



# DISTRIBUTION CONSTRUCTION STANDARDS

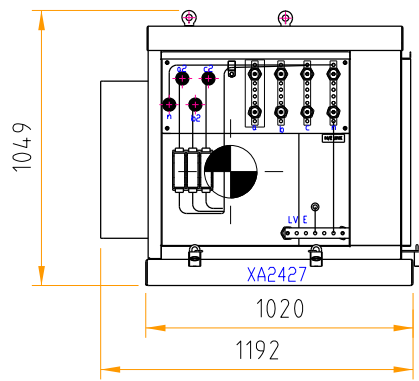
*Date Published: 15<sup>th</sup> December 2021*

## PART 10 - SUBSTATIONS G4 – EQUIPMENT INSTALLATION GUIDE

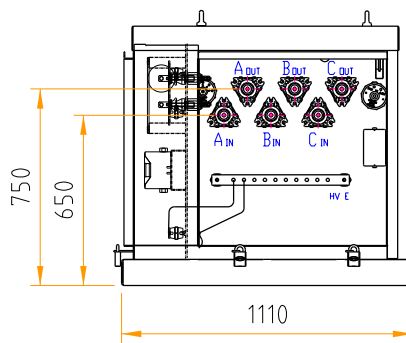
For application to  
Horizon Power  
Electricity Distribution Networks

## G4 - DISTRIBUTION SUBSTATION EQUIPMENT INSTALLATION GUIDE – Drawing Register

Number	Description
<a href="#">G4-01/1</a>	63kVA/ MV Metering Transformer Kiosk - General Arrangement
<a href="#">G4-01/2</a>	63kVA/ MV Metering Transformer Kiosk – Installation Guide
<a href="#">G4-02/1B</a>	Etel MKII MPS 6/11, 22, 33kV – 315 & 630kVA Transformer Kiosk - General Arrangement
<a href="#">G4-02/2A</a>	Etel MKII MPS 6/11, 22, 33kV – 315 & 630kVA Transformer Kiosk – Installation Guide
<a href="#">G4-02/2B</a>	Etel MKII MPS 6/11, 22, 33kV – 315 & 630kVA Transformer Kiosk – Installation Guide
<a href="#">G4-02/5</a>	Etel MKII MPS 6/11, 22, 33kV – 315 & 630kVA Transformer Kiosk – LV Cable Terminations
<a href="#">G4-03/1</a>	Safe Excavation Practices for Substations, Kiosks & Trenches Installation Guide – Civil Requirements
<a href="#">G4-03/2</a>	Backfill Around Equipment In Distribution Substations, Civil Requirements
<a href="#">G4-04/1</a>	Schneider RM6 Switchgear Cyclonic Kiosk and Stand General Arrangement – Installation Details
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<a href="#">G4-4/3</a>	Schneider RM6 Outdoor Switchgear (4 way) Installation Guide - Withdrawn
<a href="#">G4-4/4</a>	Schneider RM6 Outdoor Switchgear (4 Way) – Installation Guide, Withdrawn
<a href="#">G4-05/1</a>	Public Electricity Network Distribution Assemblies (PENDA) – Installation Requirements
<a href="#">G4-05/2</a>	Public Electricity Network Distribution Assemblies (PENDA) – General Arrangements
<a href="#">G4-05/3</a>	Public Electricity Network Distribution Assemblies (PENDA) – Cable Termination Details
<a href="#">G4-06/1</a>	Tyree MKII Non-MPS 6/11, 22, 33kV- 315, 630 & 1000kVA Transformer Kiosk - General Arrangement
<a href="#">G4-06/2A</a>	Tyree MKII Non-MPS 6/11, 22, 33kV- 315, 630 & 1000kVA Transformer Kiosk– Installation Guide
<a href="#">G4-06/2B</a>	Tyree MKII Non-MPS 6/11, 22, 33kV- 315, 630 & 1000kVA Transformer Kiosk – Installation Guide
<a href="#">G4-06/3</a>	Tyree MKII Non-MPS 6/11, 22, 33kV- 315, 630 & 1000kVA Transformer Kiosk - Cable Terminations

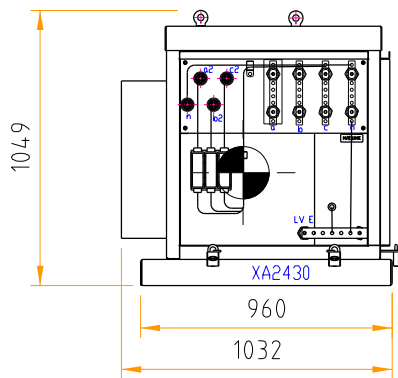


SIDE VIEW (LV)

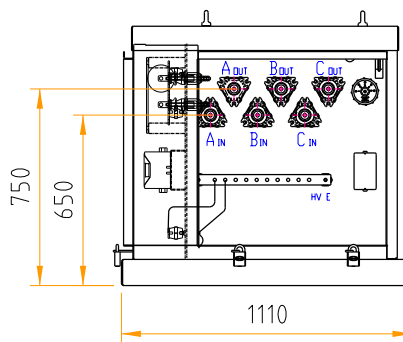


SIDE VIEW (HV)

63kVA / 11kV

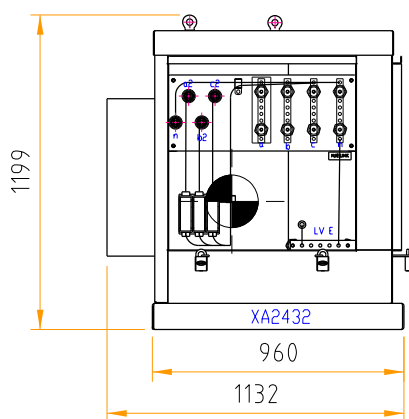


SIDE VIEW (LV)

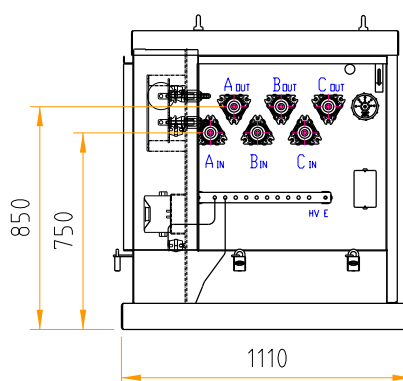


SIDE VIEW (HV)

63kVA / 22kV



SIDE VIEW (LV)



SIDE VIEW (HV)

63kVA / 33kV

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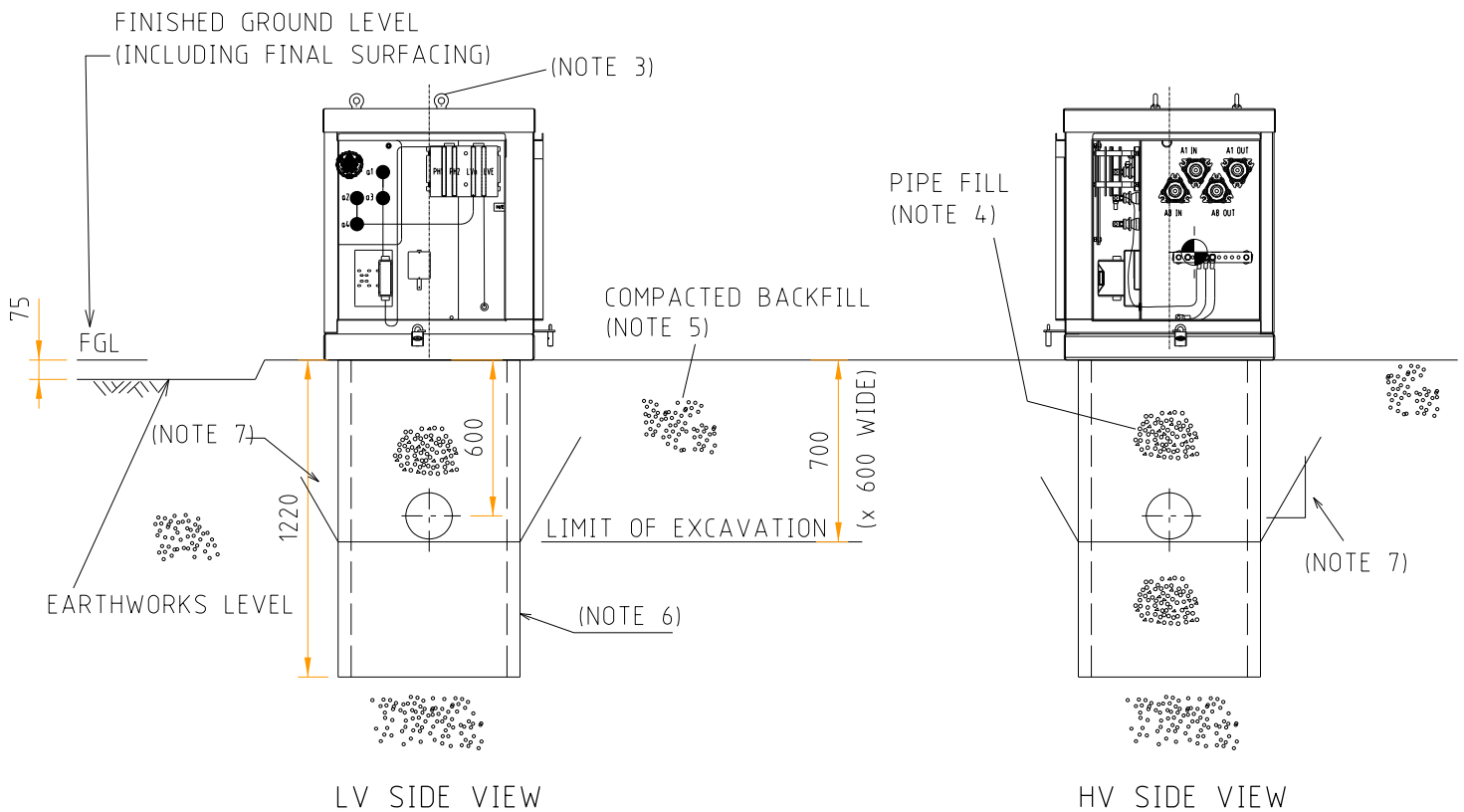


