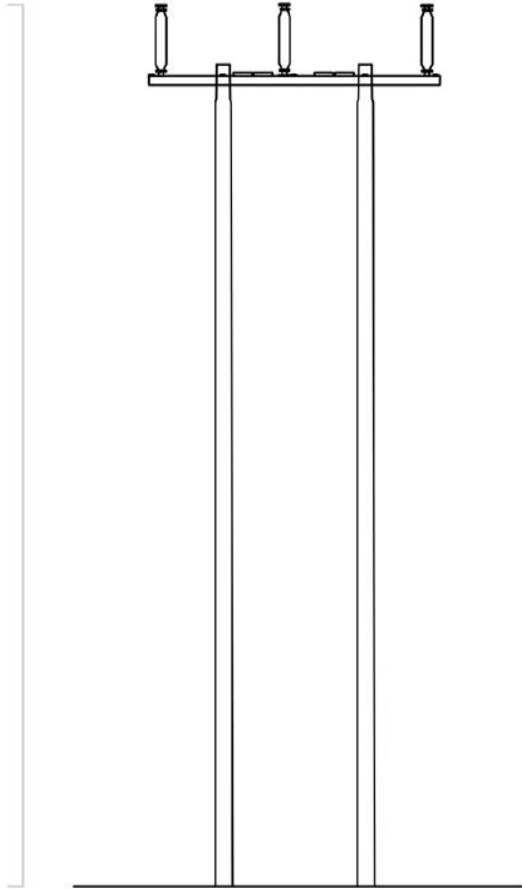


Appendix 4C

Project Infrastructure

Typical Overhead Line H-Pole

Typically
11 - 15 m



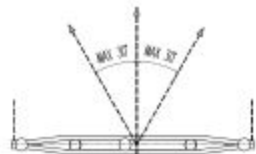
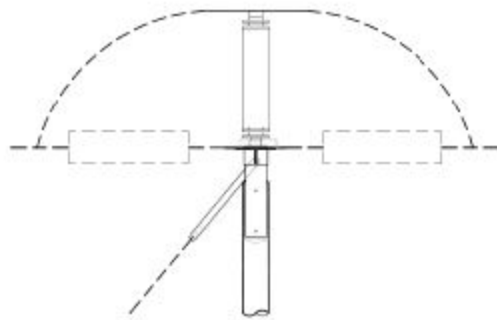
Typical H-Pole

