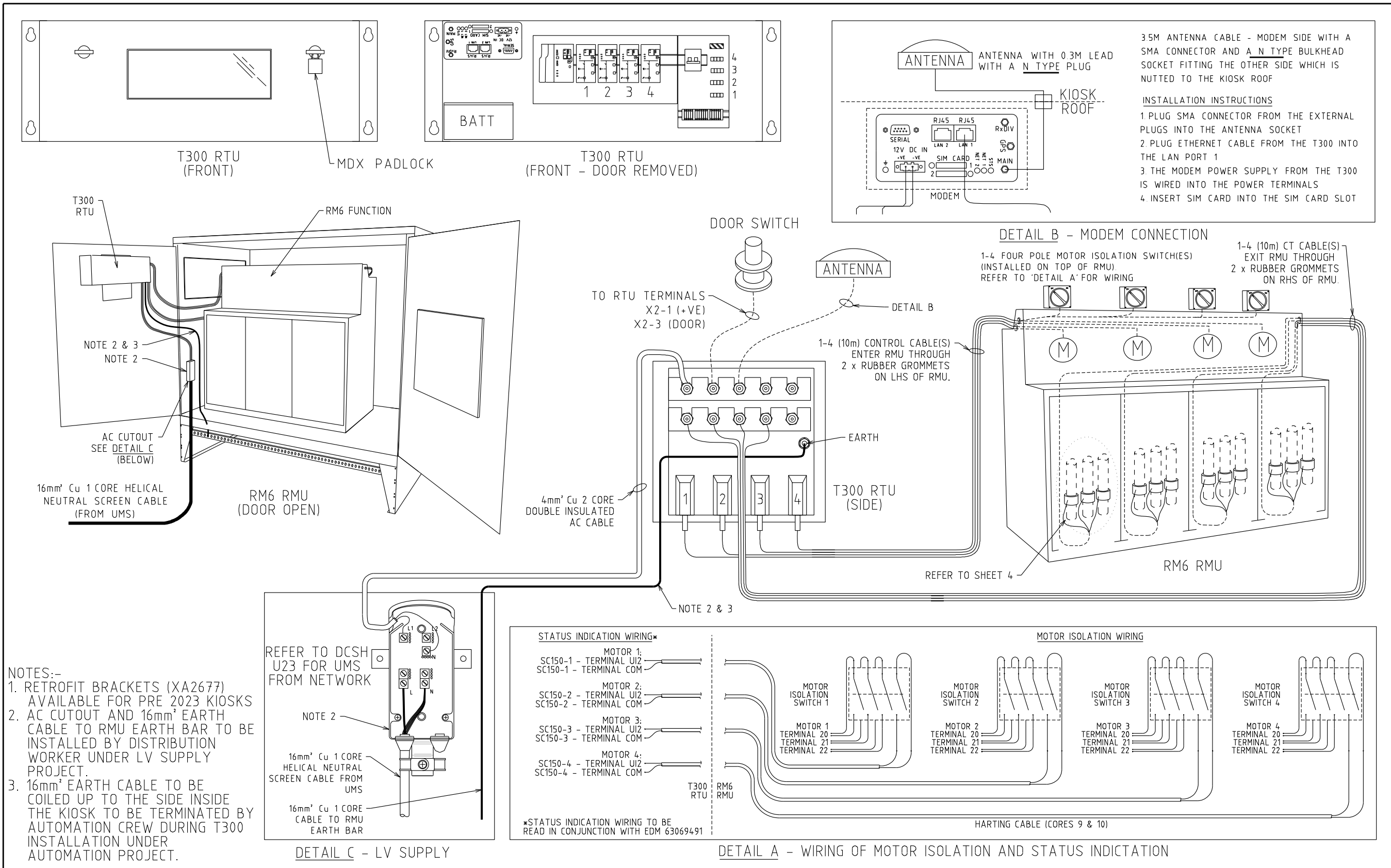
RM6 SWITCHGEAR  
 1+0 UNIT = 135kG  
 0+1 UNIT = 185 kG  
 1+0 UNIT = 135 kG  
 2+1 UNIT = 275 kG  
 2+2 UNIT = 390 kG  
 2+3 UNIT = 645 kG  
 3+0 UNIT = 240 kG  
 3+1 UNIT = 355 kG  
 3+2 UNIT = 595 kG  
 4+0 UNIT = 320 kG

RM6 BUS ISOLATOR UNIT = 145 kG  
 RM6 METERING UNIT = 400 kG

**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

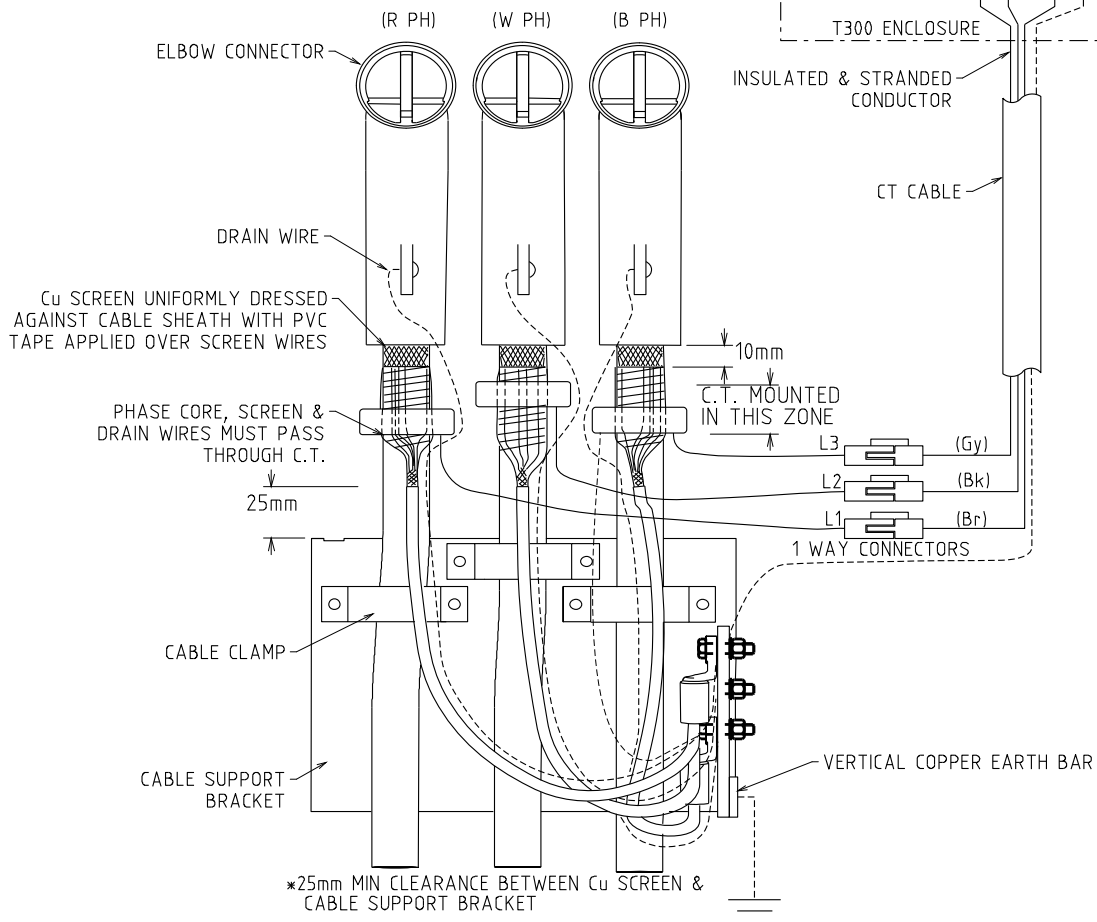
				TITLE		DISTRIBUTION SUBSTATION MANUAL		westernpower	
				SCHNEIDER RM6		DRAWN: JRR		DATE: 18-11-2019	
				OUTDOOR EXTENSIBLE SWITCHGEAR		ORIGINATED: GC		SCALE: NTS	
				GENERAL ARRANGEMENT		CHECKED: CO		ORG. No. DSM-4-04	
				INSTALLATION DETAILS		APPROVED: GRANT STACY		REV. SHT. 2/2	
				REV. DATE		DESCRIPTION		ORG. CHKO. APPRO.	
A				06.09.21		ORIGINAL ISSUE			