DISTRIBUTION CONSTRUCTION STANDARDS

63kVA / MV METERING  
TRANSFORMER KIOSK  
GENERAL ARRANGEMENT

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DRAWING No.  
G4-01/1



NOTES:

1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS3798 FOR EARTHWORKS, AS4678 FOR EARTH RETAINING STRUCTURES AND AS1597 FOR PRECAST CONCRETE PIPE.
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 PIPE, AND BACKFILL. 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 METERING TRANSFORMER. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE OUTER FRAME.
4. PIPE TO BE FILLED WITH SAND, COMPACTED (SEE NOTE 3) TO UNDERSIDE OF CABLE ENTRIES. ABOVE CABLE ENTRIES HAND COMPACTION REQUIRED (NOT BY MACHINE).
5. COMPACTED BACKFILL MATERIAL ADJACENT TO SUPPORT PIPES AND TO CABLE TRENCHES 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 AS1289.6.3.2. THIS MAY BE MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER OR PERTH PENETROMETER. FINAL LAYER SHALL BE COMPACTED AGGREGATE AS SPECIFIED IN G4-02/4 WITHIN 450mm OF EQUIPMENT. COMPACTED NATURAL FILL SHALL BE USED BEYOND 450mm.
6. CONCRETE PIPE 600 I/D x 1220 LONG. STOCK CODE CA0001, WITH CORED HOLES FOR INSTALLATION.
7. THE BASE OF EXCAVATION IS TO BE A MINIMUM OF 500mm LARGER THAN THE BASE OF THE CULVERT ON ALL SIDES. THE SIDES OF THE EXCAVATION SHALL BE MADE SAFE WITH A SAFE SLOPE AS PER GUIDANCE IN G4-02/3 AND WA CODE OF PRACTICE - EXCAVATION.
8. IN THE EVENT THAT THE SITE IS HIGHER THAN THE FINISHED LEVLS OF THE NEIGHBOURING AREAS, RETAINING WALLS, ACCESS STEPS AND DRAINAGE SHALL BE PROVIDED COMPLYING WITH AS4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND HORIZON POWER. THIS WORK SHALL BE CERTIFIED BY A PROFESSIONAL CIVIL ENGINEER (NPER).
9. WHERE THERE IS A RISK OF FLOODING OR WHERE GROUND WATER EXISTS, THE SUBSTATION SITE SHALL BE ELEVATED AND RETAINED SO THAT THE PIPE TOP LEVEL IS ABOVE THE PREDICTED FLOODING OR HIGHEST POSSIBLE GROUND WATER LEVEL. THE FOUNDATION DESIGN, BACKFILL AND COMPACTION IS TO BE APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER.
10. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS1289.6.3.2 IS REQUIRED BY HORIZON POWER FOR ALL SUBSTATION INSTALLATIONS.

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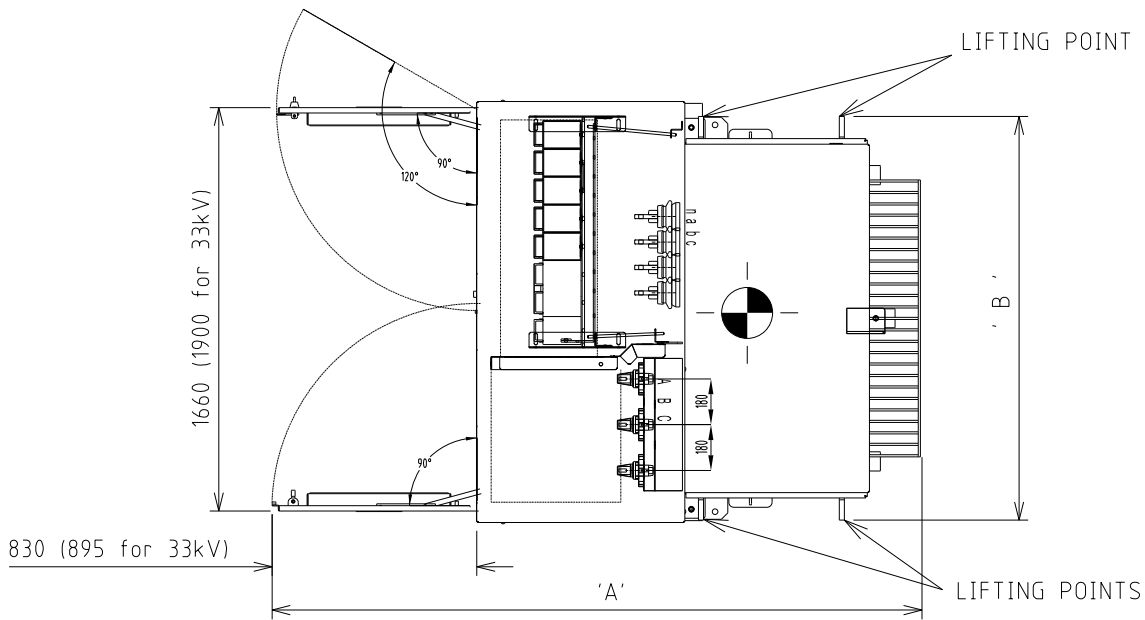


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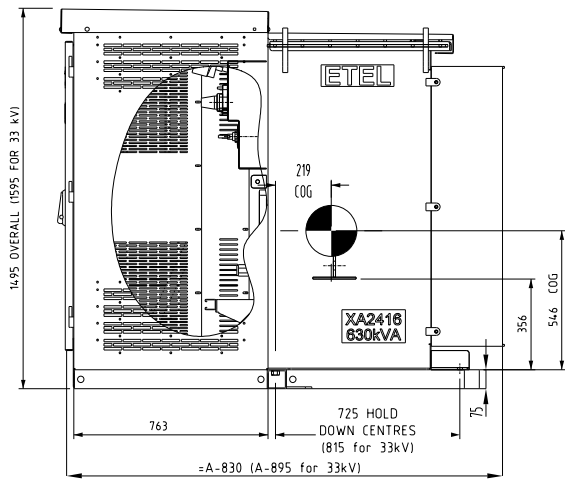
63kVA / MV METERING TRANSFORMER KIOSK INSTALLATION GUIDE

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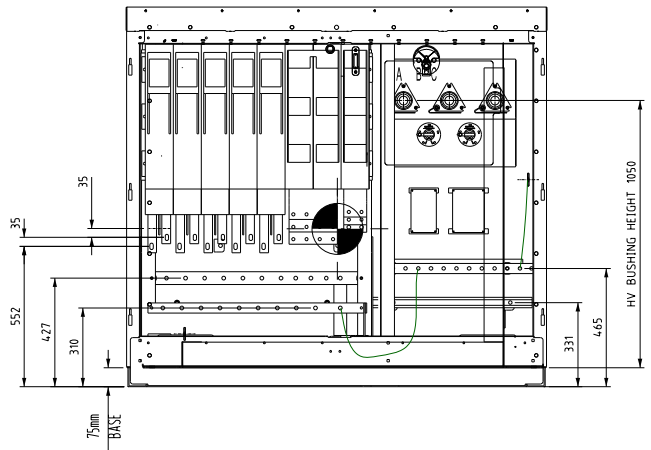
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PLAN



SIDE ELEVATION



FRONT ELEVATION

TRANSFORMER SIZE (kVA)	VOLTAGE (kV)	DIMENSION		OIL QTY (L)	WEIGHT (kg)	STOCK CODE	COMPATIBLE UNIT TRANSFORMER & LV CAB
		'A'	'B'				
315	6.6/11	2420	1536	650	2080	XA2414	HU61
315	22	2320	1536	615	2040	XA2420	HU61
315	33	2435	1890	665	2350	XA2424	HU61
630	6.6/11	2540	1586	727	2700	XA2416	HU61
630	22	2540	1586	705	2760	XA2422	HU61
630	33	2605	1890	875	3240	XA2425	HU61



