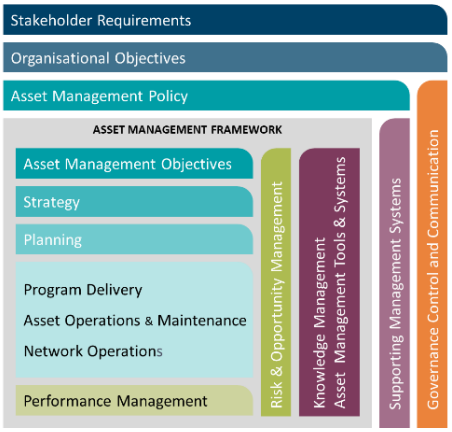
Western Power's Asset Management System



Distribution Substation Plant Manual Chapter 10 – Plant General Arrangements and Installation Guides - 33kV

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Document control

Endorsement approvals

	Name	Title	Signature and Date
Author	Samuel Liau	Senior Distribution Standards Engineer	Signature on file
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Endorsed by	Ken Tiong	Engineering Team Leader	Signature on file
Approved by	Pep Ngwenya	Distribution Design & Standards Manager	Signature on file

Record of revisions

Revision No.	Date	Version	Compiled by	Description
0	December 2021	EDM 1	Ken Tiong	Original Issue
1	May 2025	Volt 2	Samuel Liau	3 yearly periodic review
2	20/01/2026	Volt 3	Nory Cerrado	DSPM-10-05 Added

Key documents providing direction and influencing this document

Doc	Title of document
EDM# 40304923	Asset Management System
EDM# 41965928	Safety in Design Guidelines
EDM# 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 Unit / 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)

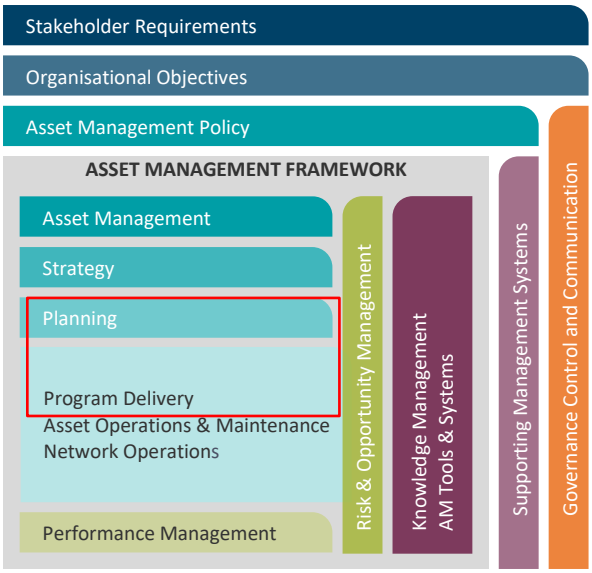
Business Unit / Function
Asset Management - Asset Performance
Asset Management – Safety Environment Quality and Training
Asset Management - Grid Transformation
Asset Operations – Network Operations
Asset Operations – Operational Services
Asset Operations – Customer Connection Services
Business and Customer 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 a technical document within the AMS document classification and structure and sits within the planning and Program Delivery components 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 AMS document Volt ID

ID-005-dc7f342fed83eb7f008777ff0463b876.



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DSPM-10-01	4/6	A	TYREE & ETEL MKII MPS 33kV - 315 & 630kVA Residential Area Kiosk Installation Guide
DSPM-10-01	5/6	A	TYREE & ETEL MKII MPS33kV - 315 & 630kVA Residential Area Kiosk Installation Guide
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DSPM-10-03	1/1	A	Public Electricity Network Distribution Assemblies (PENDA) Single Line Diagrams
DSPM-10-04	1/6	A	TYREE & ETEL MKII Non MPS 33kV - 315, 630kVA & 1MVA Commercial / Industrial Kiosk Single Line Diagram
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DSPM-10-04	4/6	A	TYREE & ETEL MKII Non MPS 33kV - 315, 630 & 1000kVA Commercial/ Industrial Area Kiosk Installation Guide
DSPM-10-04	5/6	A	TYREE & ETEL MKII Non MPS 33kV - 315, 630 & 1000kVA Commercial / Industrial Area Kiosk Installation Guide
DSPM-10-04	6/6	A	TYREE & ETEL MKII Non MPS 33kV - 315, 630 & 1000kVA Commercial / Industrial Area Kiosk Cable Terminations
DSPM-10-05	1/2	A	Ormazabal CGM.3 33kV Switchgear with Stand General Arrangement
DSPM-10-05	2/2	A	Ormazabal CGM.3 33kV Switchgear with Stand Installation Details

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 33kV 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 Customer Connection Requirements (DCCR)
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.

Any non-standard design must be approved by a Team Leader and a Senior Engineer. The design shall be recorded in the register:

Non-standard drawings register for Distribution Construction Standards Handbook (DCSH) and Distribution Substation Manual (DSM/DSPM) (EDM# 34163616)

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.

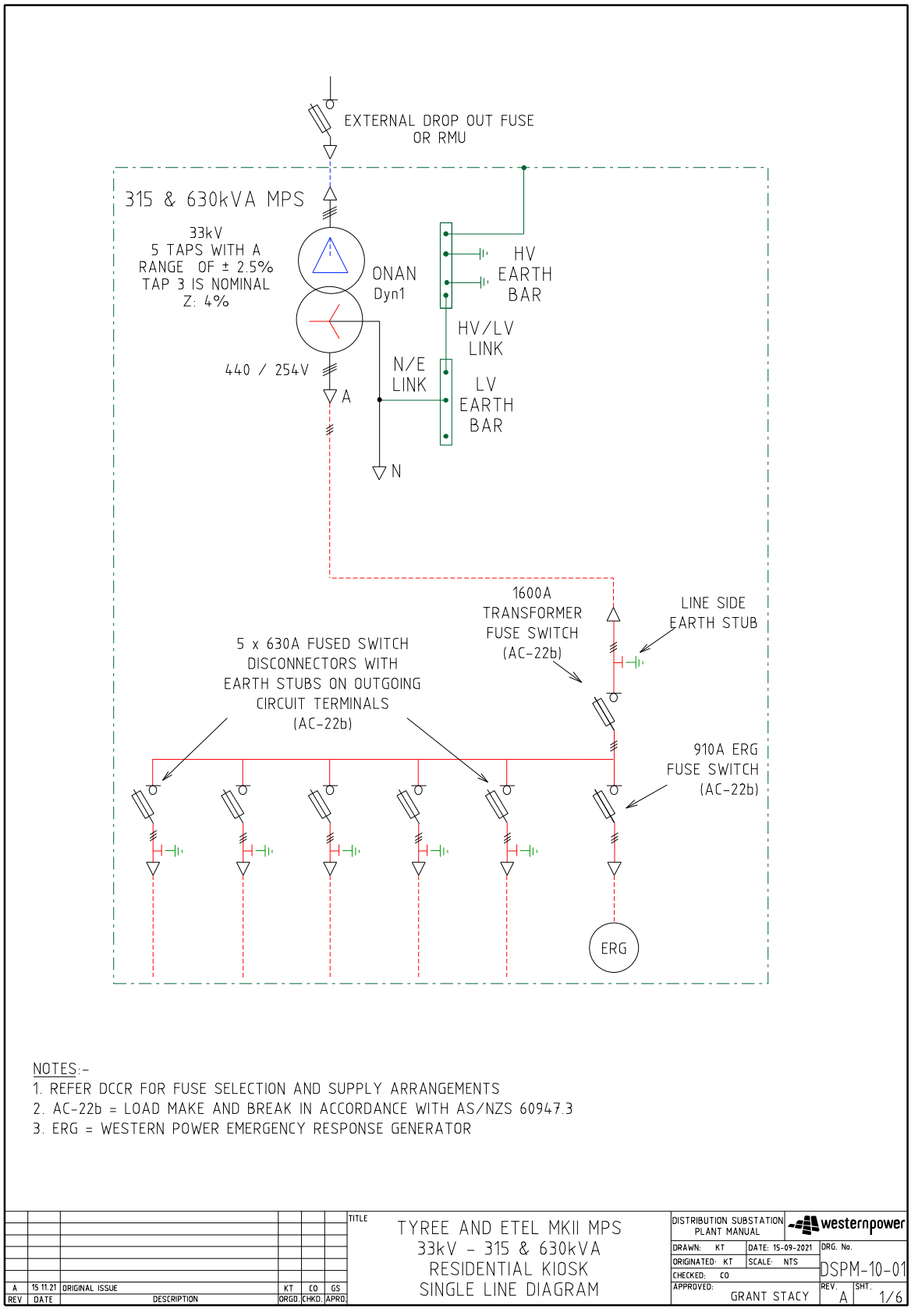
5. Drawings – General Arrangements and Installation Guide