NGED
Upper Ogmores Grid Connection
Environmental Statement

Typical H-Pole

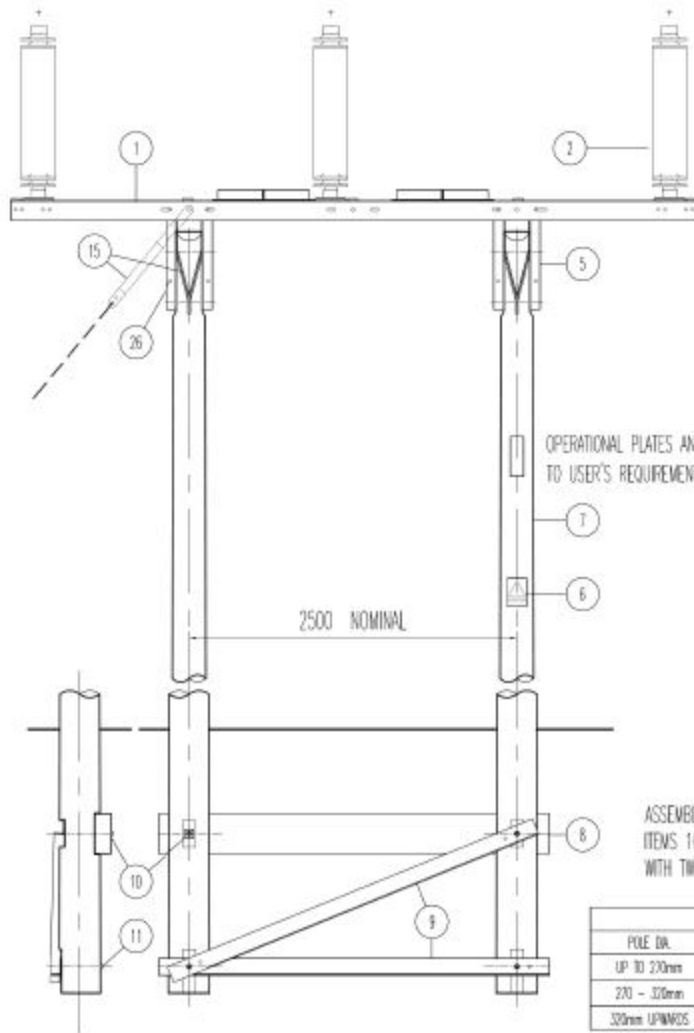
November 2025





CONNECTION TO SWITCHGEAR

MAXIMUM TENSION ON CONNECTIONS TO SWITCHGEAR OR OVERHEAD LINE 4 . 4kN (450kgf) PER PHASE

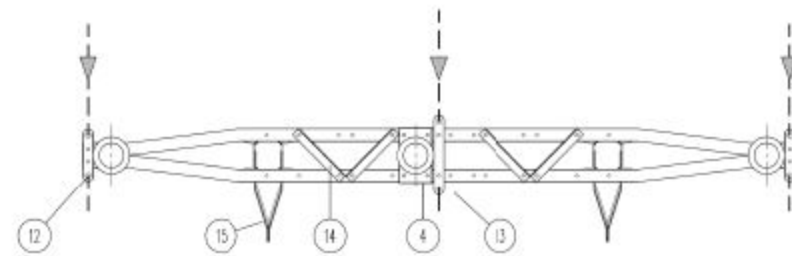


OPERATIONAL PLATES AND DEVICES TO USER'S REQUIREMENTS

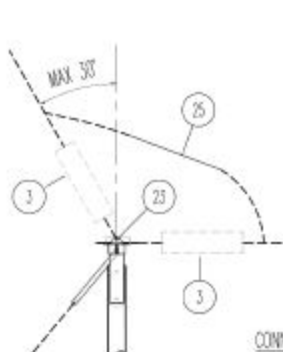
2500 NOMINAL

ASSEMBLY BOLTS:-
ITEMS 16, 17 & 18 TO BE SUPPLIED WITH TIM FULL NUTS AND HEAVY GAUGE WASHER.

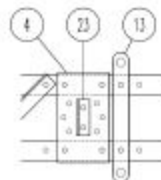
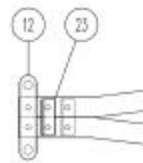
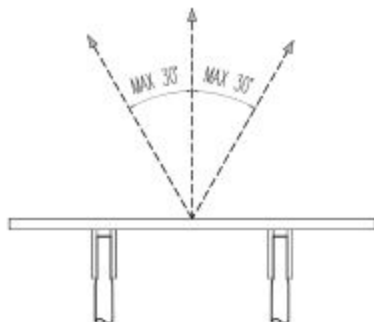
FOUNDATION BOLTS		
POLE DIA.	ITEM 8	ITEM 9
UP TO 230mm	400mm	375mm
270 - 320mm	530mm	450mm
320mm UPWARDS	750mm	530mm



No.	ITEM	ENATS STANDARD ORG No. OR BS REF	No. OF	REMARKS
1	ANGLE CROSSARM	439533	2	
2	POST INSULATOR & CONDUCTOR CLAMP	ENATS 43-93	3	SEE MORE
3	TENSION INSULATORS AND INSULATOR FITTINGS	ENATS 43-93	6 SETS	
4	INSULATOR MOUNTING PLATE	BS 3288	6 SETS	
5	CROSSARM SUPPORT CHANNEL	439540	1	
6	DAWNER PLATE	439534	4	
7	WOOD POLE	439701	1	
8	WOOD POLE	435004	2	
9	BRACE BLOCK	435004	2	
10	Y' POLE FOUNDATION BRACE	439112	1	TYPE 2
11	SQUARE FLAT WASHER	439545	2	
12	SQUARE CURVED WASHER	439604	3	
13	SHORT TYPE STRAPS	439605	2	
14	LONG TYPE STRAPS	439541	2	
15	CROSS BRACING	439542	1	
16	STAY ASSEMBLY	439543	4	
17	WASHER WAFER 1"	ENATS 43-91	1	SEE MORE
18	M20 x 60 BOLT	ENATS 43-96	35	
19	M24 x 60 BOLT	ENATS 43-96	4	
20	M20 x 375 BOLT	ENATS 43-96	4	
21	M20 x 450 BOLT	ENATS 43-96	4	AS REQUIRED
22	M20 x 530 BOLT	ENATS 43-96	4	AS REQUIRED
23	M20 x 750 BOLT	ENATS 43-96	4	AS REQUIRED
24	CROSSARM DOWNLEAD PLATE	ENATS 43-96	3	SEE MORE
25	BOLTS M20 x 60	ENATS 43-96	6	
26	JUMPER SOFTNER	ENATS 43-96	3	
27	ENRTHING ATTACHMENT NUT	439554	1	