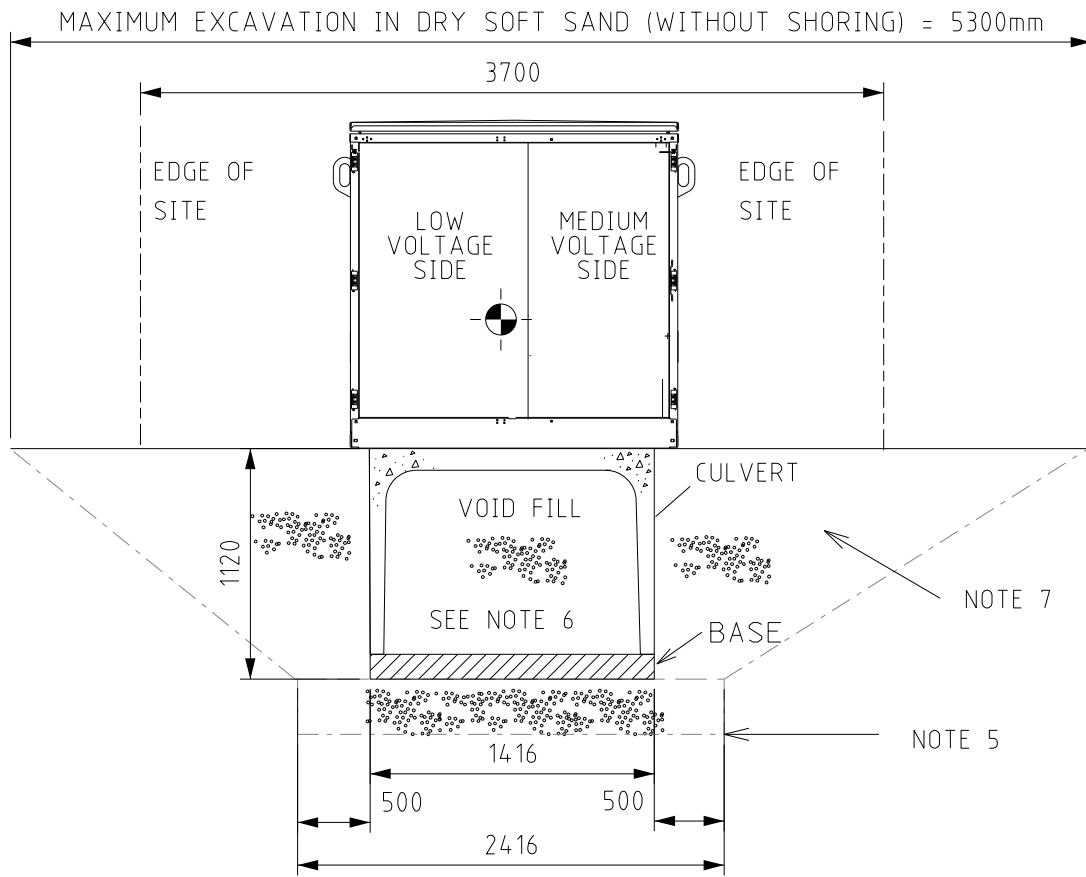
DISTRIBUTION CONSTRUCTION STANDARDS

ETEL MKII MPS  
6/11, 22, 33kV - 315 & 630kVA  
TRANSFORMER KIOSK  
GENERAL ARRANGEMENT

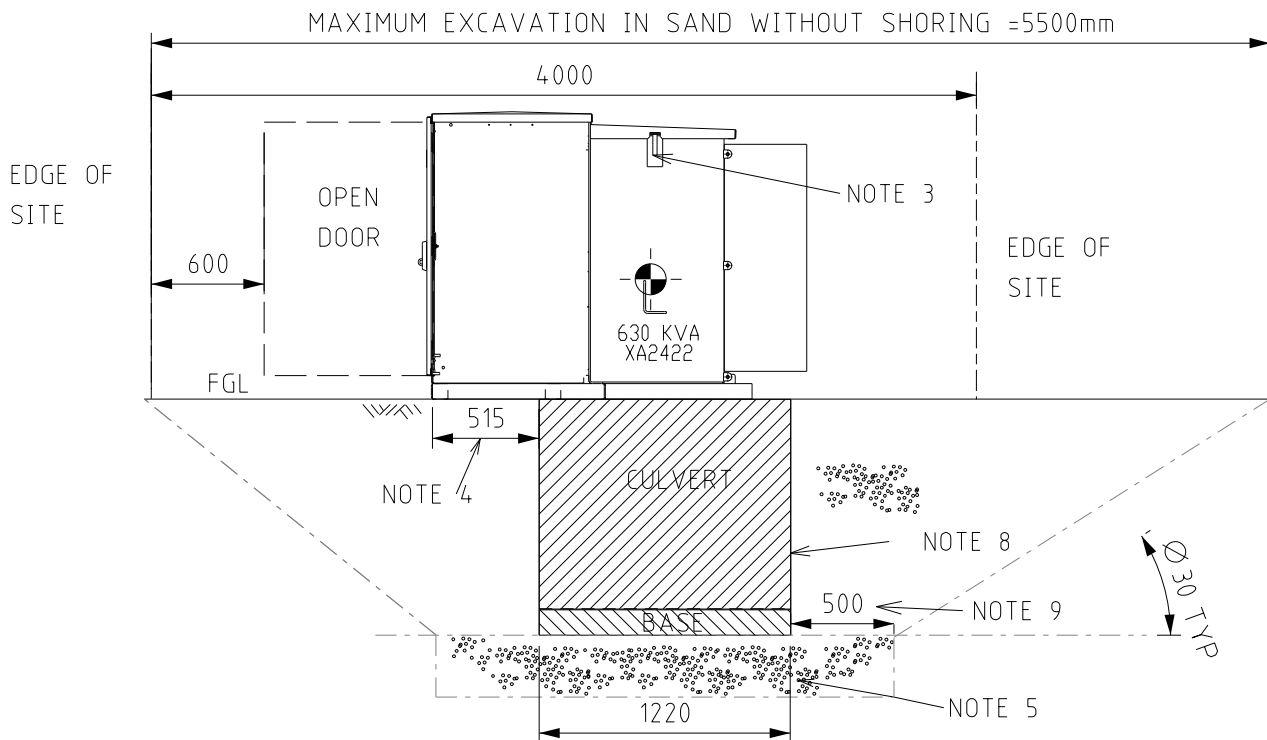
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### FRONT VIEW



### SIDE VIEW



**NOTES:-**

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON G4-02/2B.




**DISTRIBUTION CONSTRUCTION STANDARDS**

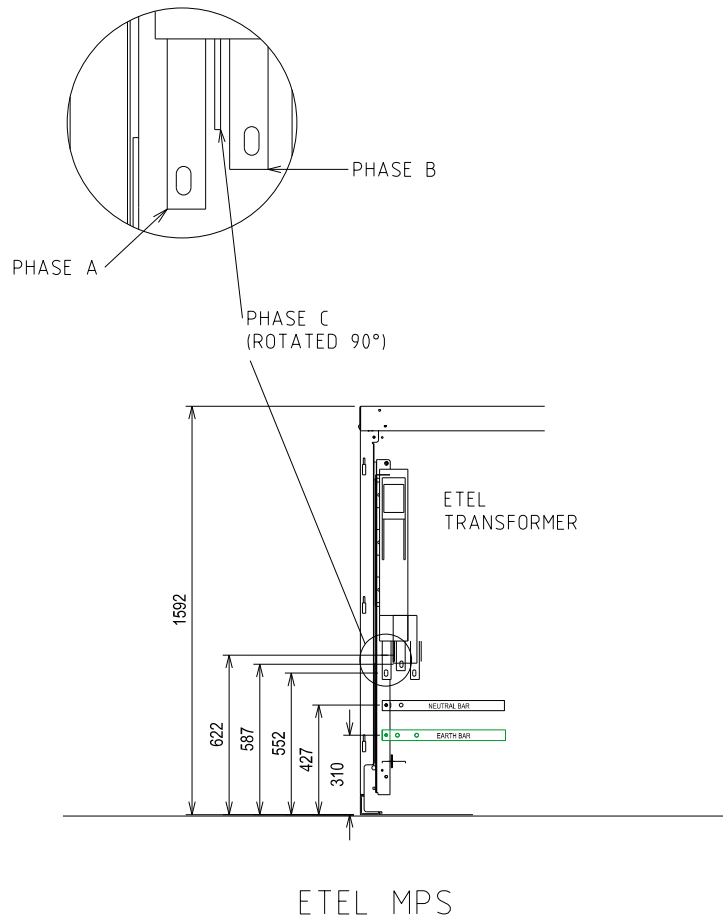
ETEL MKII MPS  
6/11, 22, 33kV - 315 & 630kVA  
TRANSFORMER KIOSK  
INSTALLATION GUIDE

REVISION A	DATE 08/12/21
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**NOTES:-**

1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS3798 FOR EARTHWORKS, AS4678 FOR EARTH RETAINING STRUCTURES AND AS1597 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 MPS UNIT. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE LV FRAME.
4. WHEN LANDING THE MPS TRANSFORMER THE EDGE OF THE CULVERT SHOULD BE LOCATED 515mm FROM THE FRONT EDGE OF THE LV FRAME BASE.
5. COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 95% TO AS1289.6.3.2 FOR A DEPTH OF 1000mm BELOW CULVERT BASE. IN CLEAN SAND THIS MAY BE MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENETROMETER OR PERTH PENETROMETER.
6. VOID TO BE FILLED WITH SAND, HAND COMPACTION REQUIRED (NOT BY MACHINE).
7. COMPACTED BACKFILL MATERIAL IS TO BE CLEAN 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 AS1289.6.3.2. THIS MAY BE MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER OR PERTH PENETROMETER. FINAL LAYER SHALL BE COMPACTED AGGREGATE AS SPECIFIED IN G4-02/4 WITHIN 450mm OF EQUIPMENT. COMPACTED NATURAL FILL SHALL BE USED BEYOND 450mm.
8. PRECAST REINFORCED BOX CULVERT AND BASE TO AS1597 ( 100kN ) STOCK CODE CA0002. NOMINAL (INTERNAL) SIZE OF CULVERT 1244 wide x 914 high x 1220 long. TO BE INSTALLED AS PER AS1597. EXTERNAL SIZE 1416 X 1022 X 1220.
9. 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 EXAVATION SHALL BE MADE SAFE WITH A SAFE SLOPE AS PER GUIDANCE IN G4-02/3 AND WA CODE OF PRACTICE - EXCAVATION.
10. 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 AS4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND HORIZON POWER. THIS WORK SHALL BE CERTIFIED BY A PROFESSIONAL CIVIL ENGINEER (NPER).
11. 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), REFER TO WASIR CLAUSE 14.4.6.
12. A COMPACTION CERTIFICATE IN ACCORDANCE WITH AS1289.6.3.2 IS REQUIRED BY HORIZON POWER FOR ALL SUBSTATION INSTALLATIONS.

 DISTRIBUTION CONSTRUCTION STANDARDS	ETEL MKII MPS 6/11, 22, 33kV - 315 & 630kVA TRANSFORMER KIOSK INSTALLATION GUIDE	REVISION A	DATE 08/12/21
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MANUFACTURER	ETEL
SWITCHGEAR COMPONENT	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
NEUTRAL CABLES	1 x Cu WAVECON SCREENS PER CIRCUIT
FASTENERS	M12 STAINLESS STEEL FASTENERS (GREASED).
TORQUE SETTING	48NM



DISTRIBUTION CONSTRUCTION STANDARDS

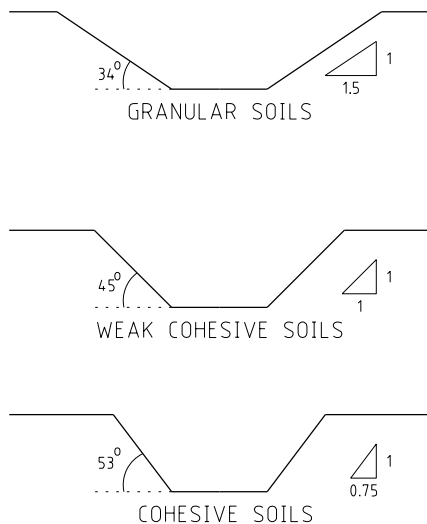
ETEL MKII MPS  
6/11, 22, 33kV - 315 & 630kVA  
TRANSFORMER KIOSK  
LV CABLE TERMINATIONS

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DRAWING No.  
G4-02/5



FIGURE 16



**WARNING**  
SLOPES INDICATED ARE FOR GUIDANCE ONLY  
(NOTE 2)

SOIL TYPE	HORIZ/DEPTH RATIO	SLOPE ANGLE
GRANULAR SOILS: CRUSHED ROCK, GRAVEL, NON-ANGULAR POORLY GRADED SAND (SUCH AS 'BASSENDEAN SAND'), LOAMY SAND	1.5:1	34°
WEAK COHESIVE SOILS: ANGULAR WELL GRADED SAND (SUCH AS 'KARRAKATTA SAND' OR 'SPEARWOOD SAND'), SILT, SILTY LOAM, SANDY LOAM.	1:1	45°
COHESIVE SOILS: CLAY, SILTY CLAY, SANDY CLAY.	0.75:1	53°

FIGURE 16: SLOPES WHICH MAY BE SAFE FOR VARIOUS SOIL TYPES. THESE SLOPES MAY NOT BE SAFE IN ALL CONDITIONS. TYPICAL CIRCUMSTANCES THAT MAY REQUIRE A SAFER SLOPE (OR SHORING AND OTHER PRECAUTIONS) INCLUDE WHERE:

- THERE ARE SURCHARGE LOADS;
- THERE ARE PLANES OF WEAKNESS OR SOIL LAYERING;
- THE GROUND TO BE EXCAVATED IS NOT LEVEL;
- GROUNDWATER WILL BE ENCOUNTERED; OR
- THERE ARE VIBRATION FORCES.