- NOTES:-**
1. RETROFIT BRACKETS (XA2677) AVAILABLE FOR PRE 2023 KIOSKS
  2. AC CUTOUT AND 16mm² EARTH CABLE TO RMU EARTH BAR TO BE INSTALLED BY DISTRIBUTION WORKER UNDER LV SUPPLY PROJECT.
  3. 16mm² EARTH CABLE TO BE COILED UP TO THE SIDE INSIDE THE KIOSK TO BE TERMINATED BY AUTOMATION CREW DURING T300 INSTALLATION UNDER AUTOMATION PROJECT.

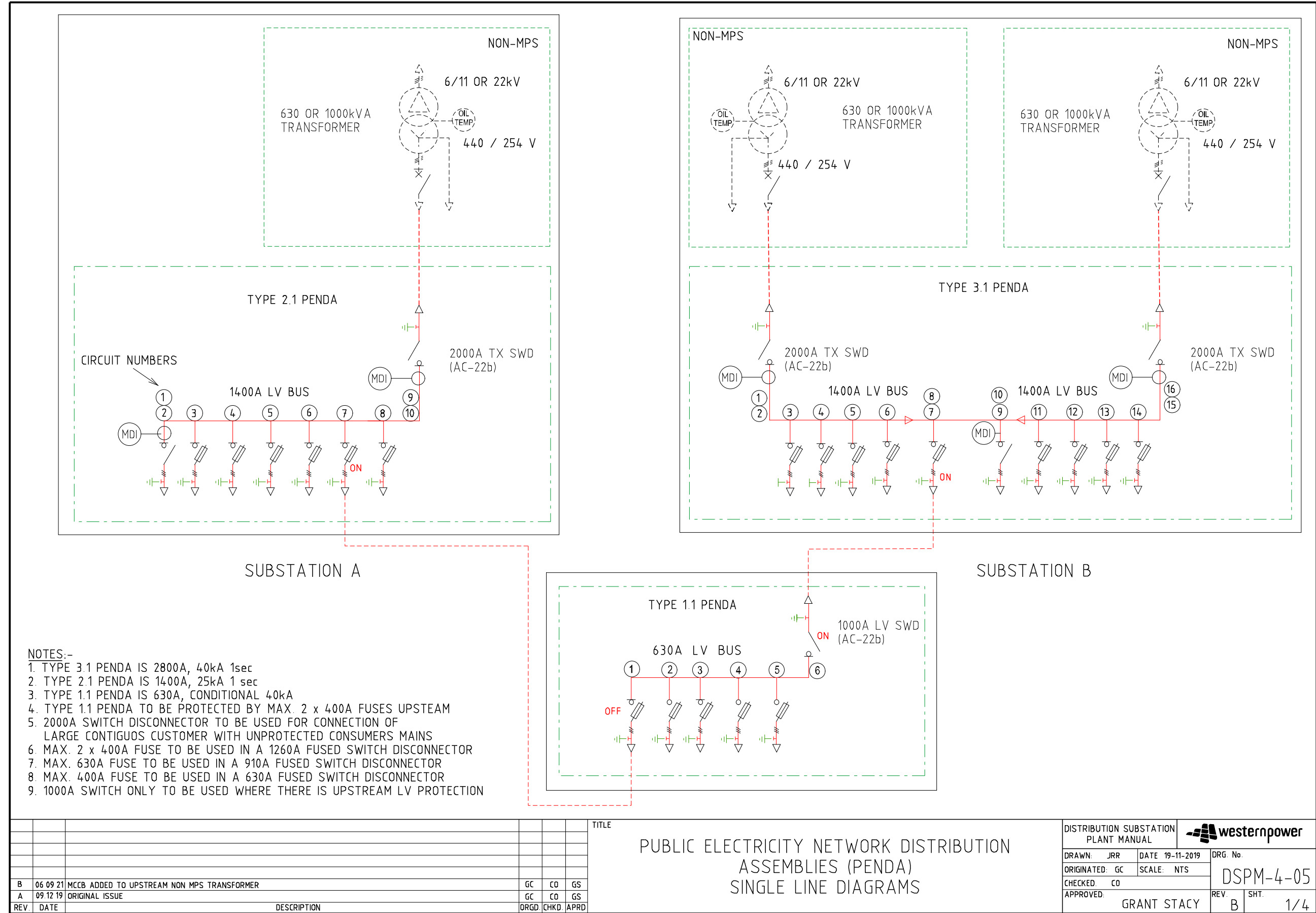
				TITLE				DISTRIBUTION SUBSTATION PLANT MANUAL				
				T300 INSTALLATION DETAILS FOR SCHNEIDER RM6 SWITCHGEAR IN OUTDOOR KIOSK [NEXT G]				DRAWN: JRR DATE: 12-02-2023 DRG. No.			DSPM-4-04	
								ORIGINATED: JT SCALE: NTS				
								CHECKED: TM				
								APPROVED: CHRIS OMODEI			REV. B SHT. 3	
B	15.04.24	DRAWING REVISED		TCM	SL	CO						
A	28.07.23	ORIGINAL ISSUE		JT	TCM	CO						
REV.	DATE	DESCRIPTION		ORGD.	CHKD.	APRD						





NOTES:-  
 1. ALL DIMENSIONS ARE IN MILLIMETRES.