This section contains drawings within the following categories:

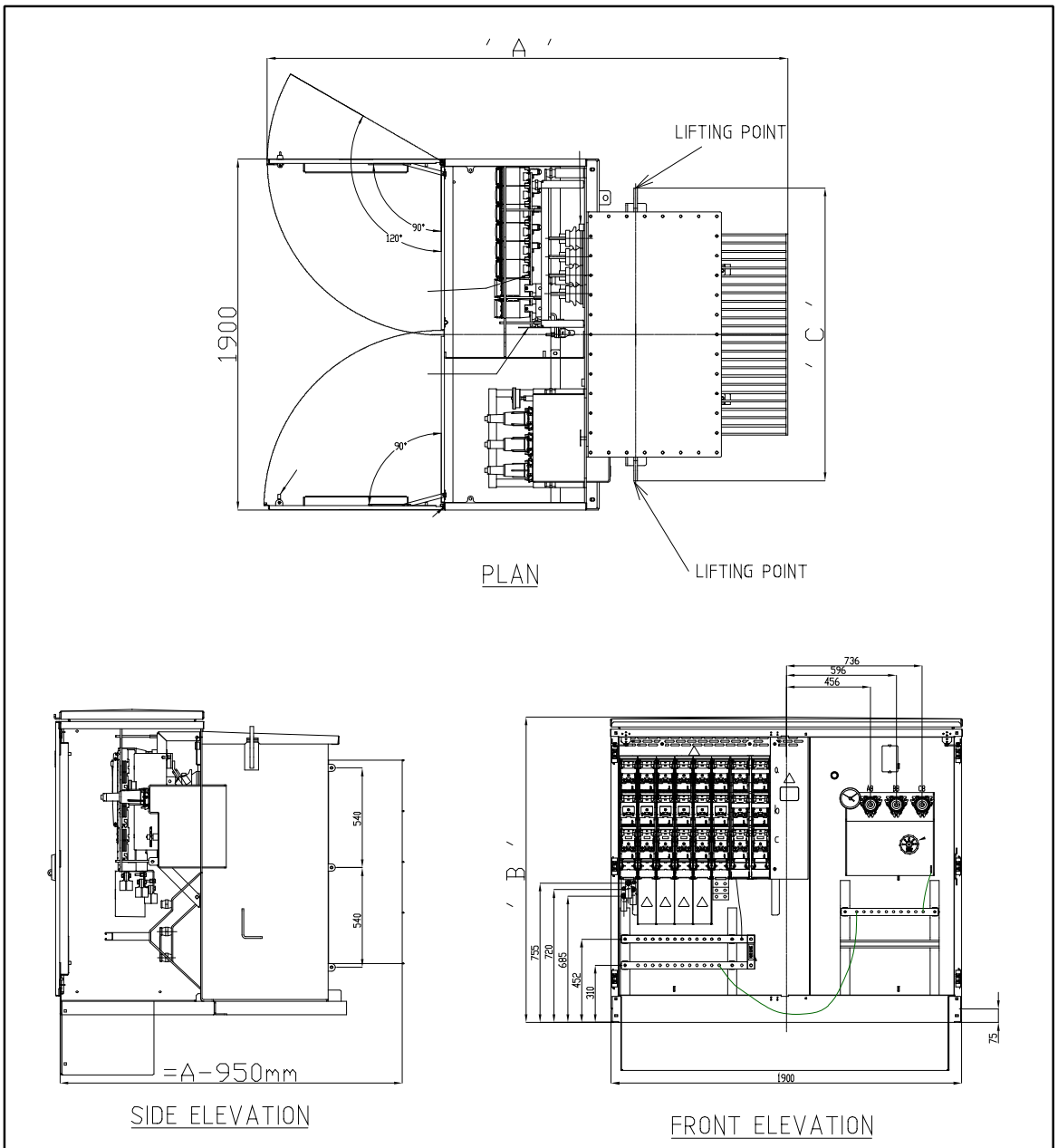
- Modular Package Substation (MPS)
- Schneider Flusarc Switchgear Kiosk
- Low Voltage Switchgear
- Non-Modular Package Substation (Non-MPS), cluster substation.

5.1 DSPM 10-01 MPS Transformers

5.1.1 Tyree and ETEL MKII MPS Single Line Diagram



5.1.2 Tyree MKII MPS General Arrangement



TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	WEIGHT (kg)	OIL QTY (L)	STOCK NUMBER	COMPATIBLE UNIT TRANSFORMER & LV CAB
315	33	2700	1656	1626	2410	595	XA2424	HU61
630	33	2822	1656	1586	3280	840	XA2425	HU61

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE MKII MPS 33kV - 315 & 630kVA RESIDENTIAL AREA KIOSK GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

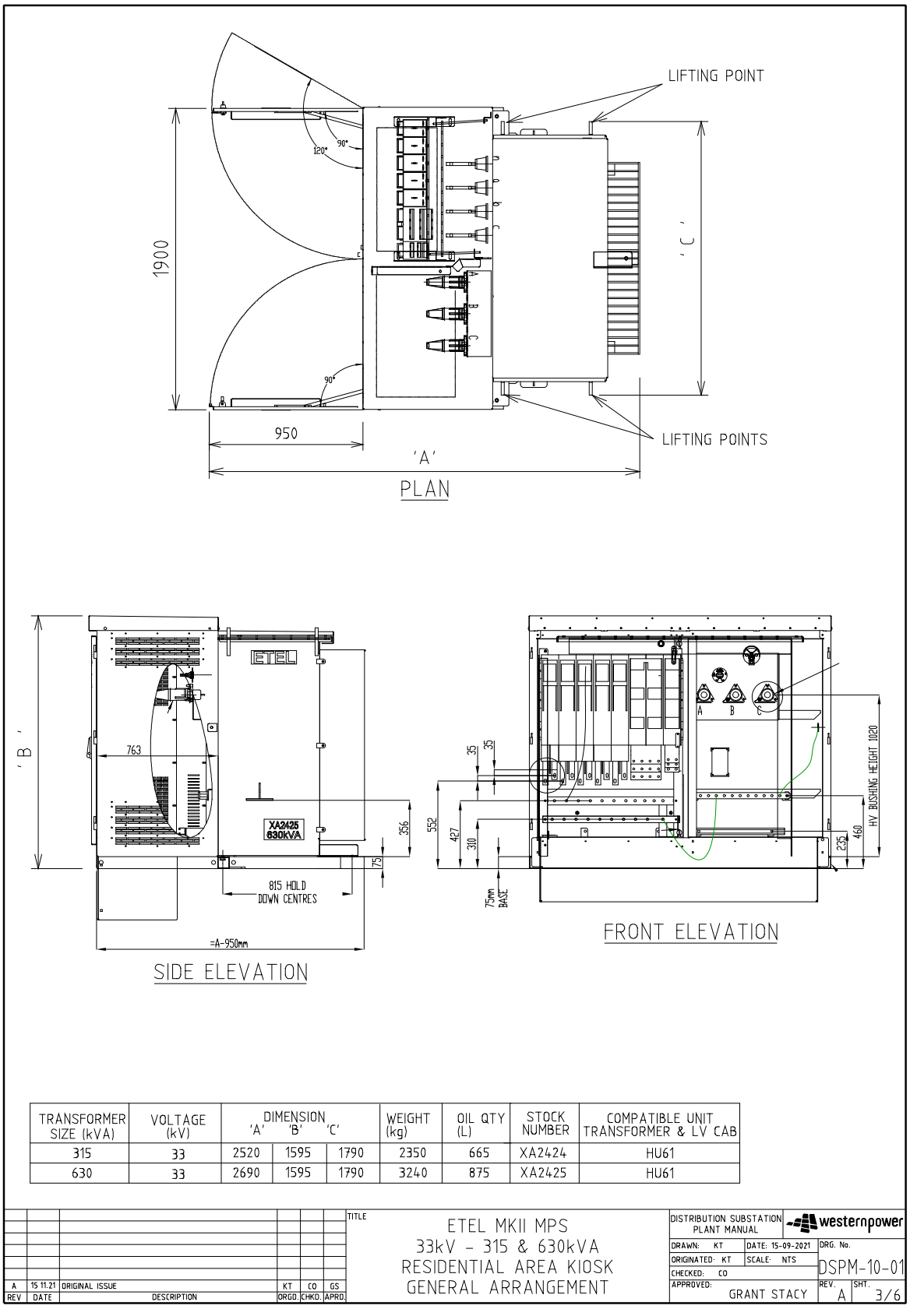
DRAWN: KT | DATE: 15-09-2021 | DRG. No. DSPM-10-01