EXTRACT FROM WA EXCAVATION - CODE OF PRACTICE  
(WA COMMISSION FOR OCCUPATIONAL SAFETY & HEALTH - 2005)

NOTES:

1. BEFORE COMMENCING ANY EXCAVATION WORKS, REFER TO HORIZON POWER FIELD INSTRUCTION 8.04
2. THE ADVICE PROVIDED IN FIG 16 (ABOVE) SHOULD ONLY BE USED AS A GUIDE. EXAMINATION OF SITE CONDITIONS BY A COMPETENT PERSON IS REQUIRED TO DETERMINE SAFE SLOPE CONDITIONS FOR EXCAVATIONS.
3. WORKERS SHALL NOT WORK IN AN EXCAVATION 1.5m OR MORE DEEP THAT IS NOT PROTECTED BY SHORING, UNLESS AN EXAMINATION OF THE GROUND BY A COMPETENT PERSON REVEALS NO INDICATION OF A POTENTIAL CAVE-IN.
4. WHERE THE RISK ASSESSMENT INDICATES EXCAVATION CANNOT BE CARRIED OUT SAFELY, SHORING OR OTHER APPROVED SAFETY MEASURES SHALL BE IMPLEMENTED, EG. BENCHING OR AN ALTERNATIVE INSTALLATION METHOD USED, REFER TO FIELD INSTRUCTION 8.04.
5. SAFETY HELMETS SHALL BE WORN BY ALL PERSONS WORKING IN ANY TRENCH DEEPER THAN 1.2m AND/OR WHERE THERE IS A RISK TO THE PERSON OF BEING STRUCK ON THE HEAD BY FALLING OBJECTS, REFER TO HORIZON FIELD INSTRUCTION 2.02.

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DISTRIBUTION CONSTRUCTION STANDARDS

SAFE EXCAVATION PRACTICES FOR  
SUBSTATIONS, KIOSKS & TRENCHES  
INSTALLATION GUIDE  
CIVIL REQUIREMENTS

REVISION A	DATE 08/12/21
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FOLLOWING THE INSTALLATION OF ALL SUBSTATION EQUIPMENT, EXPOSED SURFACE AREAS AT THE SITE SHALL BE STABILISED TO MITIGATE AGAINST THE EFFECTS OF EROSION.

A CRUSHED ROCK COURSE SHALL BE LAID WITHIN 450mm OF EQUIPMENT, SHALL BE COMPACTED TO 95% MMDD (MAXIMUM MODIFIED DRY DENSITY) AND FINISHED TO THE DESIGN LINES AND LEVELS.

THE CRUSHED ROCK COURSE IS THAT USED FOR UNSEALED ROADS, SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

MAXIMUM GRAVEL SIZE OF 37.5mm.

MAXIMUM PLASTICITY INDEX (PI) OF 12.

MINIMUM FOUR DAY SOAKED CBR (CALIFORNIA BEARING RATIO) OF 40%.

SPECIFICATIONS STIPULATED IN THE AUSTRROADS GUIDE TO PAVEMENT TECHNOLOGY, PART 6: UNSEALED ROADS (SHOWN IN TABLE 1)

TABLE 1: SPECIFICATIONS ADAPTED FROM AUSTRROADS GUIDE PART 6.

SIEVE SIZE (mm)	ALLOWABLE MATERIAL PASSED (%) FOR SIEVE SIZE
37.5	95-100
26.5	90-100
19	80-100
2.36	35-65
0.425	5-50
0.075	10-40

PLASTICITY INDEX SHALL BE NO GREATER THAN 12. AFTER MORE THAN 500mm ANNUAL RAINFALL FOUR-DAY SOAKED CBR SHALL BE NO LESS THAN 40%.

THIS APPLIES TO DISTRIBUTION SUBSTATION EQUIPMENT SUCH AS TRANSFORMER KIOSKS AND OUTDOOR SWITCHGEAR.

BLUE METAL AGGREGATE SHALL NO LONGER BE USED AS A SURFACE FURNISHING AROUND DISTRIBUTION SUBSTATION EQUIPMENT, UNLESS SPECIFICALLY REQUIRED BY AN EARTH DESIGN DONE FOR THAT SITE. WHERE REQUIRED, THE BLUE METAL SHALL REPLACE THE AGGREGATE SPECIFIED ABOVE.

FOR THE REMAINING AREA OF EXCAVATION (I.E. BEYOND THE 450mm AROUND EQUIPMENT), THE EXCAVATED NATURAL MATERIAL SHALL BE USED FOR THE FINAL 100mm. THIS MATERIAL SHALL BE COMPACTED.

NOTE: RETAINING WALLS AND NON LEVEL GROUND

THE RECOMMENDATION ON EARTHWORKS AND FINAL CIVIL LAYER STATED HERE APPLIES ONLY TO PAD-MOUNT SUBSTATIONS ON LEVEL GROUND.

IT DOES NOT APPLY TO SUBSTATIONS WITH RETAINING WALLS.

(E.G. THOSE IN THE G9 DRAWINGS G9-3 AND G9-4), OR OTHER ARRANGEMENTS FOR NON-LEVEL GROUND, SUCH AS STEPS OR ROCK ARMOUR.

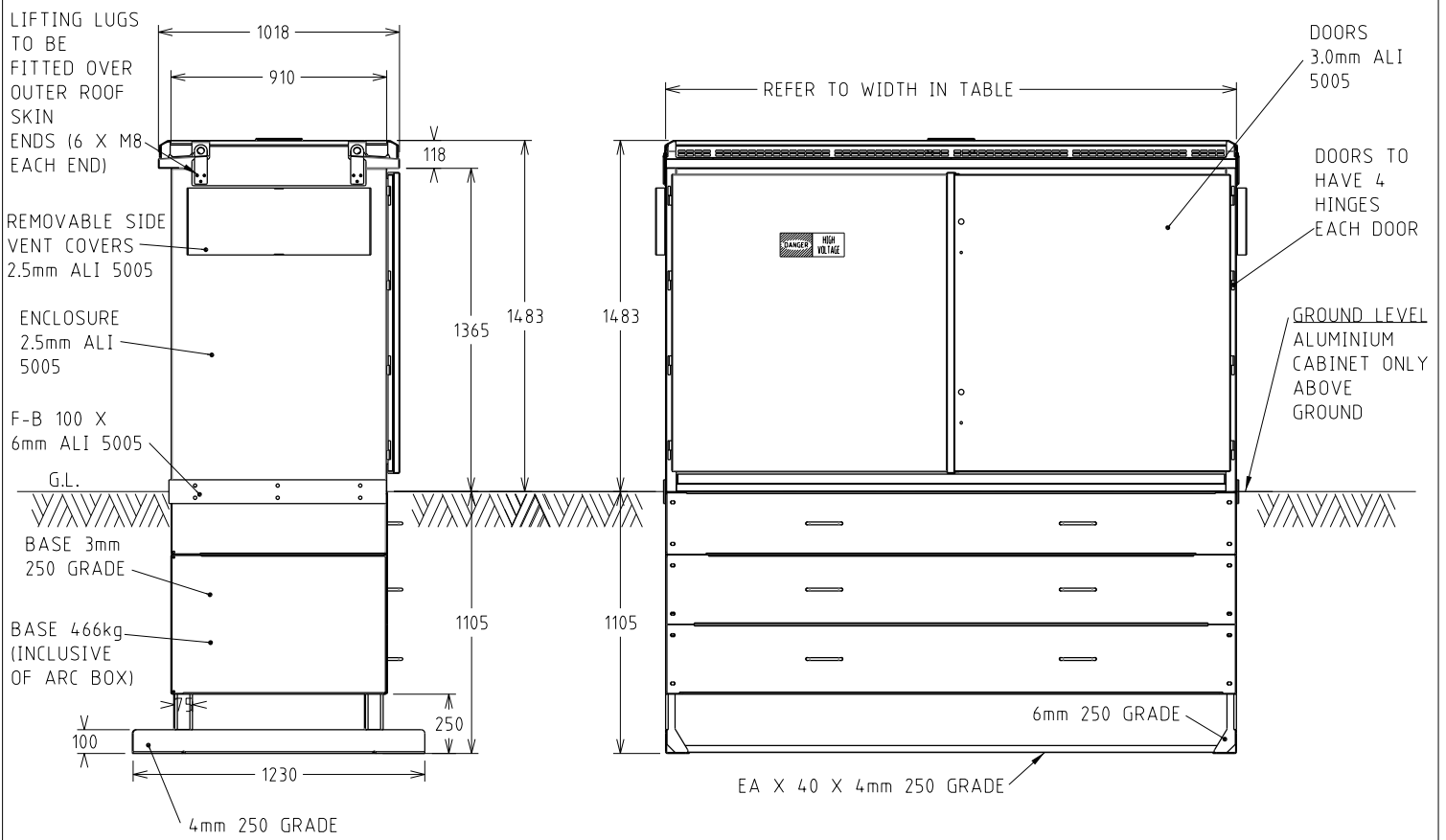


DISTRIBUTION CONSTRUCTION STANDARDS

BACKFILL AROUND EQUIPMENT  
IN DISTRIBUTION SUBSTATIONS  
CIVIL REQUIREMENTS

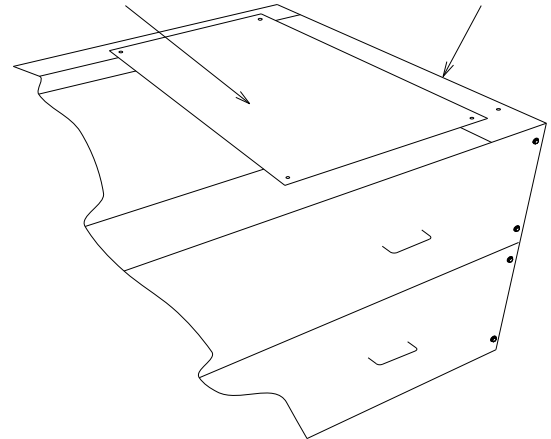
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G4-03/2