				TITLE			DISTRIBUTION SUBSTATION MANUAL		westernpower		
				SCHNEIDER RM6 SWITCHGEAR OUTDOOR KIOSK WITH T300 INSTALLATION DETAILS CABLE BOX CT WIRING						DRAWN: JRR DATE: 10-05-2023 DRG. No.	
										ORIGINATED: JT SCALE: NTS DSPM-4-04	
										CHECKED: TM	
										APPROVED: CHRIS OMODEI	
										REV. A SHT. 4	
A	28.07.23	ORIGINAL ISSUE		JT	TM	CO					
REV	DATE	DESCRIPTION		ORGD.	CHKD.	APRD.					



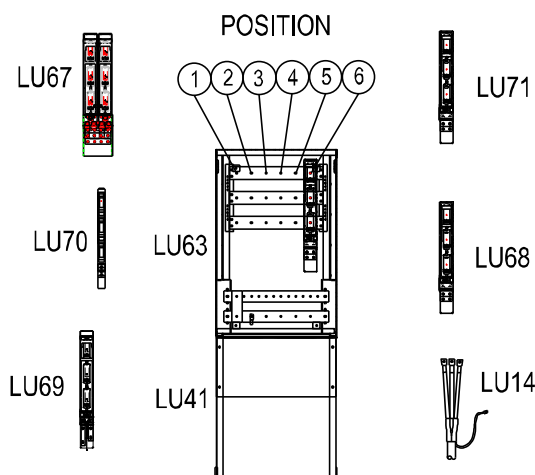
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TYPE 1.1 PENDA LAYOUT

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	///	///	LL	///	///	///
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



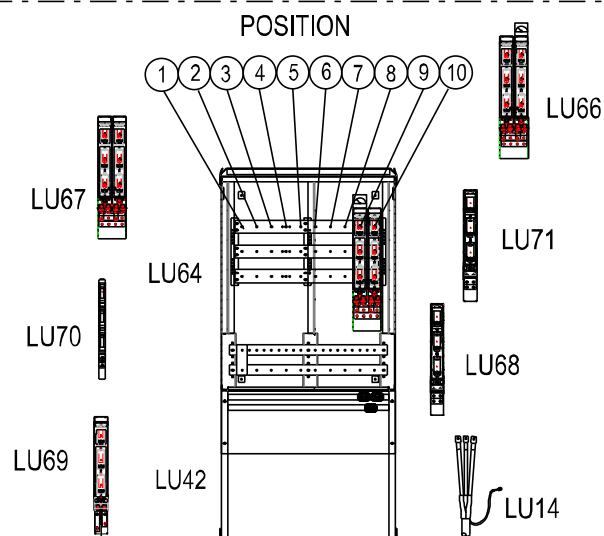
NOTES:-

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	///	///	///	LL	///	///	///	///	///	///
630 FSD	1 X 400A NH2	LU69	C/S	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	S		
TX CABLE TERM	TX MCCB	LU16	///	///	///	///	///	///	///	///	///	T1

T = TRANSFORMER L = LIGHTING CIRCUIT E = EMERGENCY RESPONSE GENERATOR  
C = CUSTOMER S = STREET CIRCUIT



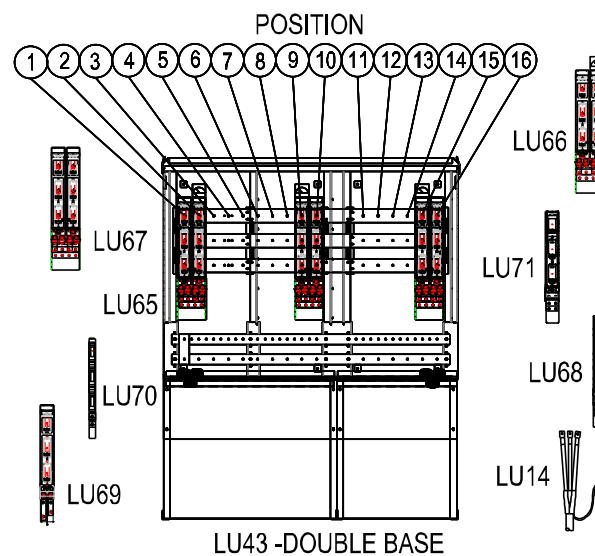
NOTES:-

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	///	///	///	LL	///	///	///	///	///	///	///	///	///	///	///	///
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	C/S		
910A FSD	1 X 630A NH3	LU68	///	///	E	///	///	///	///	///	///	///	///	///	///	///	E	
1260A FSD	2 X 400A NH2	LU67	///	///	///	C	///	C	///	C	///	C	///	C	///	C	///	///
1000A SWD	LINKS SUPPLIED	LU71	///	///	C	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	S		
TX CABLE TERM	TX MCCB	LU16	T2	///	///	///	///	///	///	///	///	///	///	///	///	///	///	T1

T = TRANSFORMER L = LIGHTING CIRCUIT E = EMERGENCY RESPONSE GENERATOR  
C = CUSTOMER S = STREET CIRCUIT



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 SPANING 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

PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) GENERAL ARRANGEMENTS

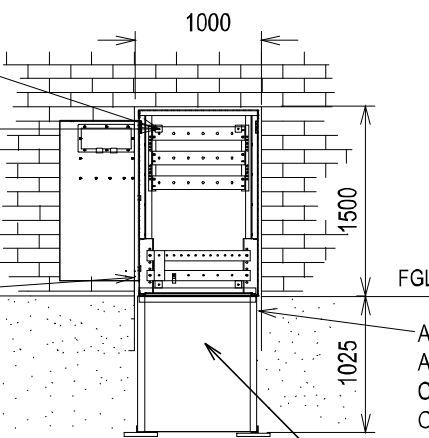
DISTRIBUTION SUBSTATION PLANT MANUAL			
DRAWN: JRR	DATE: 19-11-2019	DRG. No.	
ORIGINATED: GC	SCALE: NTS	DSPM-4-05	
CHECKED: CO	APPROVED: GRANT STACY	REV. B	SHT. 2/4



DRILL 4-HOLES 12 DIA. THRU REINFORCED SECTIONS OF PENDA CABINET

PENDA BOLTED TO SUBSTATION WALL WITH 4 x 10mm RAWLNUTS 4 x 10mm BOLTS x 75 LONG.

WALL RECESS TO BE: 450 DEEP 1000 WIDE 1500 HEIGH INSTALL LINTEL ABOVE



RECESSED IN WALL

ATTACH CABLE SUPPORT BRACKETS AT FGL USING BOLTS FOR FIXING CABINET AND BASE TOGETHER. ONE BRACKET ABOVE AND ONE BELOW.