ORIGINATED: KT | SCALE: NTS

CHECKED: CO

APPROVED: GRANT STACY | REV. A | SHT. 2/6

5.1.3 ETEL MKII MPS General Arrangement



TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	WEIGHT (kg)	OIL QTY (L)	STOCK NUMBER	COMPATIBLE UNIT TRANSFORMER & LV CAB
315	33	2520	1595	1790	2350	665	XA2424	HU61
630	33	2690	1595	1790	3240	875	XA2425	HU61

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: ETEL MKII MPS
33kV - 315 & 630kVA
RESIDENTIAL AREA KIOSK
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL

westernpower

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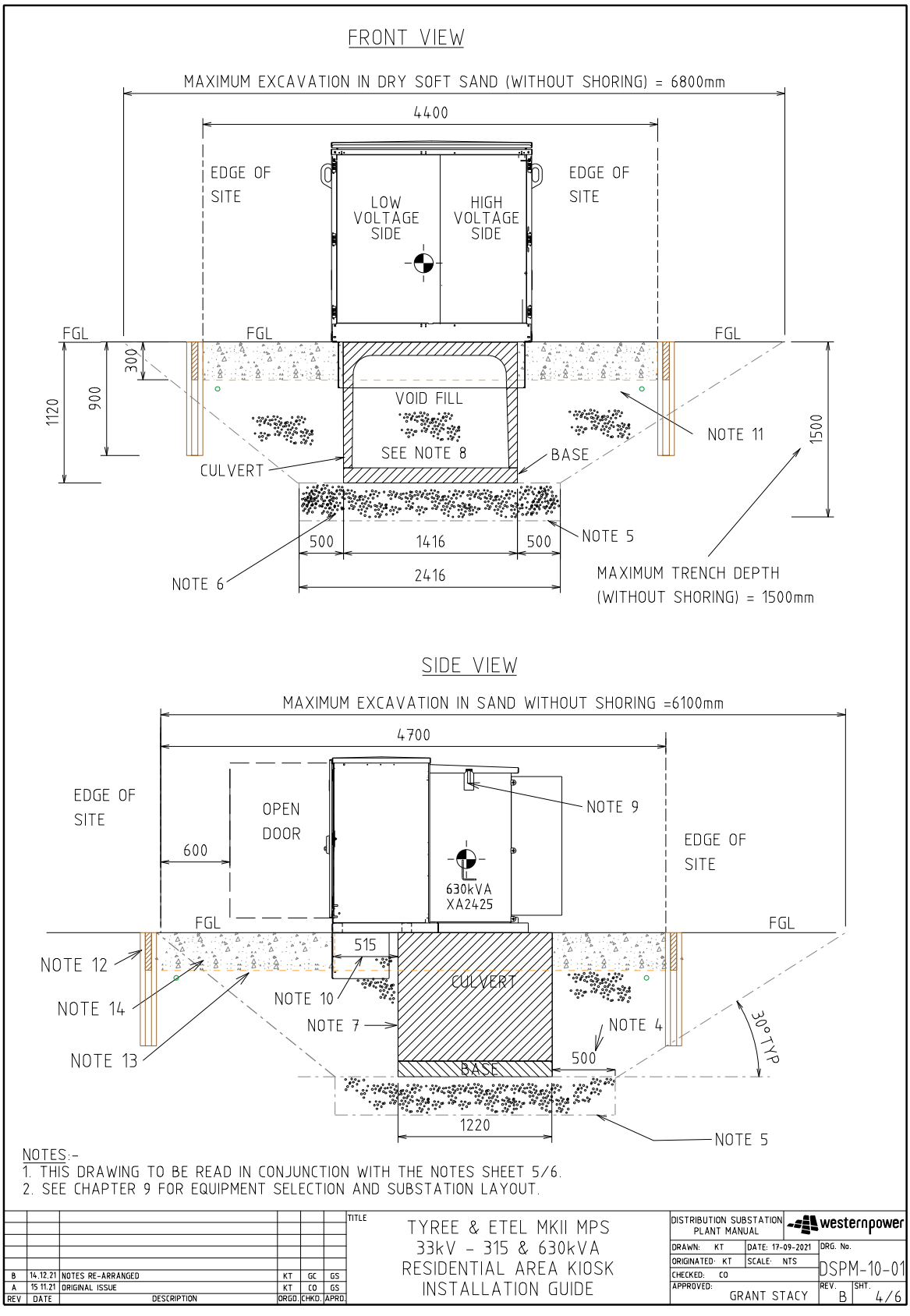
APPROVED: GRANT STACY
REV. A | SHT. 3/6

5.1.4 Tyree & ETEL MKII MPS Installation Guide (Drawing)



5.1.5 Tyree & ETEL MKII MPS Installation Guide (Notes)

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 1289.3.2 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.
B	14.12.21	NOTES MODIFIED	KT	GC	GS
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE & ETEL MKII MPS 33kV – 315 & 630kVA RESEDENTIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

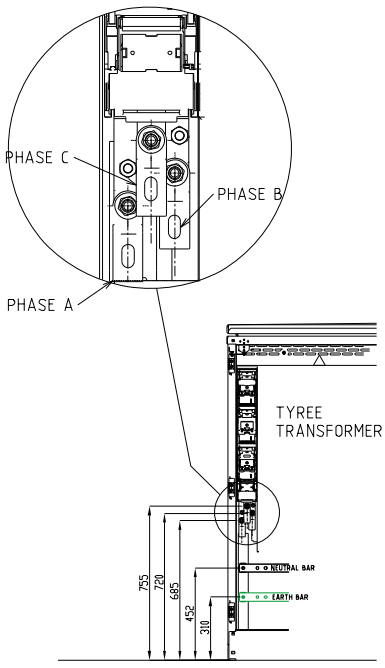
DRAWN: KT | DATE: 17-09-2021 | DRG. No. DSPM-10-01