REMOVE BLANKING PLATE TO ADD 1 WAY EXTENSION

4-WAY OR 5-WAY SUPPORT STAND



SWITCH FUNCTION	STOCK CODE KIOSK/STAND	DIMENSION (WIDTH mm)	COMPATIBLE UNIT
3+0	XAH2650 - 4 WAY	1976	HU5
2+1	XAH2650 - 4 WAY	1976	HU6
2+2	XAH2651 - 5 WAY	2409	HU7
3+1	XAH2651 - 5 WAY	2409	HU8
4+0	XAH2651 - 5 WAY	2409	HU9
2+3	XAH2561 - 5 WAY	2409	HU80
3+2	XAH2651 - 5 WAY	2409	HU81

NOTES:-

1. KIOSK AND STAND CAN BE LIFTED AT EYELETS WITHOUT RMU INSIDE.
2. DO NOT LIFT KIOSK & STAND WITH RMU INSIDE.

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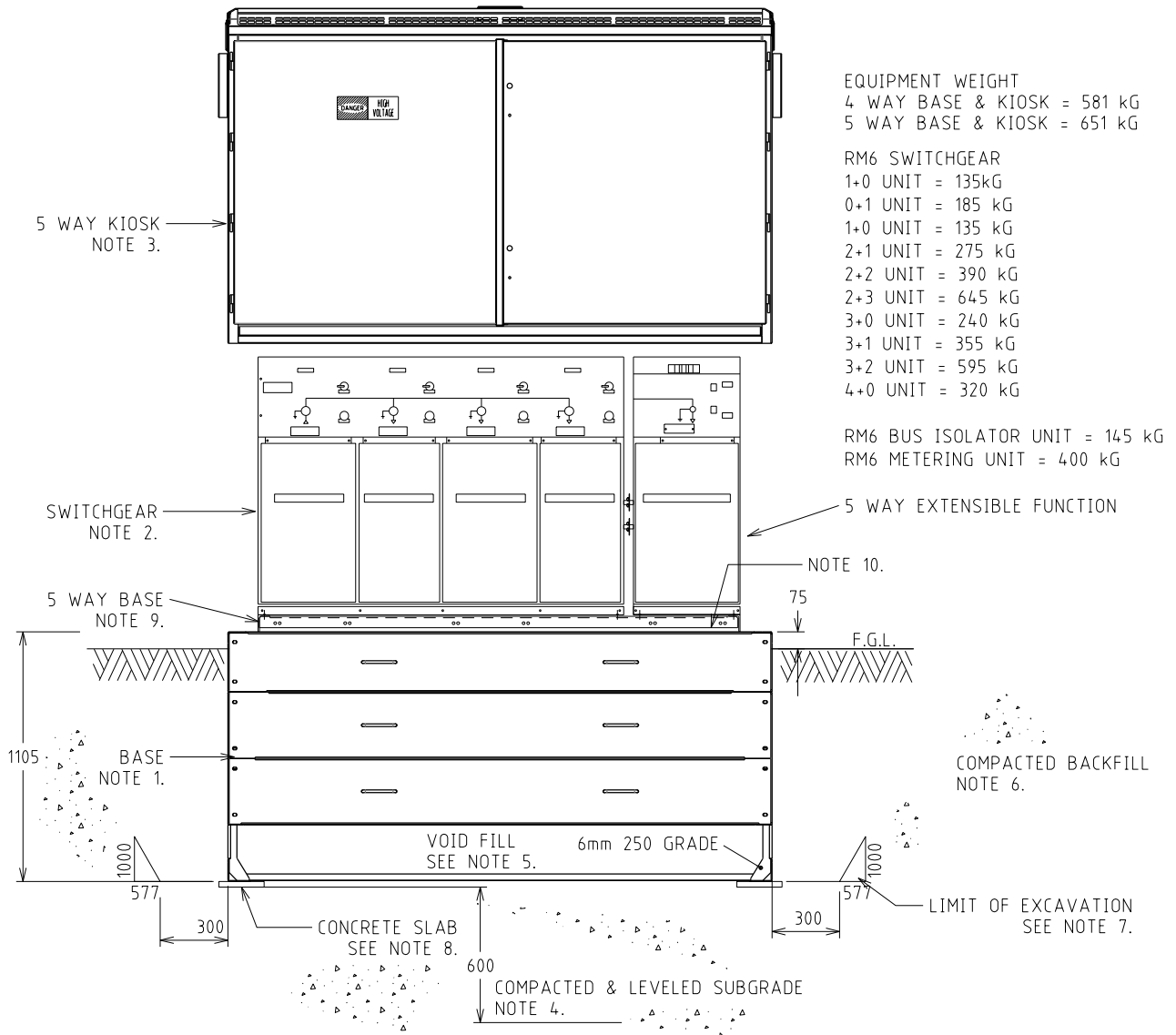


DISTRIBUTION CONSTRUCTION STANDARDS

SCHNEIDER RM6 SWITCHGEAR  
CYCLONIC KIOSK AND STAND  
GENERAL ARRANGEMENT  
INSTALLATION DETAILS

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DRAWING No.  
G4-04/1



**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 SIDES AND REAR.
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. COMPACTION OF 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 OR PERTH PENETROMETER. FINAL LAYER SHALL BE COMPACTIONED AGGREGATE AS SPECIFIED IN G4-02/4 WITHIN 450mm OF EQUIPMENT. COMPACTIONED NATURAL FILL SHALL BE USED BEYOND 450mm.
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 500x200x25 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.

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DISTRIBUTION CONSTRUCTION  
STANDARDS

SCHNEIDER RM6 SWITCHGEAR  
CYCLONIC KIOSK AND STAND  
GENERAL ARRANGEMENT  
INSTALLATION DETAILS

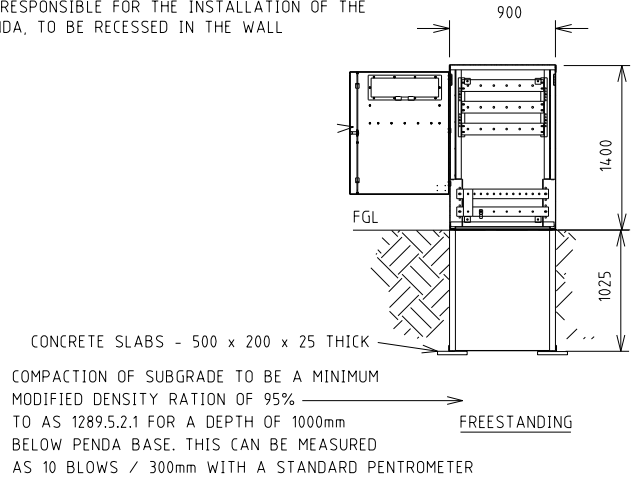
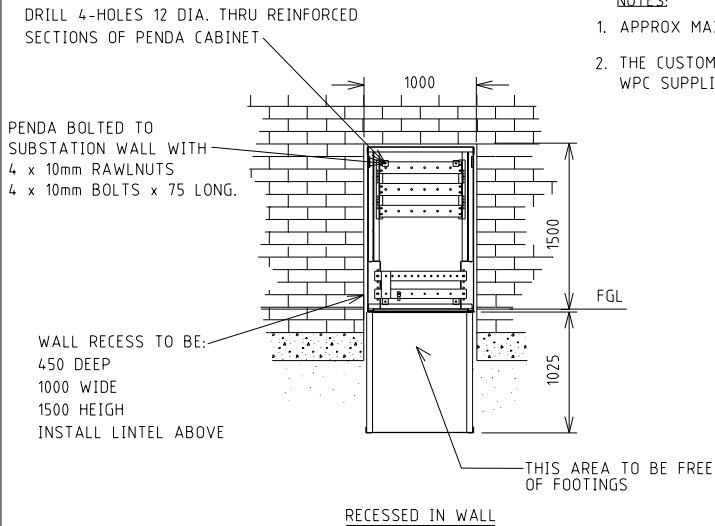
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DRAWING No.  
G4-04/2

TYPE 1.1 - PENDA INSTALLATION REQUIREMENTS

NOTES:

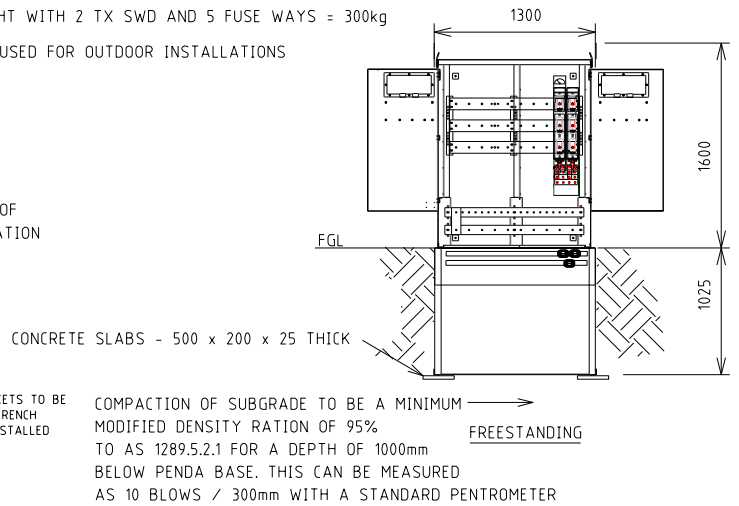
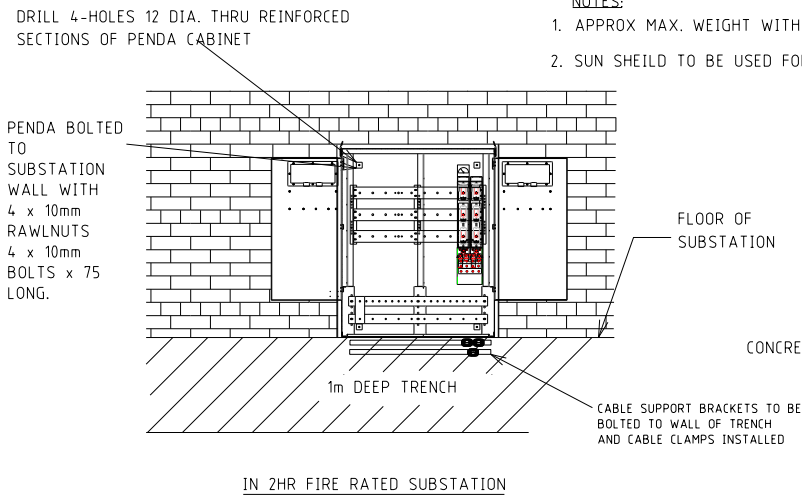
1. APPROX MAX. WEIGHT WITH 6 FUSE WAYS = 200kg
2. THE CUSTOMER IS RESPONSIBLE FOR THE INSTALLATION OF THE WPC SUPPLIED PENDA, TO BE RECESSED IN THE WALL



TYPE 2.1 PENDA - INSTALLATION REQUIREMENTS

NOTES:

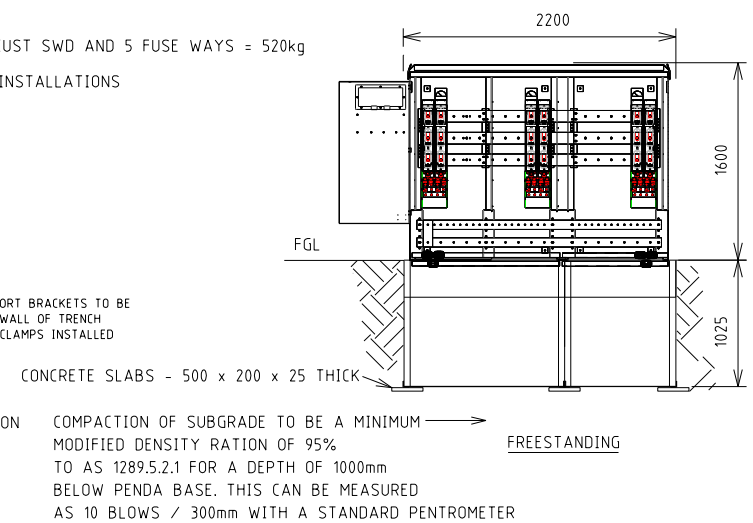
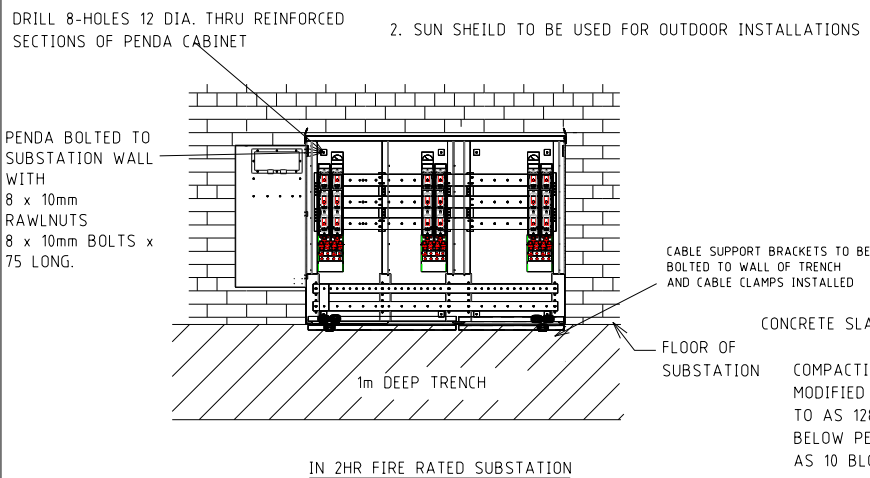
1. APPROX MAX. WEIGHT WITH 2 TX SWD AND 5 FUSE WAYS = 300kg
2. SUN SHEILD TO BE USED FOR OUTDOOR INSTALLATIONS



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



DISTRIBUTION CONSTRUCTION STANDARDS

PUBLIC ELECTRICITY NETWORK DISTRIBUTION ASSEMBLIES (PENDA) INSTALLATION REQUIREMENTS

REVISION	DATE
C	08/12/21

DRAWING No.  
G4-05/1

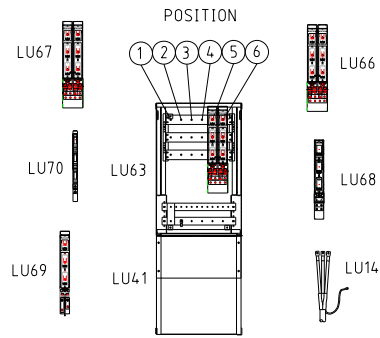
TYPE 1.1 PENDA LAYOUT

SWG	MAX FUSE	CU	1	2	3	4	5	6
TYPE 1.1 PENDA		LU63						
PENDA BASE		LU41						
160A FSD	1 X 63A DIN 00	LU70		L L				
630A 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					
2000A SWD	LINKS SUPPLIED	LU66	C				SUPPLY	
FSD CABLE TERM	FUSES SUPPLIED	LU14	S	S	S	S	S	S

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

NOTES:-

1. LU66 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. 2 X LU14 NEEDED WITH EACH LU66\_TX WHEN DUAL FEEDER SUPPLY IS USED.
5. STANDARD DUAL FEEDER SUPPLY ARRANGEMENT SHOWN (HERITAGE SITES ONLY). DESIGNER MAY DESIGN AN ALTERNATIVE PENDA LAYOUT.
6. LU70 MAY HAVE UP TO 2 IN CIRCUIT POSITION 3.



TYPE 2.1 PENDA LAYOUT

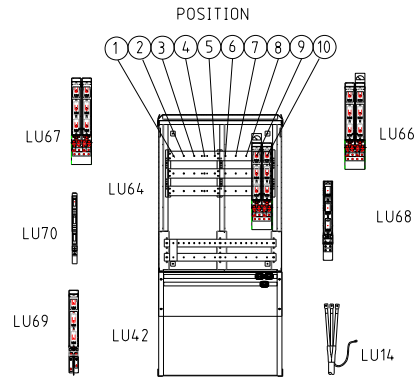
SWG	MAX FUSE	CU	1	2	3	4	5	6	7	8	9	10
TYPE 2.1 PENDA		LU64										
PENDA BASE		LU42										
160A FSD	1 X 63A DIN 00	LU70			L L							
630A FSD	1 X 400A NH2	LU69	C/S	C/S	C/S	C/S	C/S	C/S	C/S			
910A FSD	1 X 630A NH3	LU68								E		
1260A FSD	2 X 400A NH2	LU67	C		C							
2000A SWD	LINKS SUPPLIED	LU66	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  
 C = CUSTOMER  
 L = LIGHTING CIRCUIT  
 E = EMERGENCY RESPONSE GENERATOR  
 S = STREET CIRCUIT

NOTES:-

1. LU66 CAN BE USED FOR THE TRANSFORMER AND CONTIGUOUS 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.



TYPE 3.1 PENDA LAYOUT

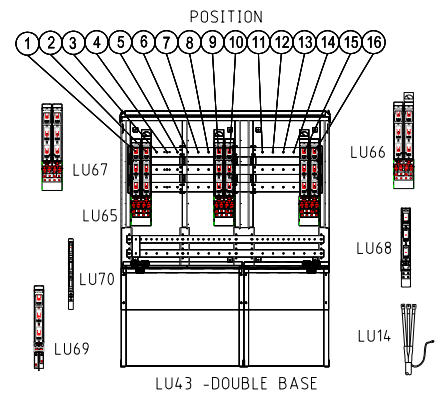
SWG	MAX FUSE	CU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TYPE 3.1 PENDA		LU65																
PENDA BASE		LU43																
160A FSD	1 X 63A DIN 00	LU70			L L													
630 FSD	1 X 400A NH2	LU69			C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S	C/S				
910A FSD	1 X 630A NH3	LU68			E											E		
1260A FSD	2 X 400A NH2	LU67				C			C		C							
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  
 C = CUSTOMER  
 L = LIGHTING CIRCUIT  
 E = EMERGENCY RESPONSE GENERATOR  
 S = STREET CIRCUIT

NOTES:-

1. LU66 CAN BE USED FOR THE TRANSFORMER AND CONTIGUOUS 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.

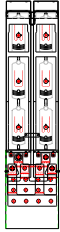


DISTRIBUTION CONSTRUCTION STANDARDS

PUBLIC ELECTRICITY NETWORK  
 DISTRIBUTION ASSEMBLIES (PENDA)  
 GENERAL ARRANGEMENTS

REVISION C DATE 08/12/21

DRAWING No. G4-05/2

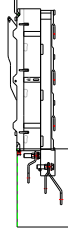


### LU67

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

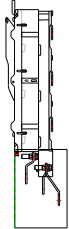


### LU66

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

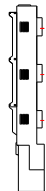


### LU70

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

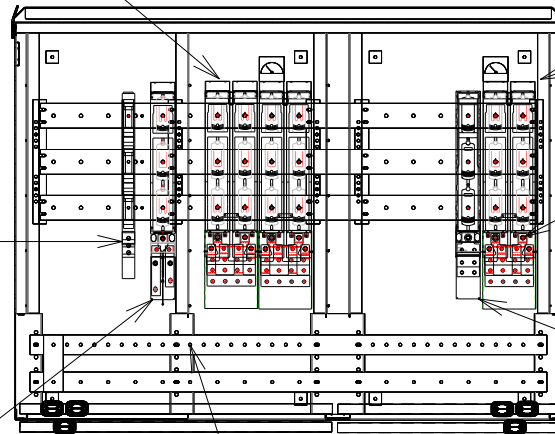
FOR CABLE TERMINATIONS USE  
M8 SS FASTENERS SUPPLIED  
WITH SWITCH  
TORQUE TO 20NM

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



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



M12 HOLES PRE DRILLED  
INTO EARTH AND NEUTRAL BARS.