THIS AREA TO BE FREE OF FOOTINGS

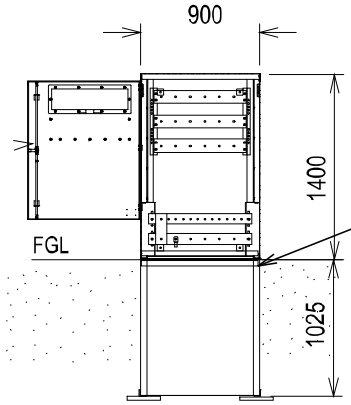
TYPE 1.1 - PENDA INSTALLATION REQUIREMENTS

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

6 FUSEWAYS = 200kg

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



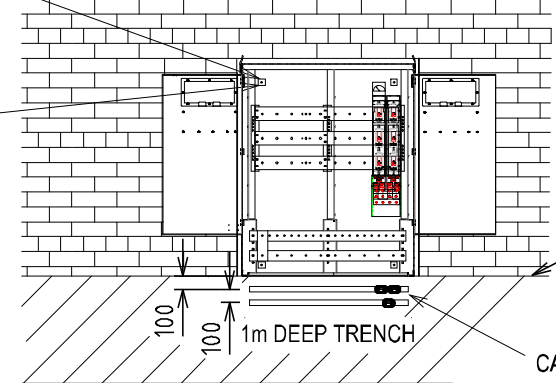
FREESTANDING

ATTACH CABLE SUPPORT BRACKETS AT FGL USING BOLTS FOR FIXING CABINET AND BASE TOGETHER. ONE BRACKET ABOVE AND ONE BELOW.

CONCRETE SLABS - 500 x 200 x 25 THICK

DRILL 4-HOLES 12 DIA. THRU REINFORCED SECTIONS OF PENDA CABINET

PENDA BOLTED TO SUBSTATION WALL WITH 4 x 10mm RAWLNUTS 4 x 10mm BOLTS x 75 LONG.



IN 2HR FIRE RATED SUBSTATION

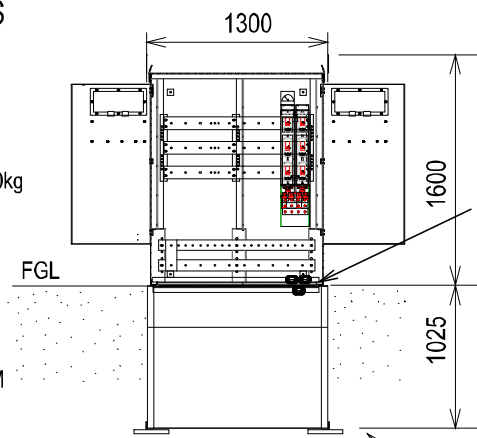
FLOOR OF SUBSTATION  
CABLE SUPPORT BRACKETS TO BE BOLTED TO WALL OF TRENCH AND CABLE CLAMPS INSTALLED

TYPE 2.1 PENDA - INSTALLATION REQUIREMENTS

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



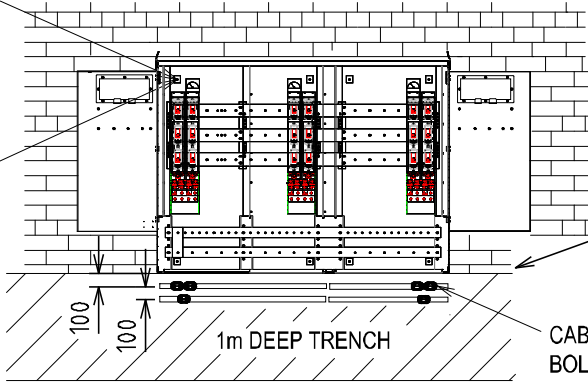
FREESTANDING

ATTACH CABLE SUPPORT BRACKETS AT FGL USING BOLTS FOR FIXING CABINET AND BASE TOGETHER. ONE BRACKET ABOVE AND ONE BELOW.

CONCRETE SLABS - 500 x 200 x 25 THICK

DRILL 8-HOLES 12 DIA. THRU REINFORCED SECTIONS OF PENDA CABINET

PENDA BOLTED TO SUBSTATION WALL WITH 8 x 10mm RAWLNUTS 8 x 10mm BOLTS x 75 LONG.



IN 2HR FIRE RATED SUBSTATION

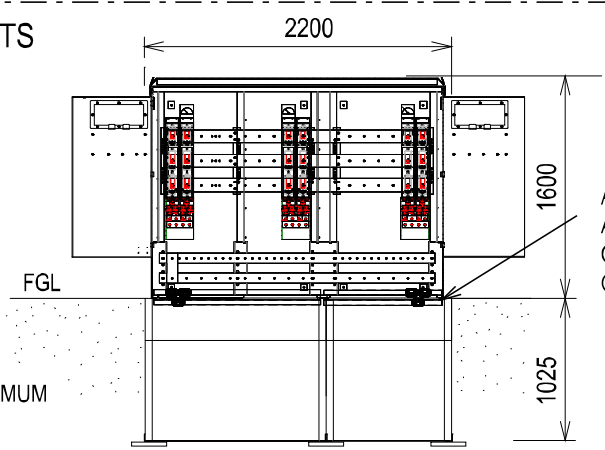
FLOOR OF SUBSTATION  
CABLE SUPPORT BRACKETS TO BE BOLTED TO WALL OF TRENCH AND CABLE CLAMPS INSTALLED

TYPE 3.1 PENDA - INSTALLATION REQUIREMENTS

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

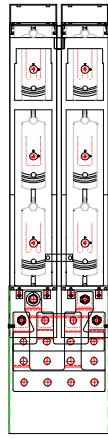
ATTACH CABLE SUPPORT BRACKETS AT FGL USING BOLTS FOR FIXING CABINET AND BASE TOGETHER. ONE BRACKET ABOVE AND ONE BELOW.

CONCRETE SLABS - 500 x 200 x 25 THICK

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

TITLE  
PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) INSTALLATION REQUIREMENTS

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

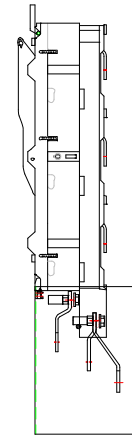


### LU67

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

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

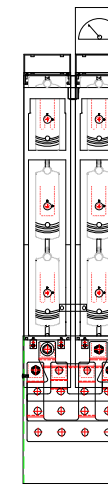
MAXIMUM OF 4 x 400mm COPPER CABLES PER PHASE