ORIGINATED: KT | SCALE: NTS

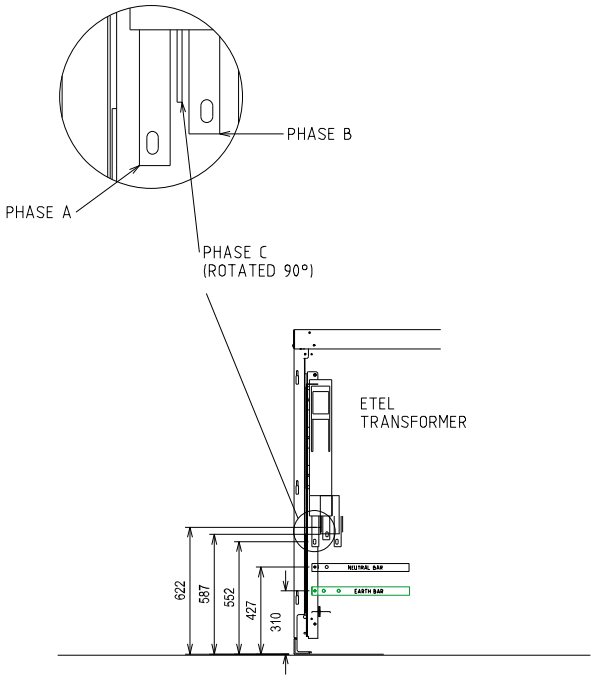
CHECKED: CD

APPROVED: GRANT STACY | REV. B | SHT. 5/6

5.1.6 Tyree & ETEL MKII MPS LV Cable Terminations



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.
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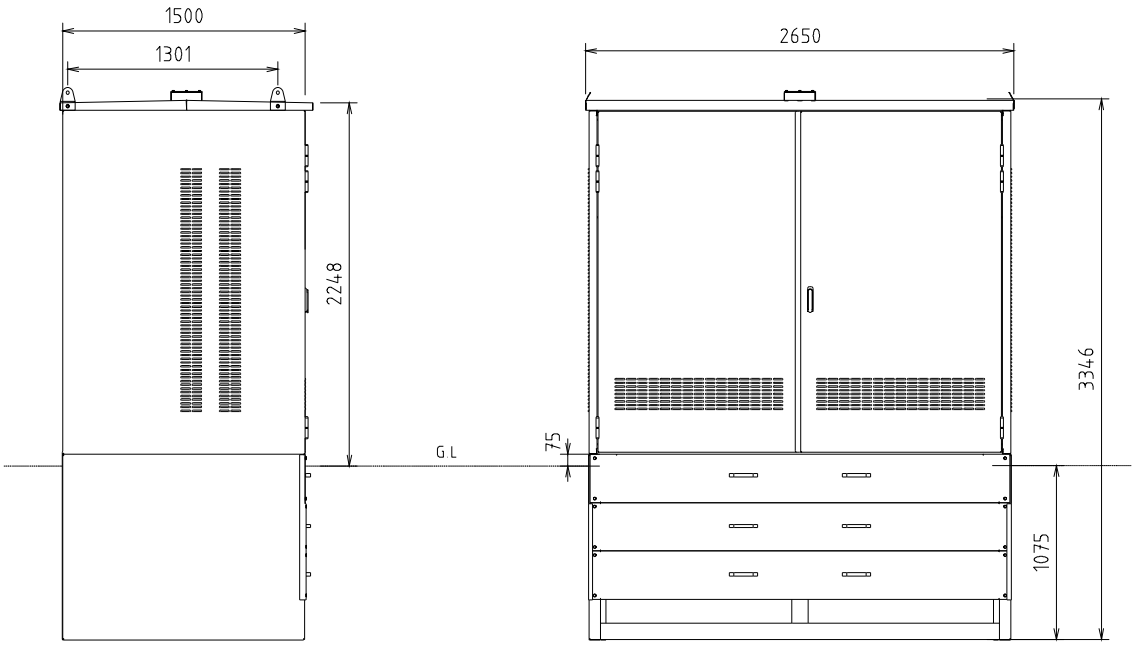
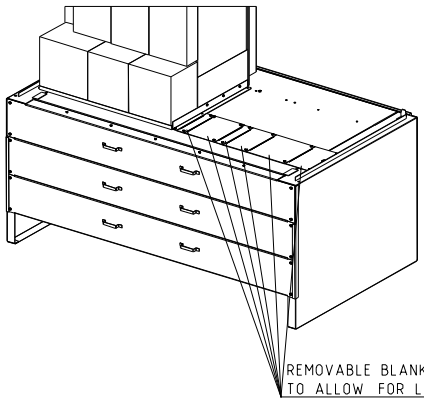
TITLE: TYREE & ETEL MKII MPS 33kV – 315 & 630kVA RESIDENTIAL AREA KIOSK LV CABLE TERMINATIONS

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: KT	DATE: 17-09-2021	DRG. No.	DSPM-10-01
ORIGINATED: KT	SCALE: NTS		
CHECKED: CO			
APPROVED: GRANT STACY		REV. A	SHT. 6/6

5.2 DSPM 10-02 Schneider Flusarc switchgear kiosk





SWITCH FUNCTION	STOCK CODE KIOSK/STAND	DIMENSION (WIDTH mm)	COMPATIBLE UNIT
3+0	XA2710 - 5 WAY	2650	HU100_33
2+1	XA2710 - 5 WAY	2650	HU101_33
2+2	XA2710 - 5 WAY	2650	HU102_33
3+1	XA2710 - 5 WAY	2650	HU103_33
4+0	XA2710 - 5 WAY	2650	HU104_33
3+2	XA2710 - 5 WAY	2650	HU106_33

NOTE:-
KIOSK AND STAND CAN BE LIFTED AT EYELETS WITHOUT RMU INSIDE.

DO NOT LIFT KIOSK & STAND WITH RMU INSIDE.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
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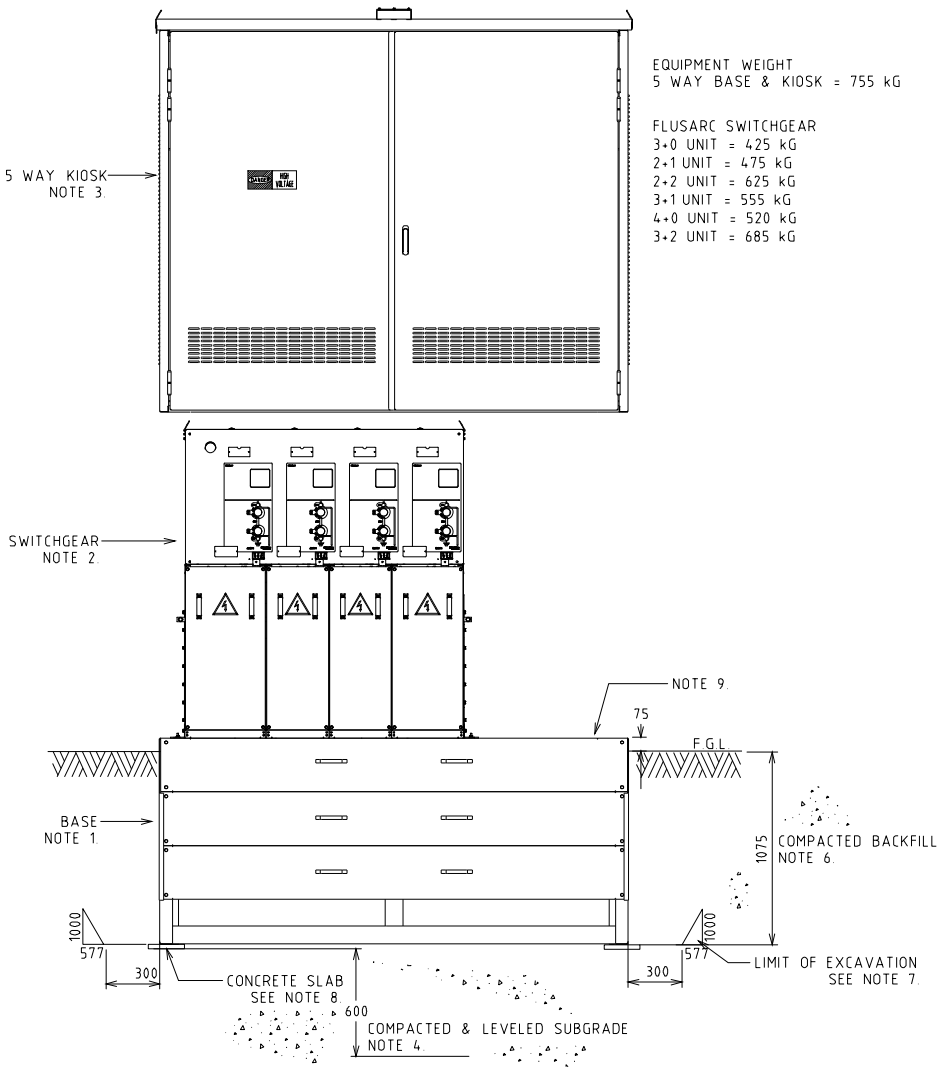
TITLE: SCHNEIDER FLUSARC SWITCHGEAR KIOSK AND STAND GENERAL ARRANGEMENT INSTALLATION DETAILS

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: KT	DATE: 20-09-2021	DRG. No.	
ORIGINATED: KT	SCALE: NTS	DSPM-10-02	
CHECKED: CO			
APPROVED: GRANT STACY		REV. A	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. UNUSED BAYS RESERVED FOR LARGER RMUS ARE BLANKED OUT WITH
   REMOVABLE BLANKINGS PLATE FIXED TO THE TOP OF THE ARC FILTER BOX