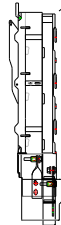
CABLE CLAMPS TO BE FITTED TO  
INCOMING AND OUTGOING CABLES  
SUPPLIED WITH EACH SWITCH

### 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



### 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



#### NOTES:-

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

**HORIZON**  
**POWER**

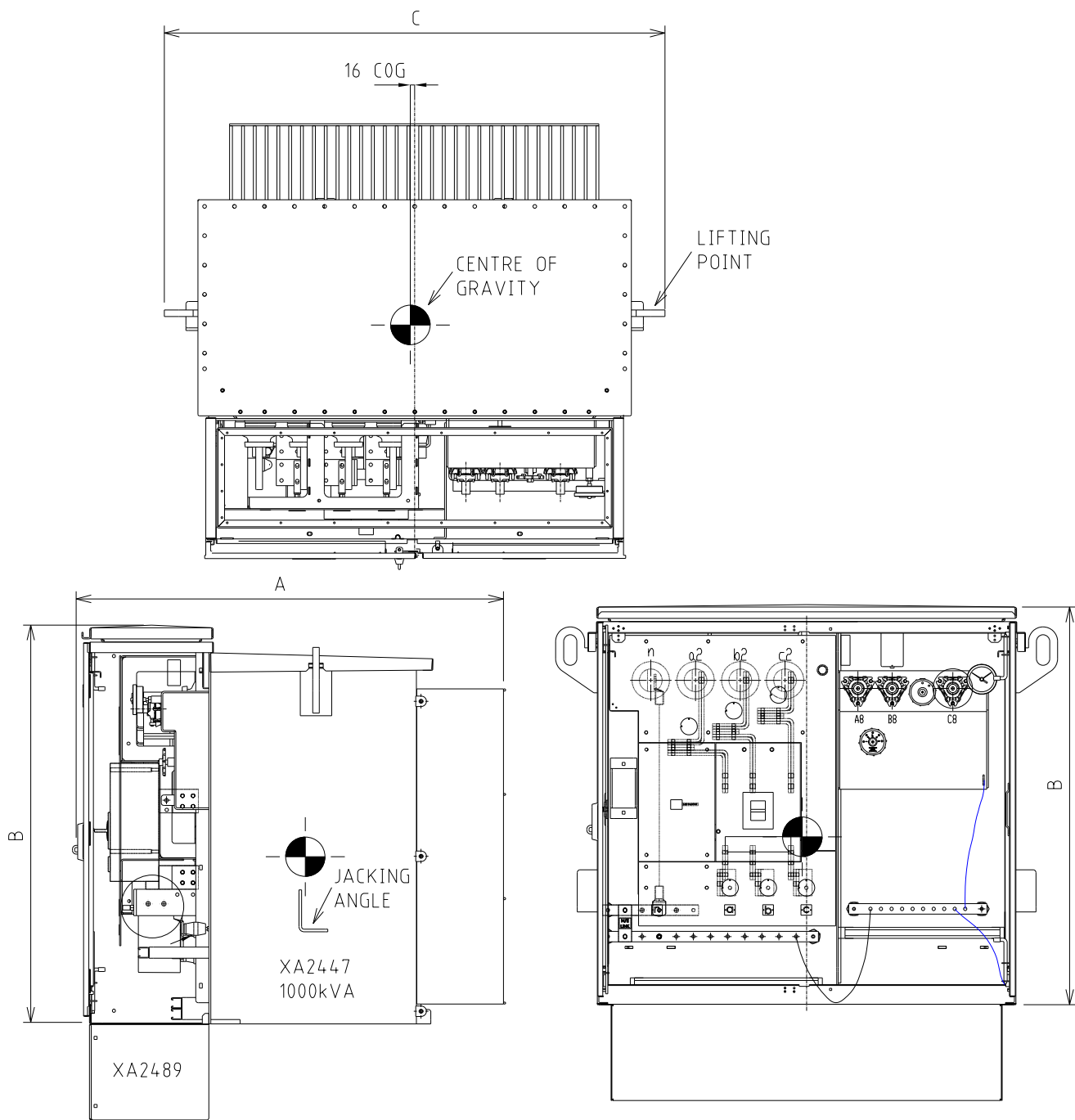
DISTRIBUTION CONSTRUCTION  
STANDARDS

PUBLIC ELECTRICITY NETWORK  
DISTRIBUTION ASSEMBLIES (PENDA)  
CABLE TERMINATION DETAILS

REVISION	DATE
A	08/12/21

DRAWING No.

G4-05/3



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
315	33	1495	1518	1616	XA2451	2220	590	HU59	HU60
630	6.6/11	1661	1518	1756	XA2446	3200	930	HU59	HU60
630	22	1576	1518	1551	XA2449	2740	730	HU59	HU60
630	33	1660	1518	1691	XA2452	3155	860	HU59	HU60
1000	6.6/11	1641	1518	1906	XA2447	4155	985	HU59	HU60
1000	22	1641	1518	1906	XA2450	3957	980	HU59	HU60
1000	33	1641	1518	1906	XA2453	4065	990	HU59	HU60

NOTES: THIS DRAWING TO BE READ IN CONJUNCTION WITH THE DISTRIBUTION DESIGN RULES - HPC-9DJ-01-0002-2015.



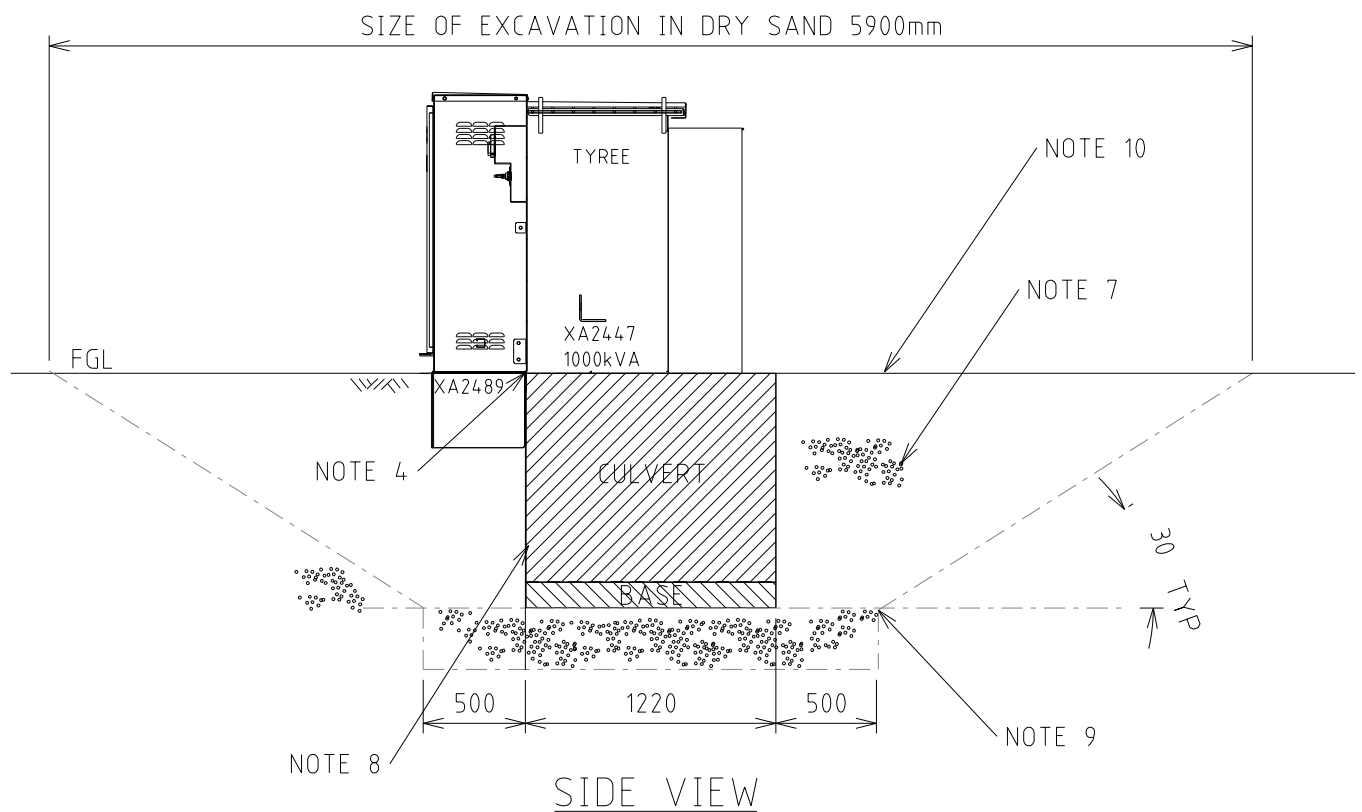
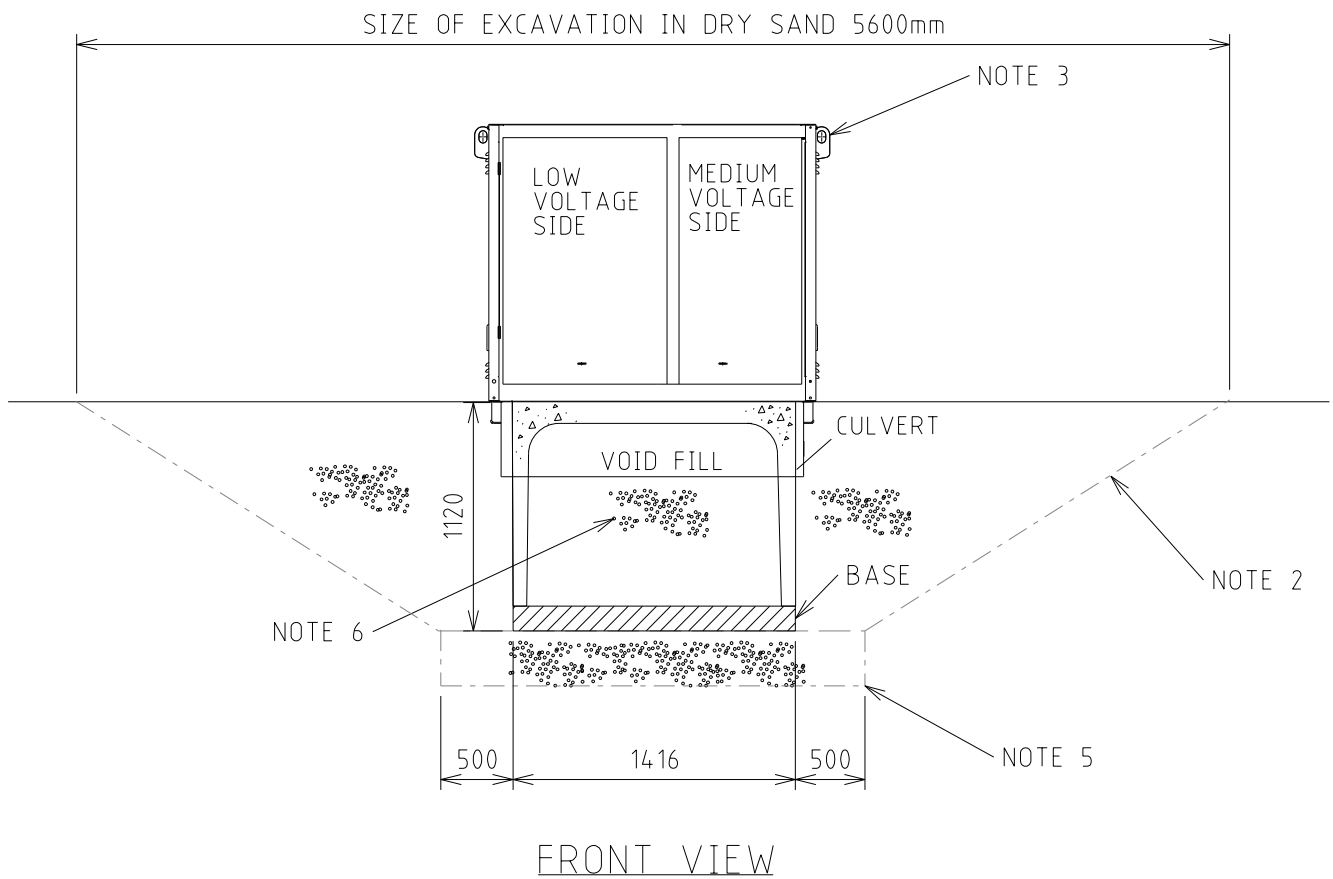
DISTRIBUTION CONSTRUCTION STANDARDS