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

### 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

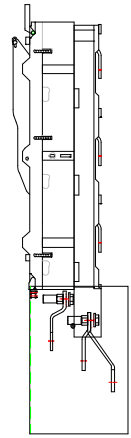


### LU66

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

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

MAXIMUM OF 4 x 400mm COPPER CABLES PER PHASE

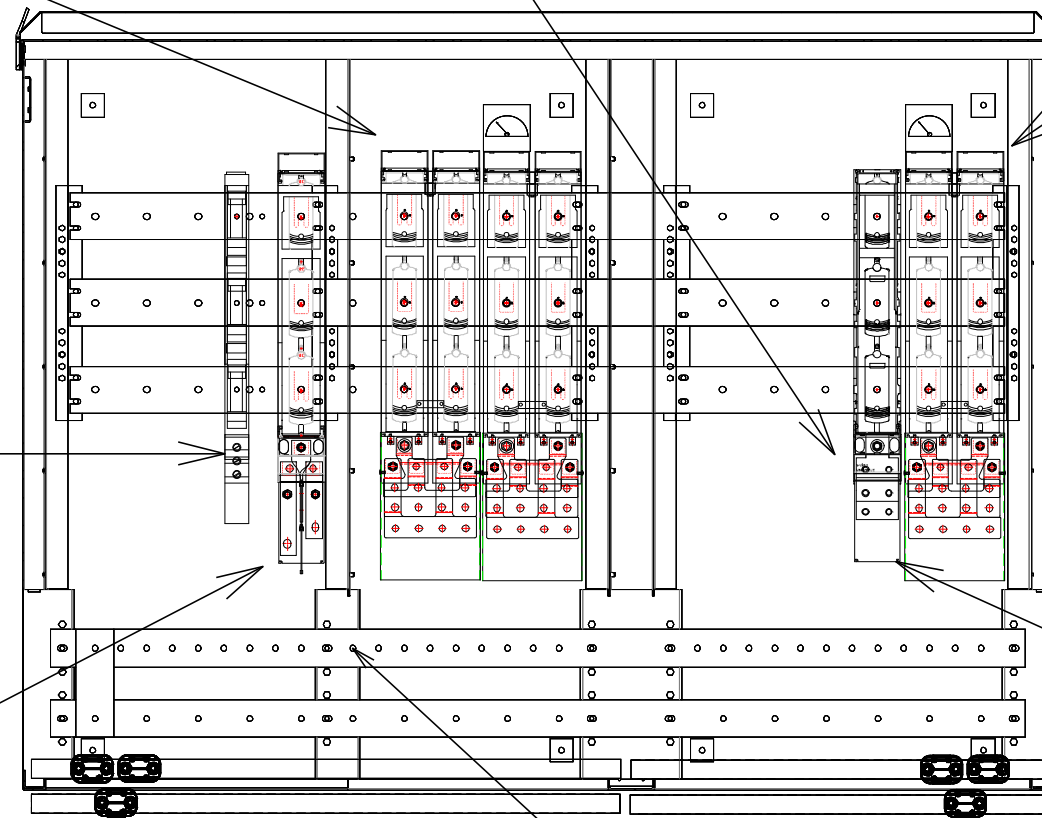
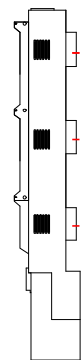


### LU70

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

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

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

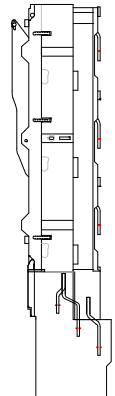


### LU71

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

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

MAXIMUM OF 2 x 240mm COPPER CABLES PER PHASE

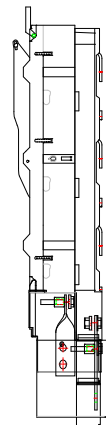


### LU69

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

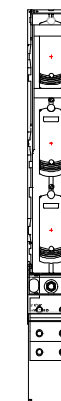
FOR CABLE TERMINATIONS USE M12 SS FASTENERS, 1 KIT (FB0873) PER 3 PHASE CABLE TORQUE TO 48NM

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

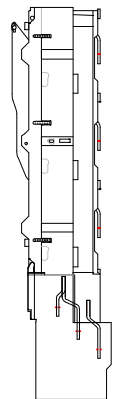


### LU68

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

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

MAXIMUM OF 2 x 240mm COPPER CABLES PER PHASE

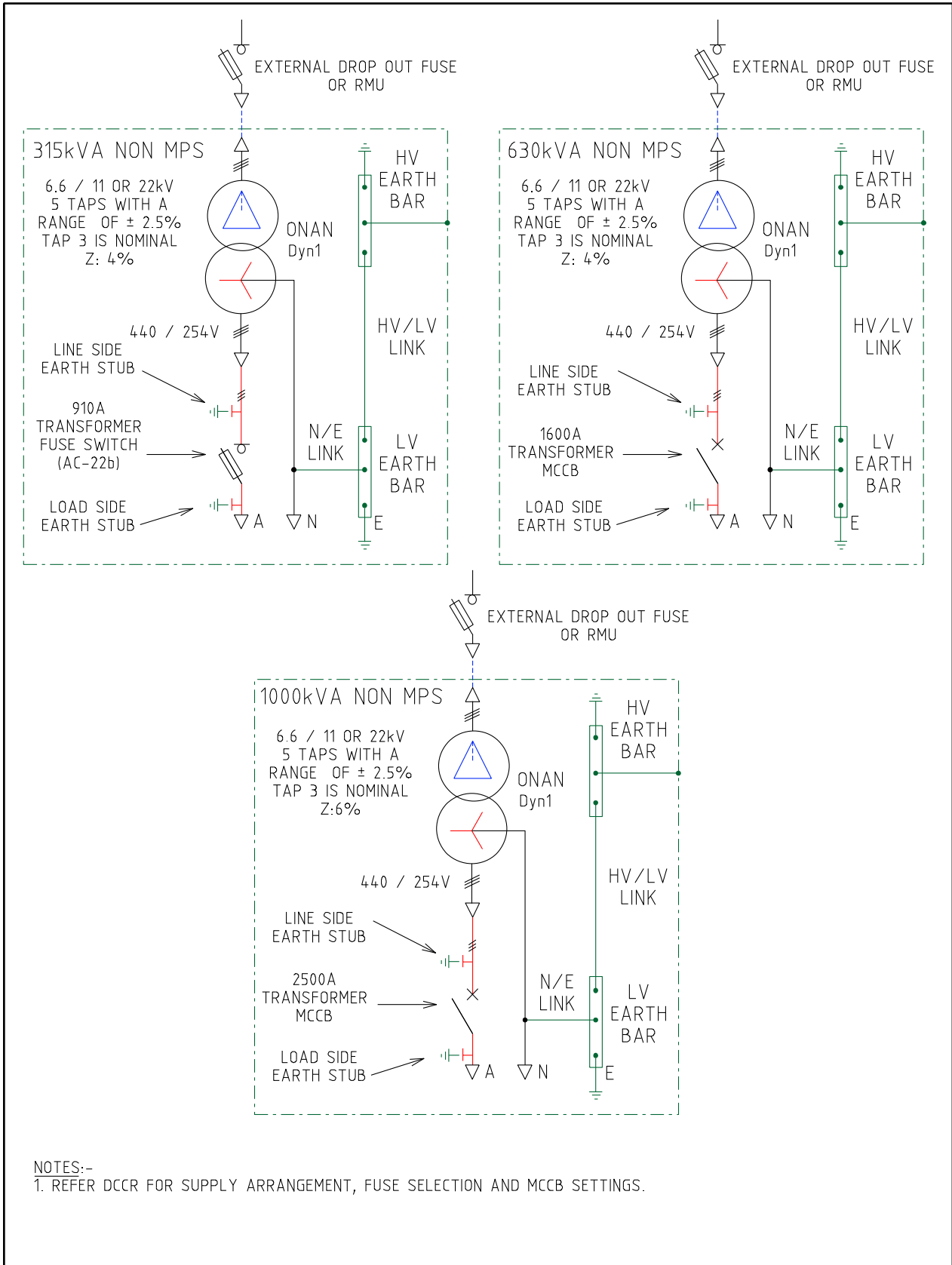


REV.	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
B	06.09.21	LU71 1000A SWITCH DISCONNECTOR ADDED	GC	CO	GS
A	06.12.19	ORIGINAL ISSUE	GC	CO	GS