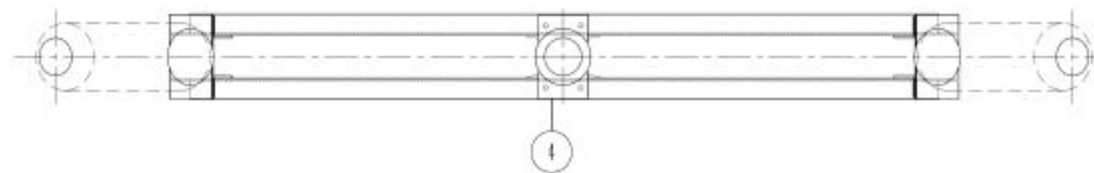
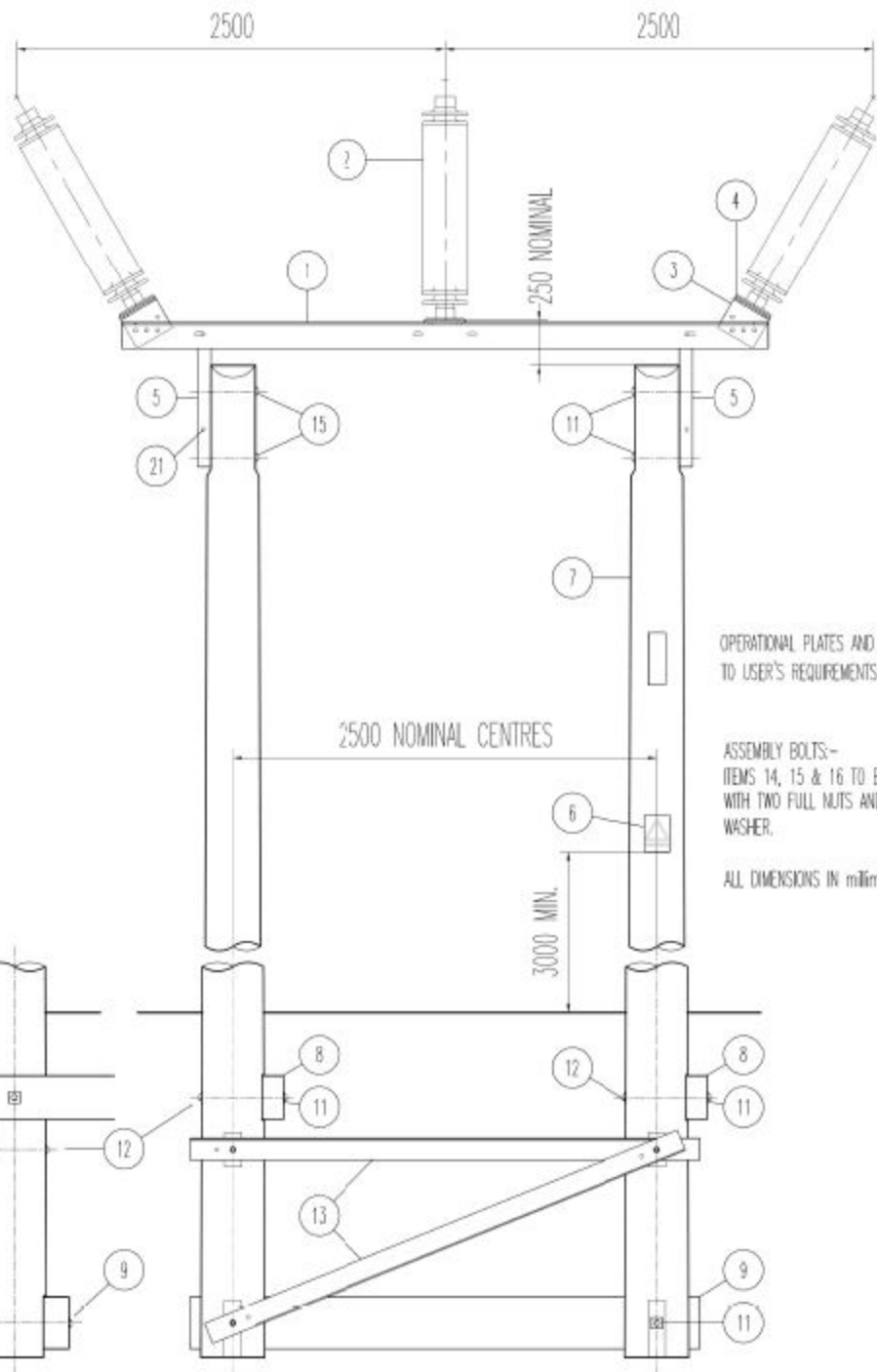