TYREE MKII NON-MPS  
6/11, 22, 33kV - 315, 630 & 1000kVA  
TRANSFORMER KIOSK  
GENERAL ARRANGEMENT

REVISION C DATE 08/12/21

DRAWING No. G4-06/1





NOTES:-

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE NOTES ON G4-06/2B.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE DISTRIBUTION DESIGN RULES - HPC-9DJ-01-0002-2015.

**HORIZON**  
**POWER**

DISTRIBUTION CONSTRUCTION  
STANDARDS

TYREE MKII NON-MPS  
6/11, 22, 33kV - 315, 630 & 1000kVA  
TRANSFORMER KIOSK  
INSTALLATION GUIDE

REVISION A	DATE 08/12/21
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DRAWING No.  
G4-06/2A

NOTES:-

1. THE FOLLOWING IS TO BE READ IN CONJUNCTION WITH AS3798 FOR EARTHWORKS, AS4678 FOR EARTH RETAINING STRUCTURES AND AS1597 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 UNIT. TRANSFORMER MUST BE LOWERED INTO PLACE FROM ABOVE WITHOUT ANY FORCE BEING APPLIED TO THE LV FRAME.
4. WHEN LANDING THE NON-MPS TRANSFORMER THE EDGE OF THE CULVERT SHOULD BE LOCATED 450mm FROM THE FRONT EDGE OF LV FRAME BASE.
5. COMPACTION OF SUBGRADE TO BE A MINIMUM MODIFIED DENSITY RATIO OF 95% TO AS1289.6.3.2 FOR A DEPTH OF 1000mm BELOW CULVERT BASE. IN CLEAN SAND THIS MAY BE MEASURED AS 10 BLOWS / 300mm WITH A STANDARD PENETROMETER.
6. VOID TO BE FILLED WITH SAND, HAND COMPACTION REQUIRED (NOT BY MACHINE).
7. COMPACTED BACKFILL MATERIAL IS TO BE CLEAN 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 AS1289.6.3.2. THIS MAY BE MEASURED AS 8 BLOWS / 300mm WITH A STANDARD PENETROMETER.  
FINAL LAYER SHALL BE COMPACTED AGGREGATE AS SPECIFIED IN G4-02/4 WITHIN 450mm OF EQUIPMENT. COMPACTED NATURAL FULL SHALL BE USED BEYOND 450mm.
8. PRECAST REINFORCED BOX CULVERT AND BASE TO AS1597 (100kN) STOCK CODE CA0002. NOMINAL (INTERNAL) SIZE OF CULVERT 1244 wide x 914 high x 1220 long. TO BE INSTALLED AS PER AS1597. EXTERNAL SIZE 1416 X 1022 X 1220.
9. 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 SHALL BE MADE SAFE WITH A SAFE SLOPE AS PER GUIDANCE IN G4-02/3 AND WA CODE OF PRACTICE - EXCAVATION.
10. 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 AS4678, THE REQUIREMENTS OF THE LOCAL GOVERNMENT AUTHORITY AND HORIZON POWER. THIS WORK SHALL BE CERTIFIED BY A PROFESSIONAL CIVIL ENGINEER (NPER).
11. 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).
12. A COMPACTION CERTIFICATE AS DETAILED IN AS1289.6.3.2 IS REQUIRED BY HORIZON POWER FOR ALL SUBSTATION INSTALLATIONS.

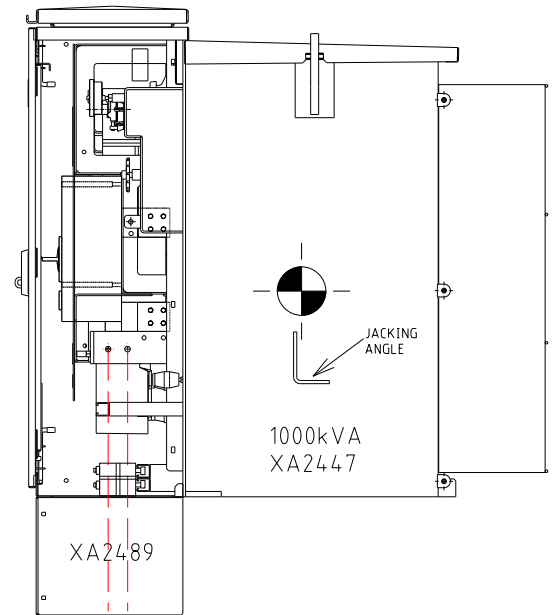
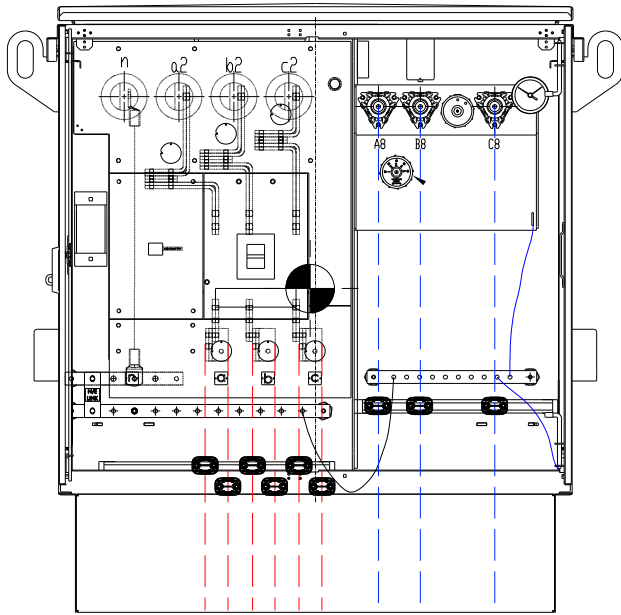


DISTRIBUTION CONSTRUCTION  
STANDARDS

TYREE MKII NON-MPS  
6/11, 22, 33kV - 315, 630 & 1000kVA  
TRANSFORMER KIOSK  
INSTALLATION GUIDE

REVISION A	DATE 08/12/21
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DRAWING No. G4-06/2B
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TYREE MKII NON-MPS

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

NOTES:-

1. CABLE CLAMP TO BE USED ON MV AND LV CABLES.
2. DESIGNER TO LIAISE WITH CONSUMER TO DETERMINE SUITBLE CLAMPS FOR CONSUMER MAINS CABLES,
3. WHERE HORIZON POWER DOES NOT HAVE SUITABLE CLAMPS FOR CONSUMER MAINS CABLES, CONSUMER IS TO PROVIDE CLAMPS,
4. HV CABLES TERMINATED USING 200A TYPE A SEPARBLE CONNECTOR ELBOWS,
5. CONSUMER TO PROVIDE SUITABLE LUGS AND CRIMP TOOL FOR THEIR CONSUMER MAIN CABLES.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE DISTRIBUTION DESIGN RULES - HPC-9DJ-01-0002-2015.

 DISTRIBUTION CONSTRUCTION STANDARDS	TYREE MKII NON-MPS 6/11, 22, 33kV- 315, 630 & 1000kVA TRANSFORMER KIOSK CABLE TERMINATIONS	REVISION C	DATE 08/12/21
		DRAWING No. G4-06/3	