TITLE	PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) CABLE TERMINATION DETAILS
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DISTRIBUTION SUBSTATION PLANT MANUAL		westernpower	
DRAWN: JRR	DATE 19-11-2019	DRG. No.	
ORIGINATED: GC	SCALE: NTS	DSPM-4-05	
CHECKED: CO	APPROVED: GRANT STACY	REV. B	SHT. 4/4

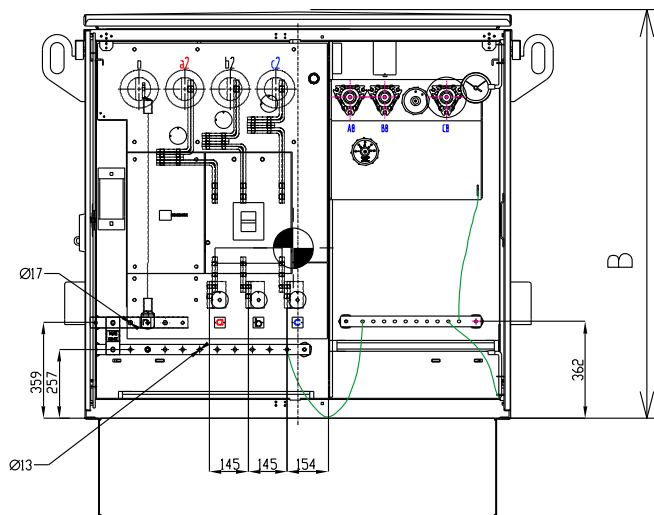
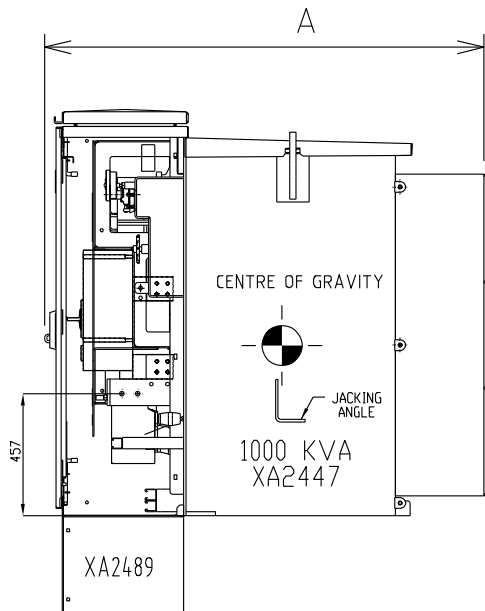
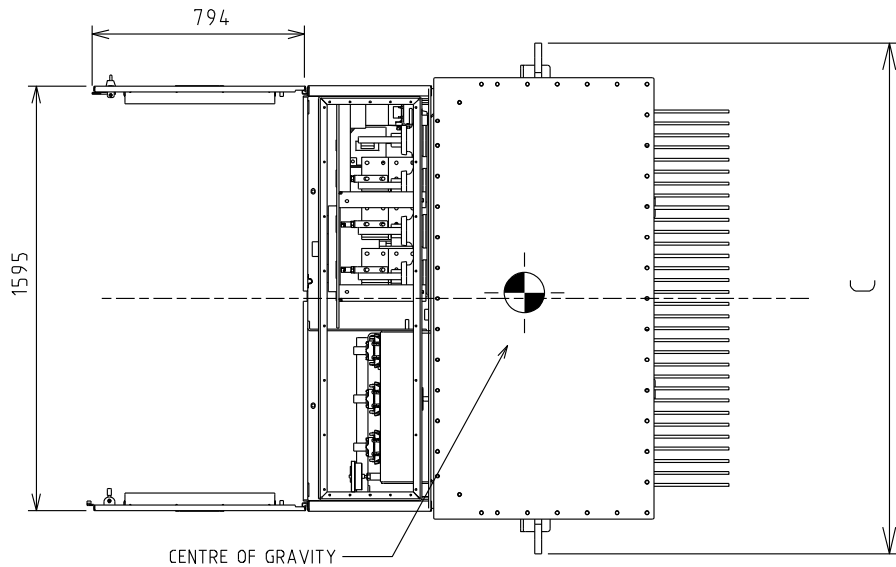
5.6 DSM 4-06 Non-MPS Transformer



NOTES:-  
 1. REFER DCCR FOR SUPPLY ARRANGEMENT, FUSE SELECTION AND MCCB SETTINGS.

			TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL		westernpower	
			TYREE & ETEL MKII NON MPS			DRAWN: JRR		DATE: 30-08-2021	
			6/11, 22kV - 315, 630kVA & 1MVA			ORIGINATED: KT		SCALE: NTS	
			COMMERCIAL / INDUSTRIAL KIOSK			CHECKED: CO		DRG. No. DSPM-4-06	
			SINGLE LINE DIAGRAM			APPROVED: GRANT STACY		REV. A SHT. 1/6	
A	06.09.21	ORIGINAL ISSUE	KT	CO	GS				
REV	DATE	DESCRIPTION	ORIG	CHKD	APPRD				