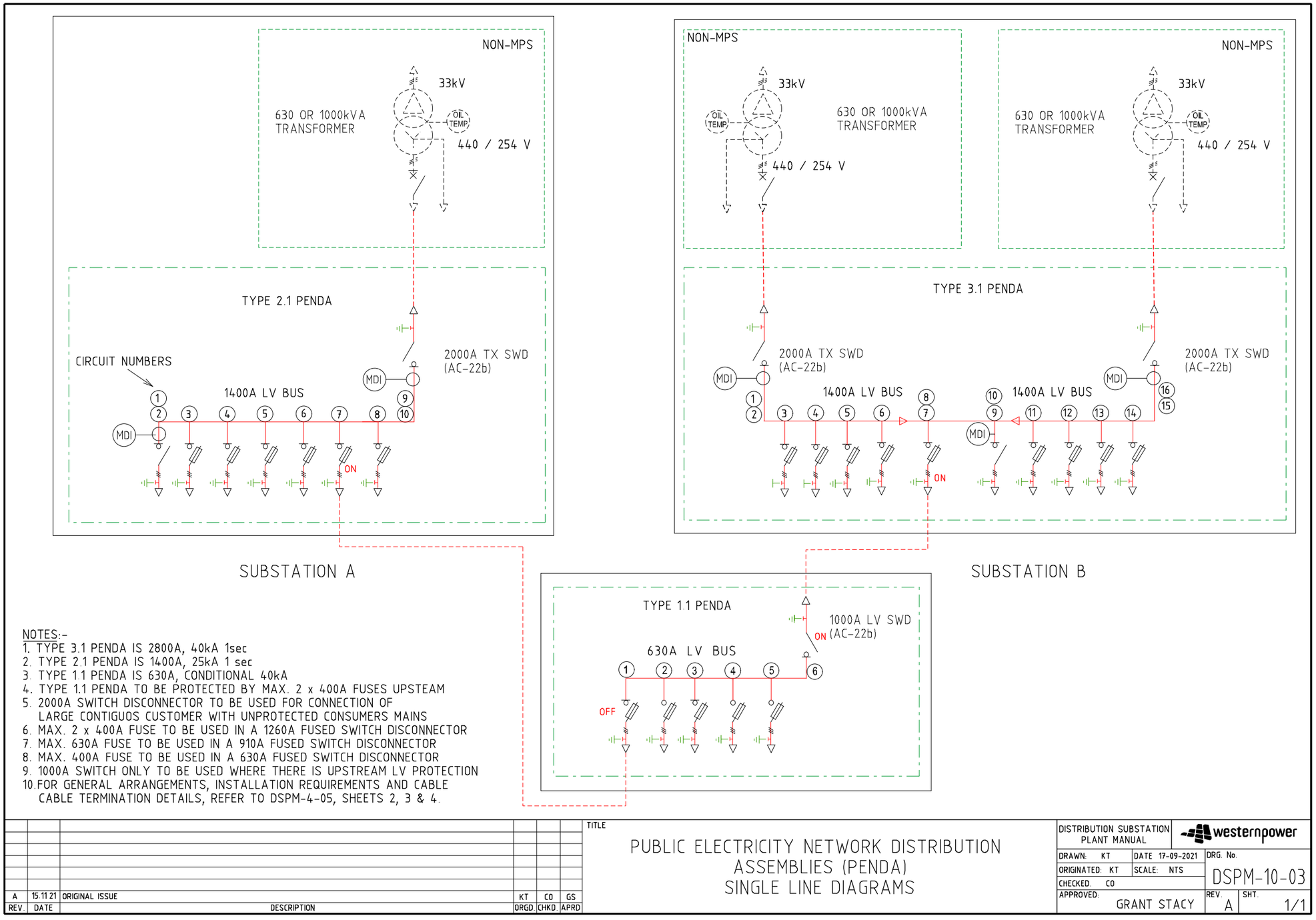
REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE
SCHNEIDER FLUSARC
OUTDOOR EXTENSIBLE SWITCHGEAR
GENERAL ARRANGEMENT
INSTALLATION DETAILS

DISTRIBUTION SUBSTATION PLANT MANUAL
westernpower

DRAWN: KT	DATE: 20-09-2021	DRG. No.
ORIGINATED: KT	SCALE: NTS	DSPM-10-02
CHECKED: CO		
APPROVED: GRANT STACY	REV. A	SHT. 2/2

5.3 DSM 10-03 Public Electricity Network Distribution Assembly (PENDA)



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
10. FOR GENERAL ARRANGEMENTS, INSTALLATION REQUIREMENTS AND CABLE CABLE TERMINATION DETAILS, REFER TO DSPM-4-05, SHEETS 2, 3 & 4.

REV.	DATE	DESCRIPTION	DRGD.	CHKD.	APRD
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE

PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) SINGLE LINE DIAGRAMS

DISTRIBUTION SUBSTATION PLANT MANUAL		westernpower	
DRAWN: KT	DATE 17-09-2021	DRG. No.	DSPM-10-03
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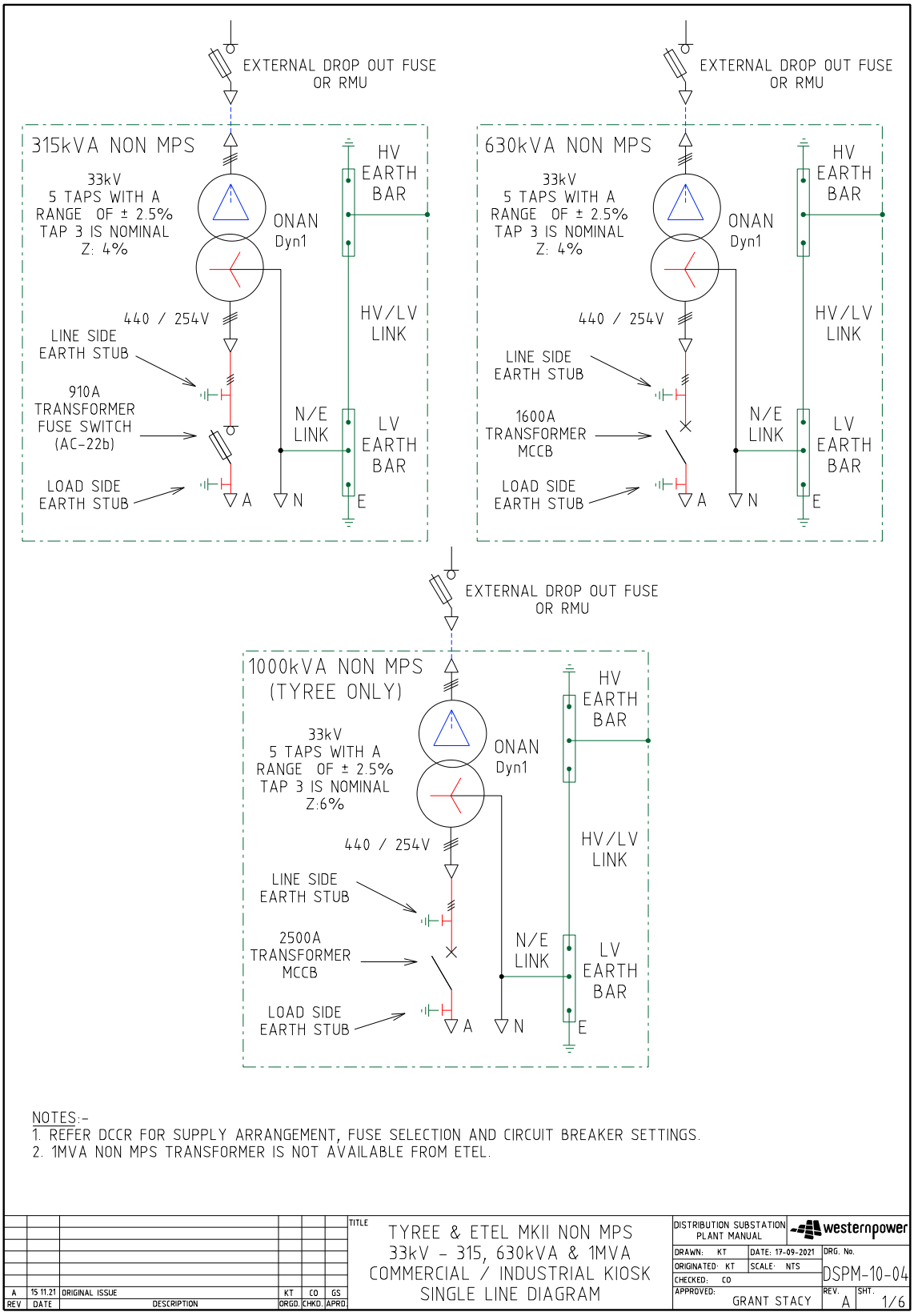
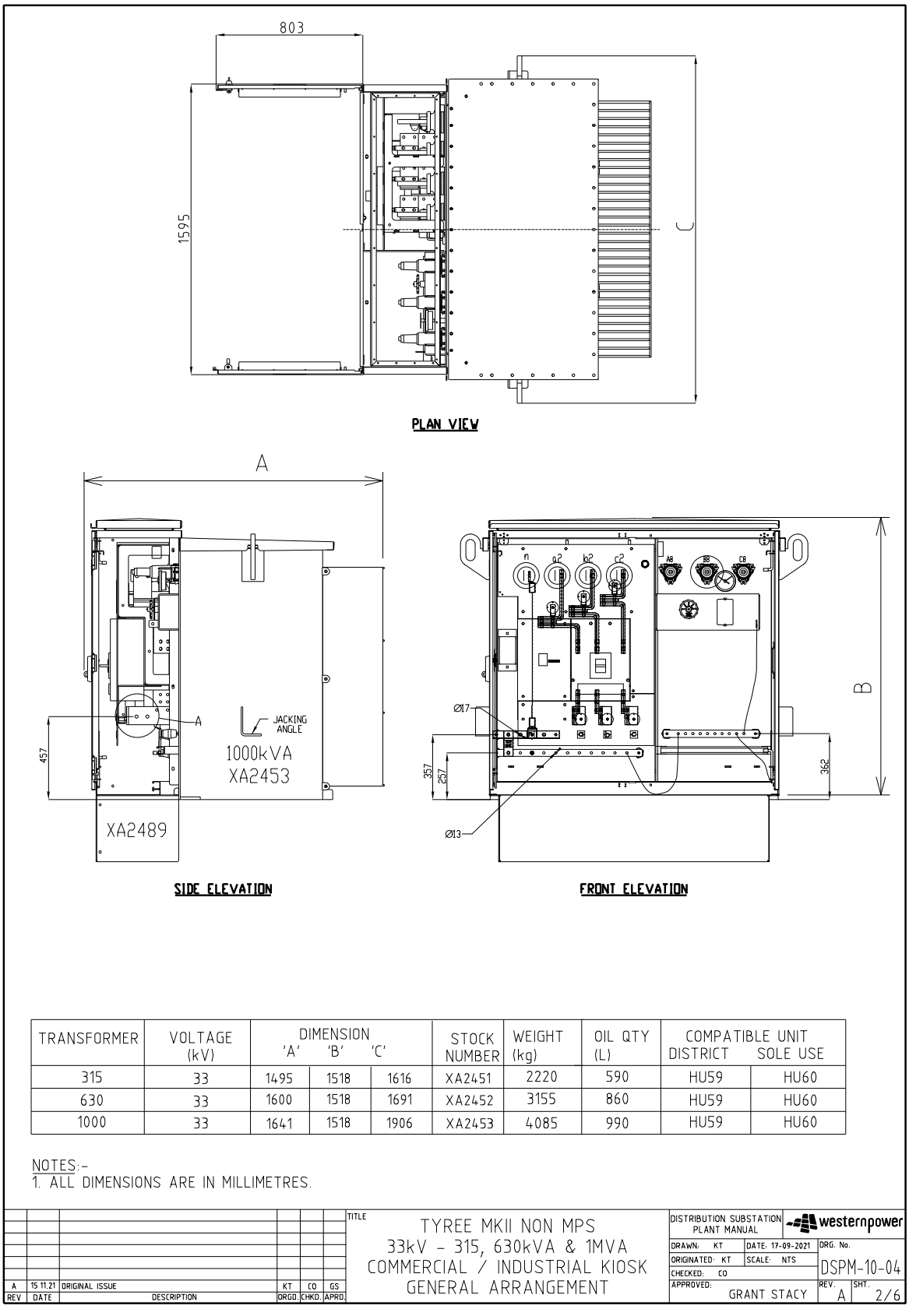
CHECKED. CO			
APPROVED: GRANT STACY		REV. A	SHT. 1/1