CONNECTION TO OVERHEAD LINE



DOWNLEAD ATTACHMENT PLATE CROSSARM POSITION

ITEM 2 - NOT REQUIRED FOR DOWNLEAD TERMINAL
ITEMS 23, 24 & 25 - NOT REQUIRED FOR SWITCHGEAR TERMINAL
ITEM 15 - IN ADDITION TO TERMINAL BACK STAYS, SIDE STAYS MAY BE FITTED TO COUNTERBALANCE DOWNLEADS.

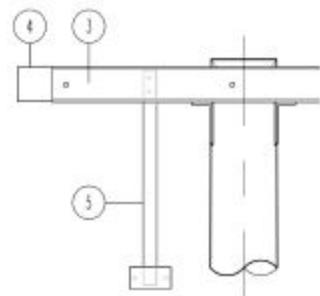


No.	ITEM	ENATS STANDARD DRG No. OR BS REF	No. OF	REMARKS
1	INTERMEDIATE CROSSARM	439532	2	2.5m SPACING
2	POST INSULATOR & CONDUCTOR CLAMP	ENATS 43-93	3	
3	INSULATOR ANGLE BRACKET SUPPORT	439539	4	
4	INSULATOR MOUNTING PLATE	439540	3	
5	CROSSARM SUPPORT CHANNEL	439534	2	
6	DANGER PLATE	439701	1	
7	WOOD POLE	435003	2	
8	TOP BULKES	439103	2	
9	BRACE BULK	439112	1	TYPE 2
10	'H' POLE FOUNDATION BRACE	439545	2	
11	SQUARE FLAT WASHER	439604	9	
12	SQUARE CURVED WASHER	439605	4	
13	M20 x 60 BOLT	ENATS 43-96	29	
14	M20 x 80 BOLT	ENATS 43-96	18	
15	M20 x 260 BOLT	ENATS 43-96	4	
16	M20 x 375 BOLT	ENATS 43-96		AS REQUIRED
17	M20 x 450 BOLT	ENATS 43-96		AS REQUIRED
18	M20 x 530 BOLT	ENATS 43-96		AS REQUIRED
19	M20 x 750 BOLT	ENATS 43-96		AS REQUIRED
20	WASHER TAPE - D M20	ENATS 43-96	5	
21	EARTHING ATTACHMENT NUT	439554	1	

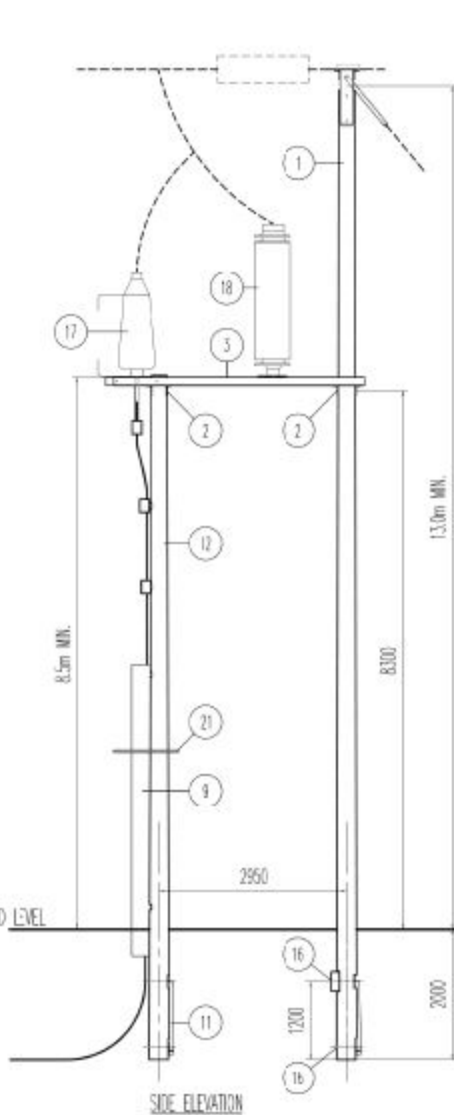
FOUNDATION BOLTS		
POLE DIA.	ITEMS 8 & 9	ITEM 10
UP TO 270mm	450mm	375mm
270 - 320mm	530mm	450mm
320mm UPWARDS	750mm	530mm