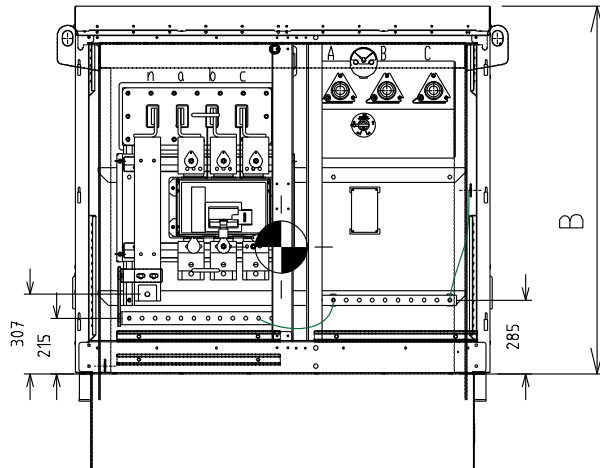
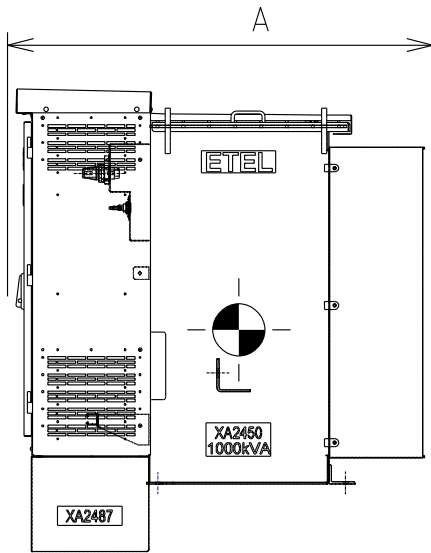
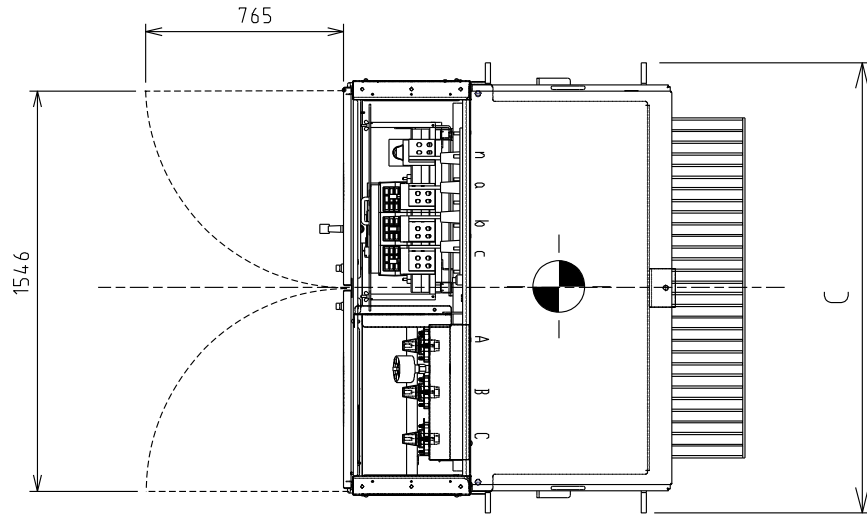


TRANSFORMER	VOLTAGE (kV)	DIMENSION			STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT	
		'A'	'B'	'C'				DISTRICT	SOLE USE
315	6.6/11	1506	1518	1463	XA2445	2390	675	HU59	HU60
315	22	1506	1518	1463	XA2448	2095	555	HU59	HU60
630	6.6/11	1661	1518	1756	XA2446	3200	930	HU59	HU60
630	22	1576	1518	1551	XA2449	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.

				TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL		westernpower		
				TYREE MKII NON MPS 6/11, 22kV - 315, 630kVA & 1MVA COMMERCIAL / INDUSTRIAL KIOSK GENERAL ARRANGEMENT						ORG. No.	
										DSPM-4-06	
A 06.09.21 ORIGINAL ISSUE				KT CO GS			DRAWN: JRR DATE: 30-08-2021		SCALE: NTS		
REV DATE DESCRIPTION				ORGD,CHKD,APRD			CHECKED: CO		APPROVED: GRANT STACY		
							REV. A		SHT. 2/6		

Uncontrolled document when printed  
Refer to DM for current version



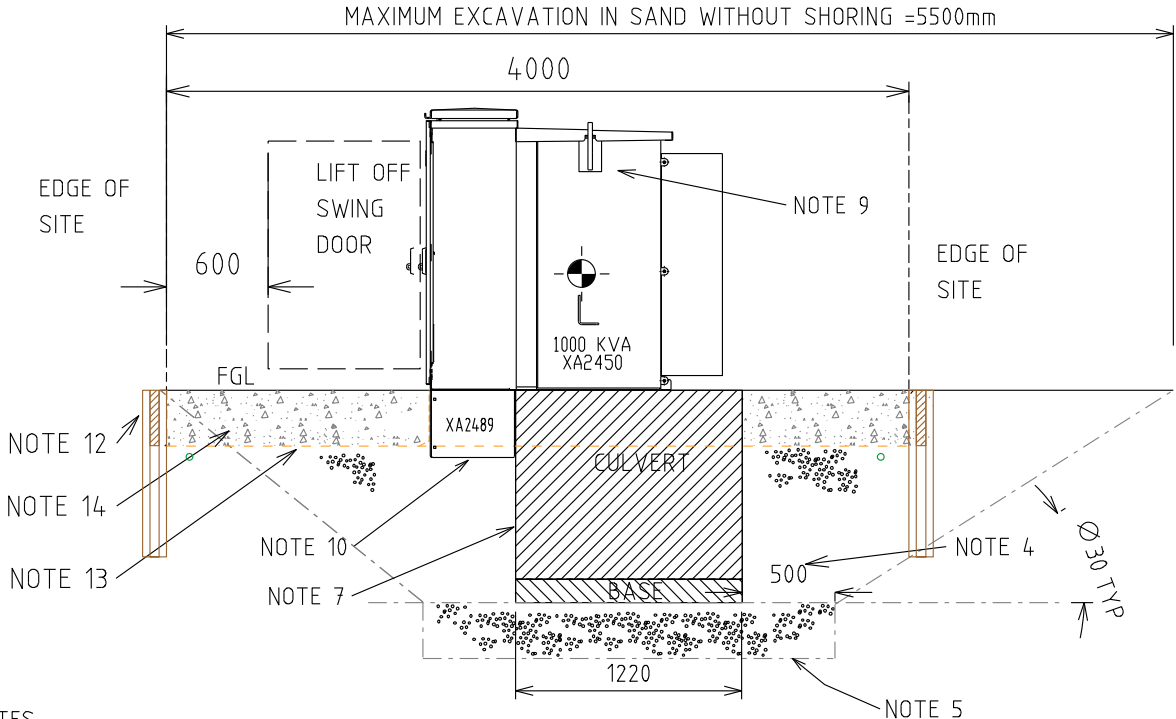
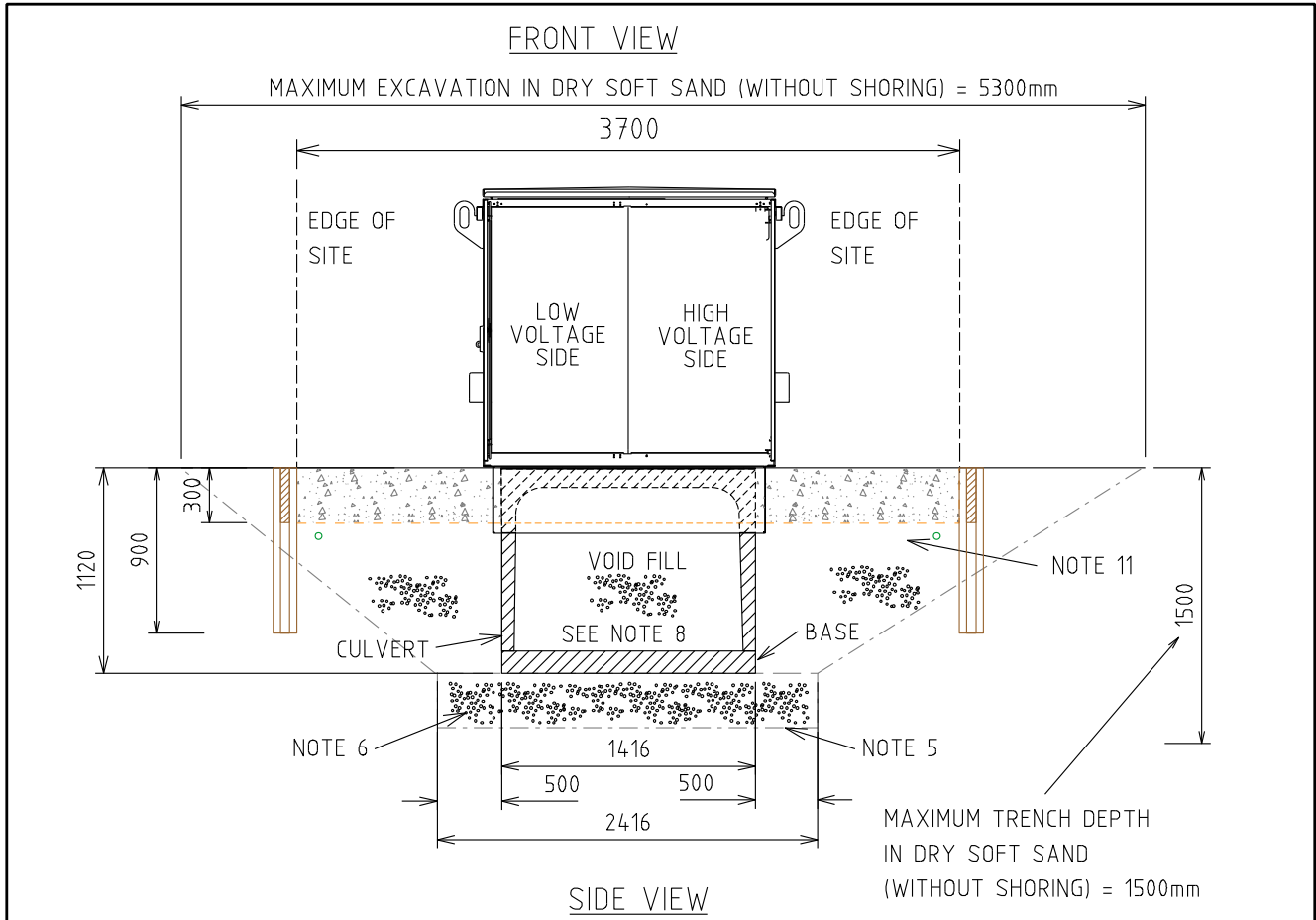
TRANSFORMER	VOLTAGE (kV)	DIMENSION			STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT	
		'A'	'B'	'C'				DISTRICT	SOLE USE
315	22	1330	1425	1610	XA2448	1890	615	HU59	HU60
630	6.6/11	1460	1425	1610	XA2446	2620	725	HU59	HU60
630	22	1460	1425	1610	XA2449	2660	705	HU59	HU60
1000	6.6/11	1580	1530	1760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