5.4 DSM 10-04 Non-MPS Transformer

5.4.1 Tyree & ETEL MKII NON MPS Single Line Diagram



5.4.2 Tyree MKII NON MPS General Arrangement



TRANSFORMER	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT DISTRICT	SOLE USE
315	33	1495	1518	1616	XA2451	2220	590	HU59	HU60
630	33	1600	1518	1691	XA2452	3155	860	HU59	HU60
1000	33	1641	1518	1906	XA2453	4085	990	HU59	HU60

NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE MKII NON MPS 33kV - 315, 630kVA & 1MVA COMMERCIAL / INDUSTRIAL KIOSK GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

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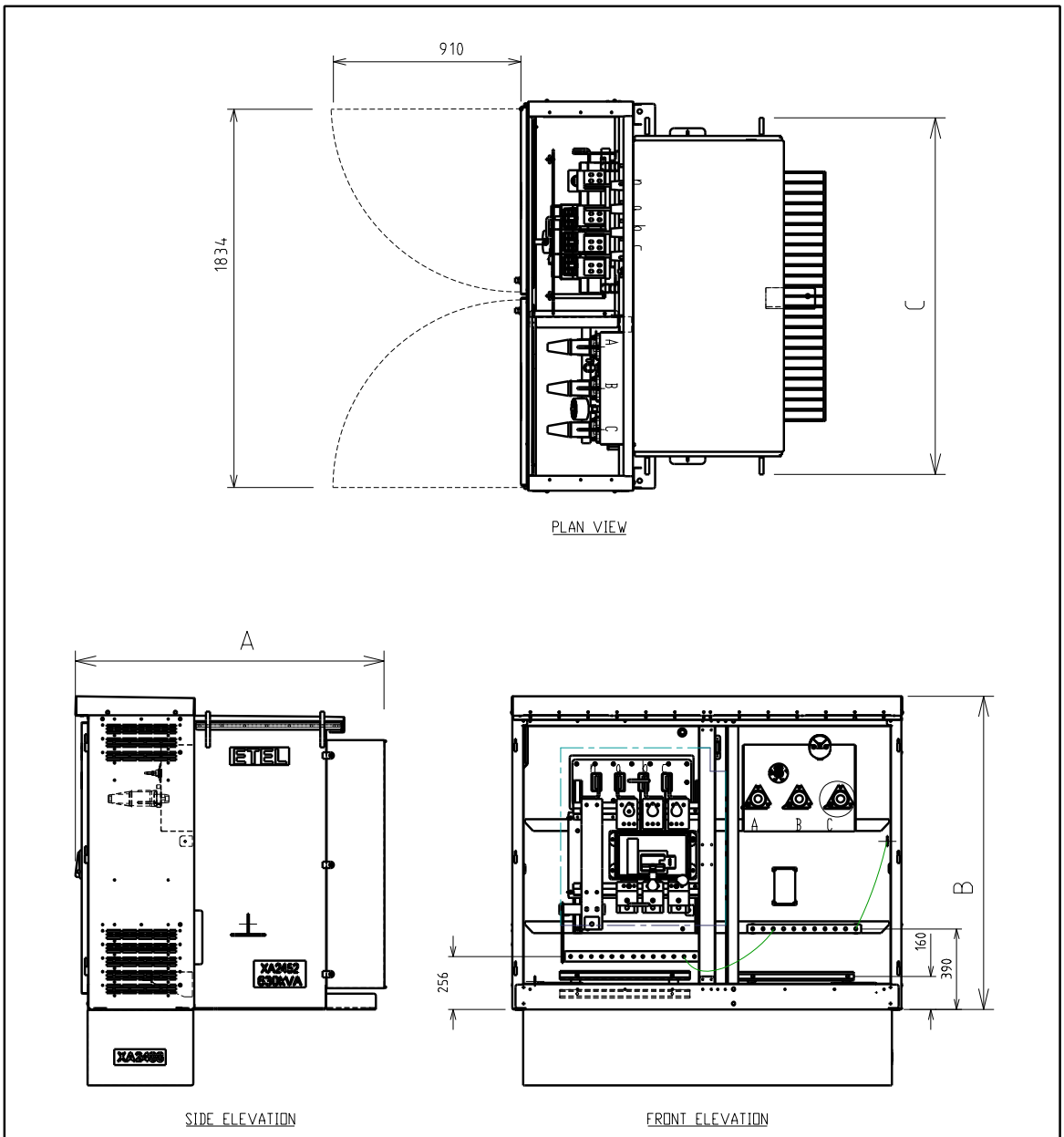
APPROVED: GRANT STACY | REV. A | SHT. 2/6

5.4.3 ETEL MKII NON MPS General Arrangement



TRANSFORMER	VOLTAGE (kV)	DIMENSION 'A'	'B'	'C'	STOCK NUMBER	WEIGHT (kg)	OIL QTY (L)	COMPATIBLE UNIT DISTRICT	SOLE USE
315	33	1470	1525	1790	XA2451	2230	670	HU59	HU60
630	33	1516	1525	1790	XA2452	3180	875	HU59	HU60

NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES.