Overhead Line to Underground Cable Terminal Connection Point (H-Pole)

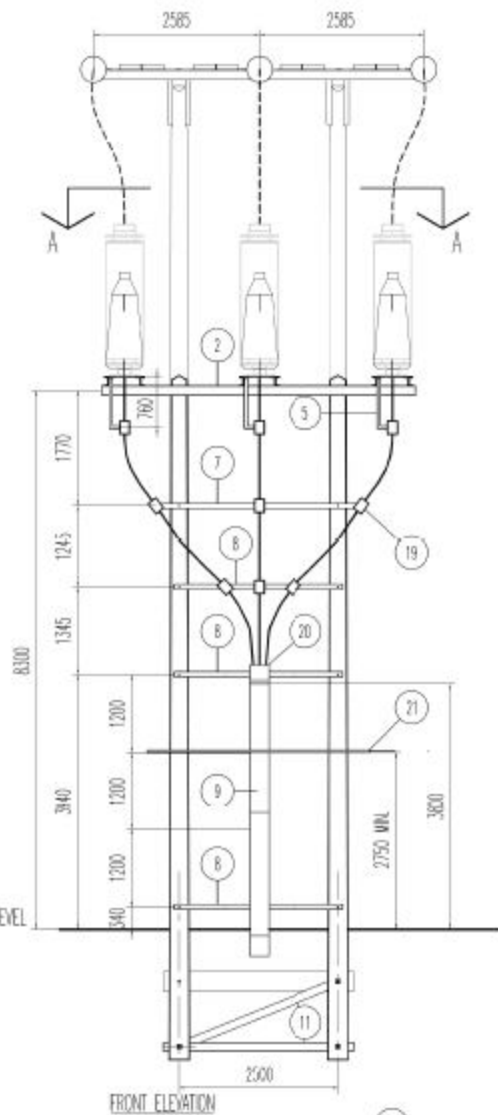




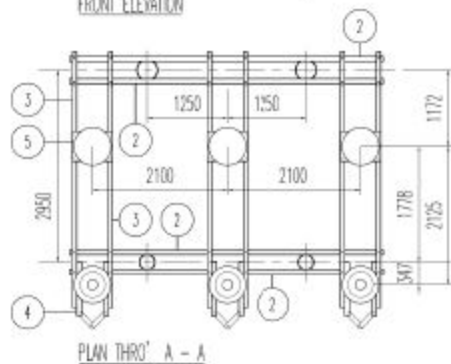
PART DETAIL OF SIDE ELEVATION
AT CHANNEL SUPPORT ENDS