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

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

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





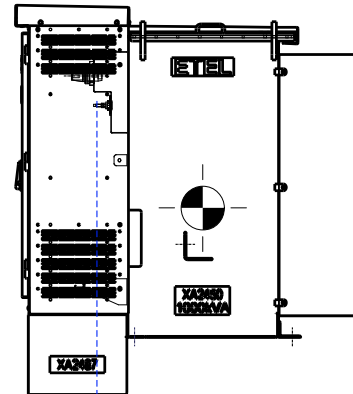
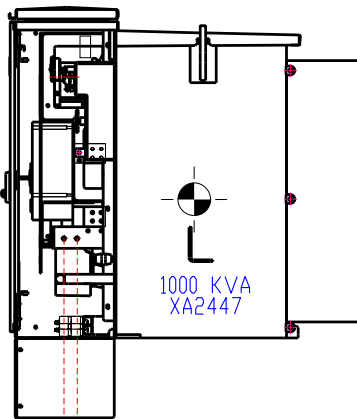
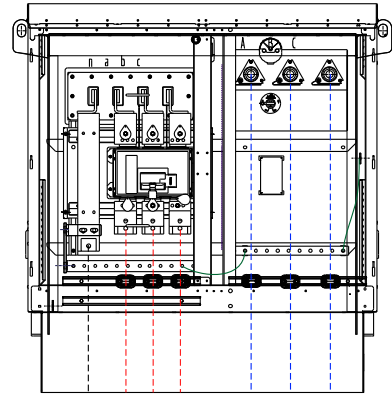
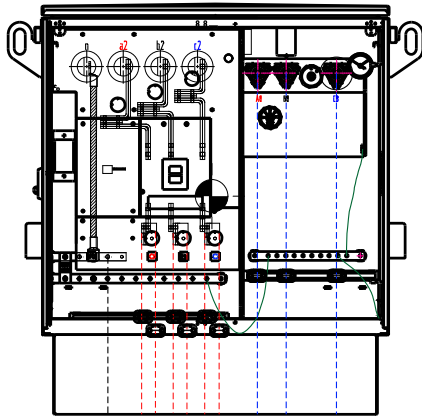
- NOTES:-**  
 1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON THE NEXT SHEET  
 2. SEE CHAPTER 3 FOR EQUIPMENT SELECTION AND SUBSTATION LAYOUT

		TITLE <b>TYREE &amp; ETEL MKII NON MPS          6/11, 22kV - 315, 630 &amp; 1000kVA          COMERCIAL/ INDUSTRIAL AREA KIOSK          INSTALLATION GUIDE</b>	DISTRIBUTION SUBSTATION PLANT MANUAL	
B 20.12.21 NOTES RE-ARRANGED A 06.09.21 ORIGINAL ISSUE	KT GC GS KT CO GS		DRAWN: JRR DATE: 30-08-2021 DRG. No. ORIGINATED: KT SCALE: NTS CHECKED: CO APPROVED: GRANT STACY	DSPM-4-06 REV. B SHT. 4/6
REV DATE DESCRIPTION ORGD. CHKD. APROD				

**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).

				TITLE			DISTRIBUTION SUBSTATION PLANT MANUAL				
				TYREE & ETEL MKII NON MPS 6/11, 22kV - 315, 630 & 1000kVA COMERCIAL / INDUSTRIAL AREA KIOSK INSTALLATION GUIDE						DRG. No.	
B xx.xx.xx NOTES AMENDED				KT	GC	GS	DRAWN: JRR		DATE: 30-08-2021	DSPM-4-06	
A 06.09.21 ORIGINAL ISSUE				KT	CO	GS	ORIGINATED: KT		SCALE: NTS	REV. B	
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.	APPROVED: GRANT STACY				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

				TITLE TYREE & ETEL MKII NON MPS 6/11, 22kV - 315, 630 & 1000kVA COMMERCIAL / INDUSTRIAL AREA KIOSK CABLE TERMINATIONS		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. A SHT. 6/6	
A	06 09 21	ORIGINAL ISSUE		KT	CO	GS			
REV	DATE	DESCRIPTION		DRGD	CHKD	APRD			