REV	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
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TITLE: ETEL MKII NON MPS
33kV - 315 & 630kVA
COMMERCIAL / INDUSTRIAL KIOSK
GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

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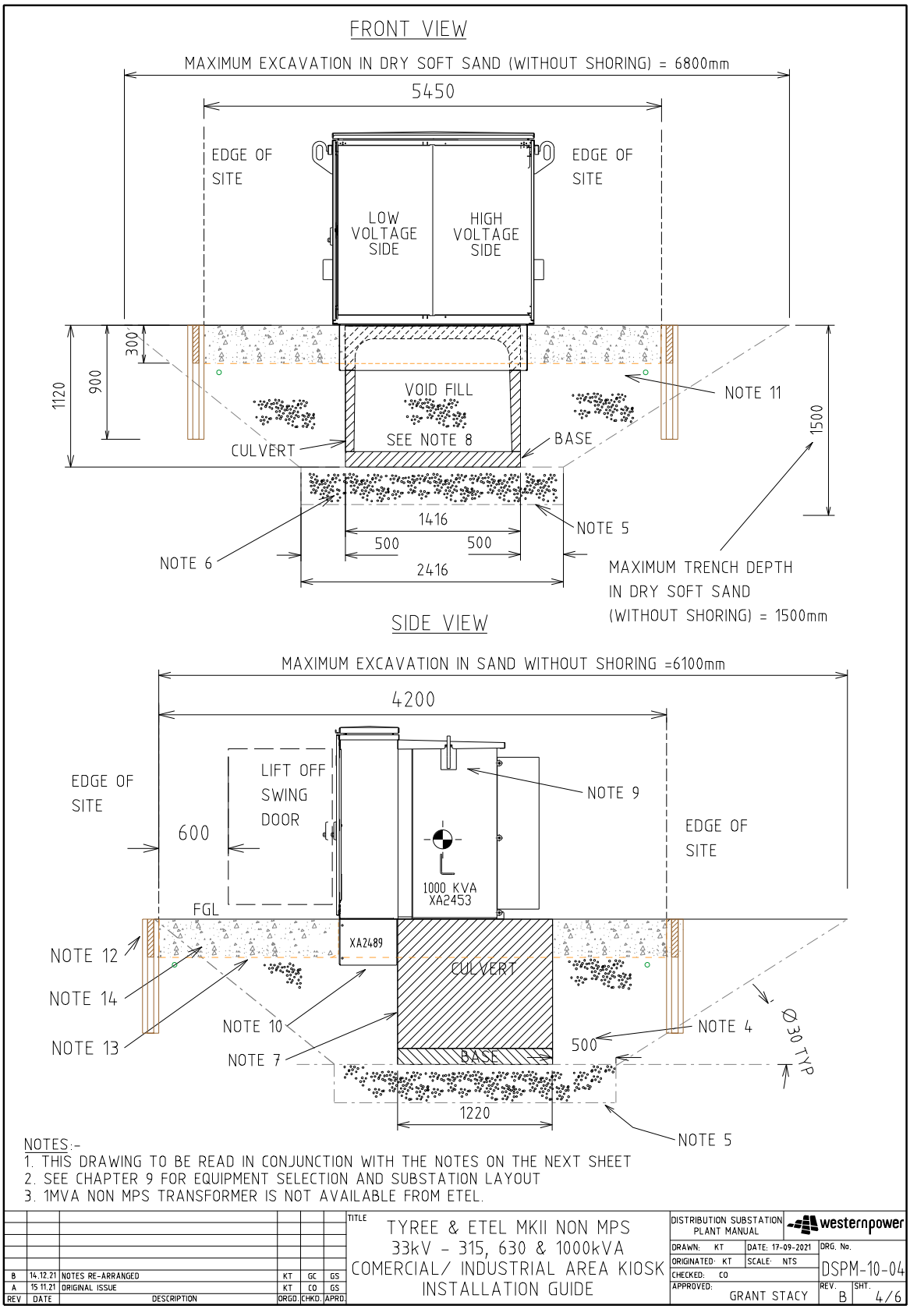
CHECKED: CO			
APPROVED: GRANT STACY		REV. A	SHT. 3/6

5.4.4 Tyree & ETEL MKII NON MPS Installation Guide (Drawing)



5.4.5 Tyree & ETEL MKII NON MPS Installation Guide (Notes)

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 1289.3.2 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	14.12.21	NOTES MODIFIED	KT	GC	GS
A	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE & ETEL MKII NON MPS 33kV - 315, 630 & 1000kVA COMERCIAL / INDUSTRIAL AREA KIOSK INSTALLATION GUIDE

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: KT	DATE: 17-09-2021	DRG. No.	DSPM-10-04
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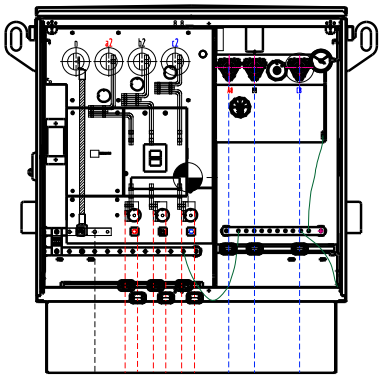
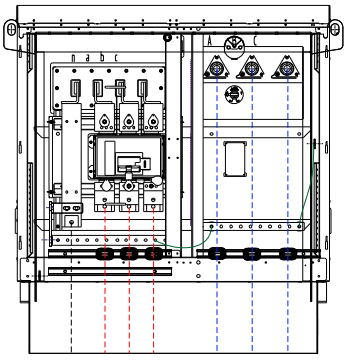
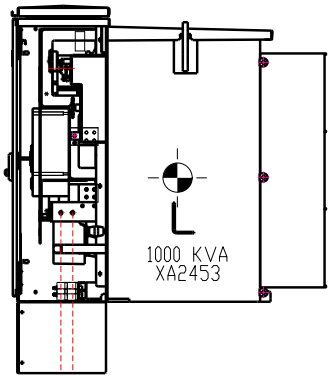
APPROVED: GRANT STACY		REV. B	SHT. 5/6

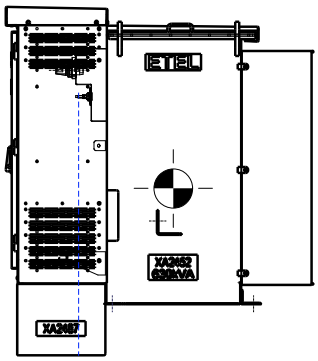
5.4.6 Tyree & ETEL MKII NON MPS Cable Terminations







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	N/A
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	15.11.21	ORIGINAL ISSUE	KT	CO	GS

TITLE: TYREE & ETEL MKII NON MPS 33kV - 315, 630 & 1000kVA COMMERCIAL / INDUSTRIAL AREA KIOSK CABLE TERMINATIONS

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: KT	DATE: 17-09-2021	DRG. No. DSPM-10-04
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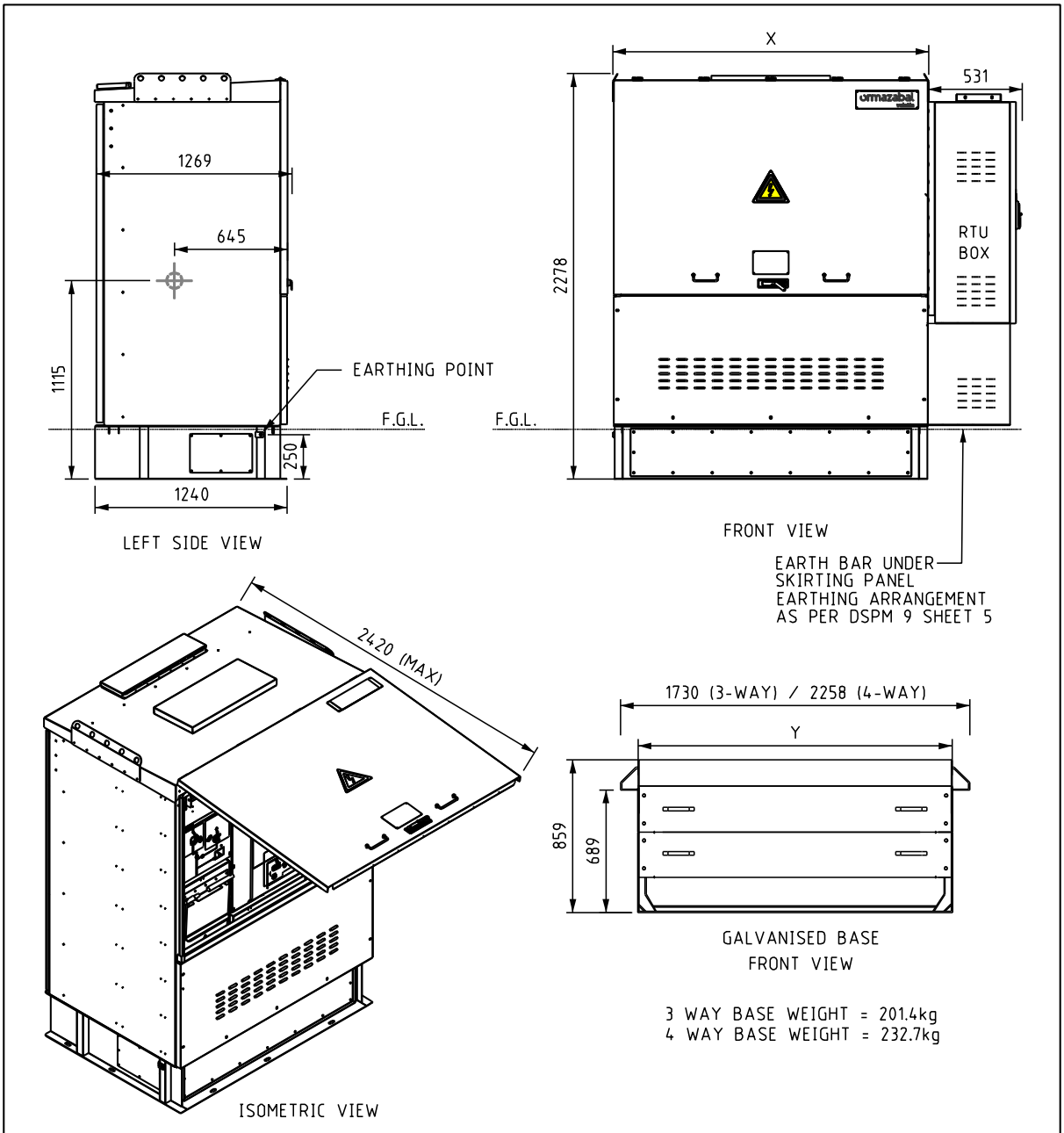
CHECKED: CO		
APPROVED: GRANT STACY		REV. A SHT. 6/6

5.5 Ormazabal CGM.3 33kV Switchgear with Stand

5.5.1 General Arrangement



SWITCH FUNCTION	DIMENSION X (WIDTH mm)	DIMENSION Y (WIDTH mm)	WEIGHT incl. KIOSK (kg)	COMPATIBLE UNIT
3+0	1541	1530	1289	HU100_33
2+1	1541	1530	1258	HU101_33
2+2	1959	2058	1747	HU102_33
3+1	1959	2058	1657	HU103_33
4+0	1959	2058	1464	HU104_33
3+1CB	1959	2058	1539	HU107_33

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES.

REV.	DATE	DESCRIPTION	ORGD.	CHKD.	APRD.
A	16.01.26	ORIGINAL ISSUE	JK	KT	LT

TITLE: ORMAZABAL CGM.3 33kV SWITCHGEAR WITH STAND GENERAL ARRANGEMENT

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

DRAWN: SL | DATE: 30-10-2025 | DRG. No. DSPM-10-05
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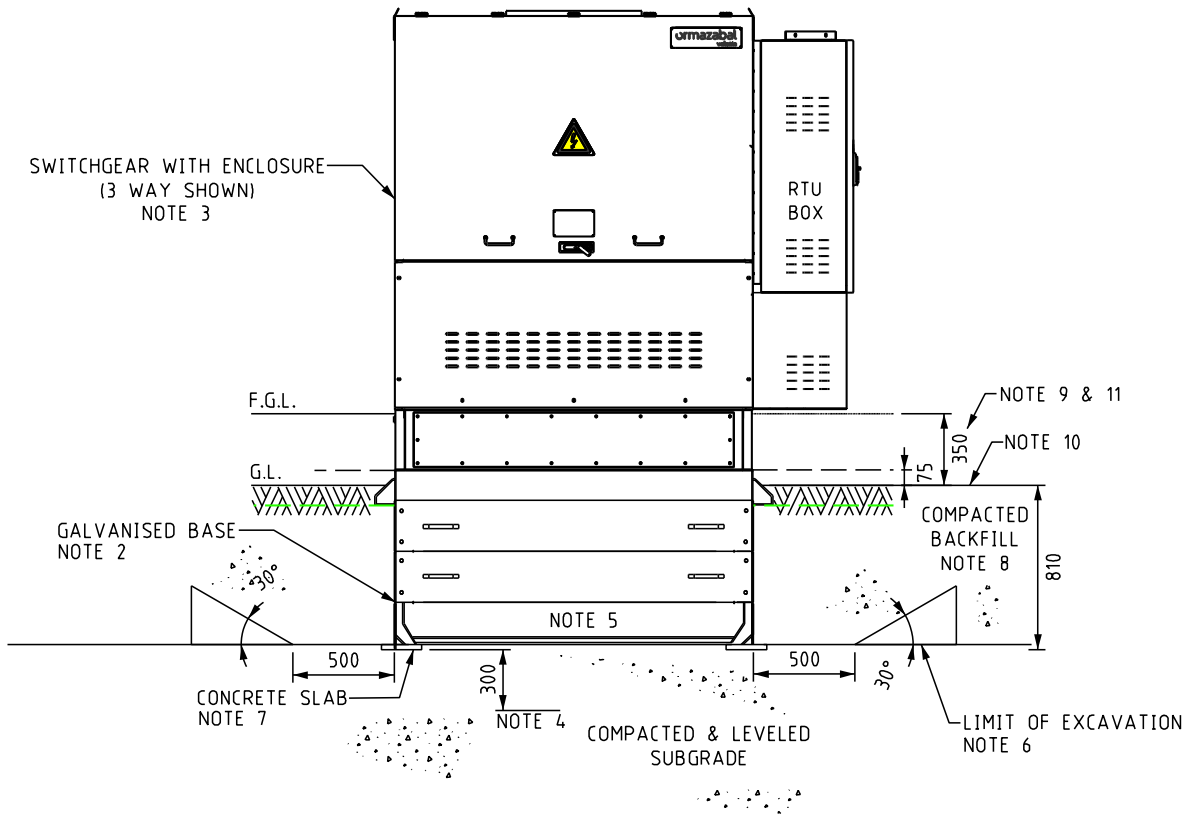
CHECKED: CD
APPROVED: LANKA THABREW | REV A | SHT. 1/2

5.5.2 Installation Detail



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. GALVANISED STEEL SUPPORT STAND BURIED INTO GROUND, EXPOSE 75mm ABOVE GROUND LEVEL.
3. SWITCHGEAR WITH ENCLOSURE BOLTED TO SUPPORT STAND WITH 10 x M16 BOLTS.
4. COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 92% TO AS1289.5.2.1 PRIOR TO INSTALLATION OF CONCRETE BASE SLABS. THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
5. VOID NOT TO BE FILLED WITH SAND, NATURAL FALL-IN THROUGH OPENINGS IS ACCEPTABLE COMPACTION NOT NECESSARY.
6. 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 SAFE SLOPE AND NOT LESS THAN 30°.
7. CONCRETE SLABS UNDER SUPPORT STAND FEET, SLABS TYPICALLY 500x200x25 THICK.
8. 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 AS PER DSPM 9. COVER WITH 100mm OF COMPACTED BACKFILL. THIS IS MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.
9. BLUE METAL 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. WHEN A TRANSFORMER IS INSTALLED IN THE SAME SUBSTATION SITE, SUBSTATION INFILL AND FINISHING IS TO BE INSTALLED AS PER DSPM-10-01 OR DSPM-10-04.
10. INSTALL PERMEABLE GEOTEXTILE MEMBRANE (SUCH AS GRUNT GRGT0361) TO SEPARATE THE BACKFILL FROM THE BLUE METAL.
11. INFILL WITH BLUE METAL (MINIMUM DEPTH OF 300mm) TO F.G.L OR FINISHED HEIGHT OF THE RETAINING WALL.
12. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS 1289.6.3.2 IS REQUIRED BY WESTERN POWER FOR ALL SUBSTATION INSTALLATIONS.
13. 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.
A	16.01.26	ORIGINAL ISSUE	JK	KT	LT

TITLE: ORMAZABAL CGM.3 33kV SWITCHGEAR WITH STAND INSTALLATION DETAILS

DISTRIBUTION SUBSTATION PLANT MANUAL — westernpower

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CHECKED: CD			
APPROVED: LANKA THABREW		REV A	SHT. 2/2