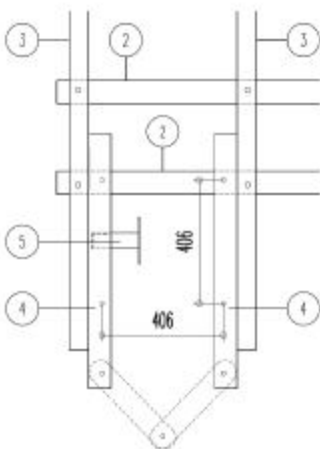
SIDE ELEVATION



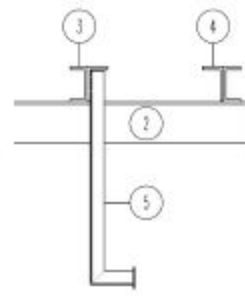
FRONT ELEVATION



PLAN THRO' A - A



PART DETAIL OF PLAN AT CHANNEL SUPPORT ENDS
CABLE SEALING ENDS OMITTED



PART DETAIL OF FRONT ELEVATION

No.	ITEM	ENAT STANDARD ORG. N. OR BS REF.	No. OF	REMARKS
1	TERMINAL 'Y' POLE	435014	1	SEE NOTES
2	CROSSARM CABLE TERM	43545	4	
3	CHANNEL SUPPORTS	43547	6	
4	SEALING END SUPPORT	43548	3 SETS	IN HANDED PAIRS
5	CABLE CLEAT SUPPORT	43549	3	
6	SURGE INVERTER SUPPORT PLATE	43550	3	
7	CABLE SUPPORT CROSSARM 'X'	43551	1	
8	CABLE SUPPORT CROSSARM 'Y'	43552	3	
9	132kV CABLE GUARD	43553	2	
10	CABLE BACKBOARD	43518	1	
11	'X' POLE FOUNDATION BRACE	43545	2	
12	CABLE TERMINAL AUX. POLE	43505	2	
13	M12 x 50 BOLT	EN41 - 95	6	
14	M16 x 50 BOLT	EN41 - 95	54	
15	M20 x 375 BOLT	EN41 - 95	14	
16	SQUARE CUPPED WASHER	43605	3	
17	132kV SEALING END		3	SEE NOTES
18	132kV SURGE INVERTER		3	
19	SINGLE CABLE CLEAT		9	
20	TRIFOIL CABLE CLEAT		4	
21	ANTI-CLIMBING DEVICE	EN41 - 90	-	

NOTES

ITEM 1 TO INCLUDE ALL ITEMS FROM 435014 EXCEPT Nos. 2, 23, 24 & 25.

ITEM 17 132kV SEALING END TO INCLUDE ARCING HORNS AND EARTH END ATTACHMENT PLATES

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

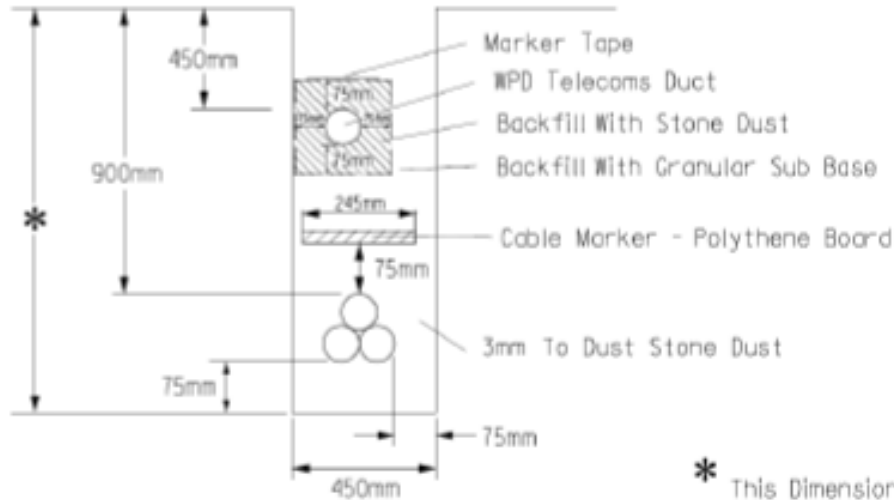


ENATS Drawing No. 435016

General Arrangement Pole Mounted Cable Termination - Straight Crossarm

66kV Cable Trenches

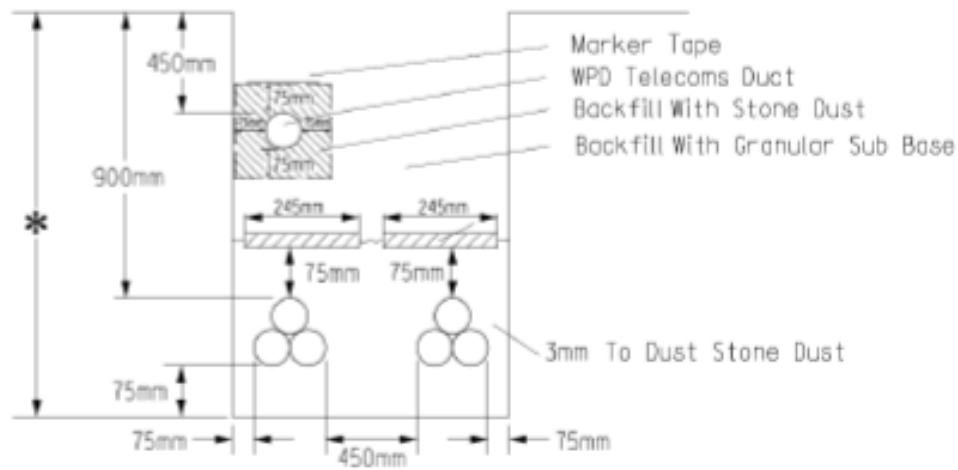
SINGLE CIRCUIT



75mm Cover To Marker Tape
75mm Fine Stone Dust Bedding

* This Dimension Will Vary Due To The Diameter Of The Respective Cable Being Installed

DUAL CIRCUIT



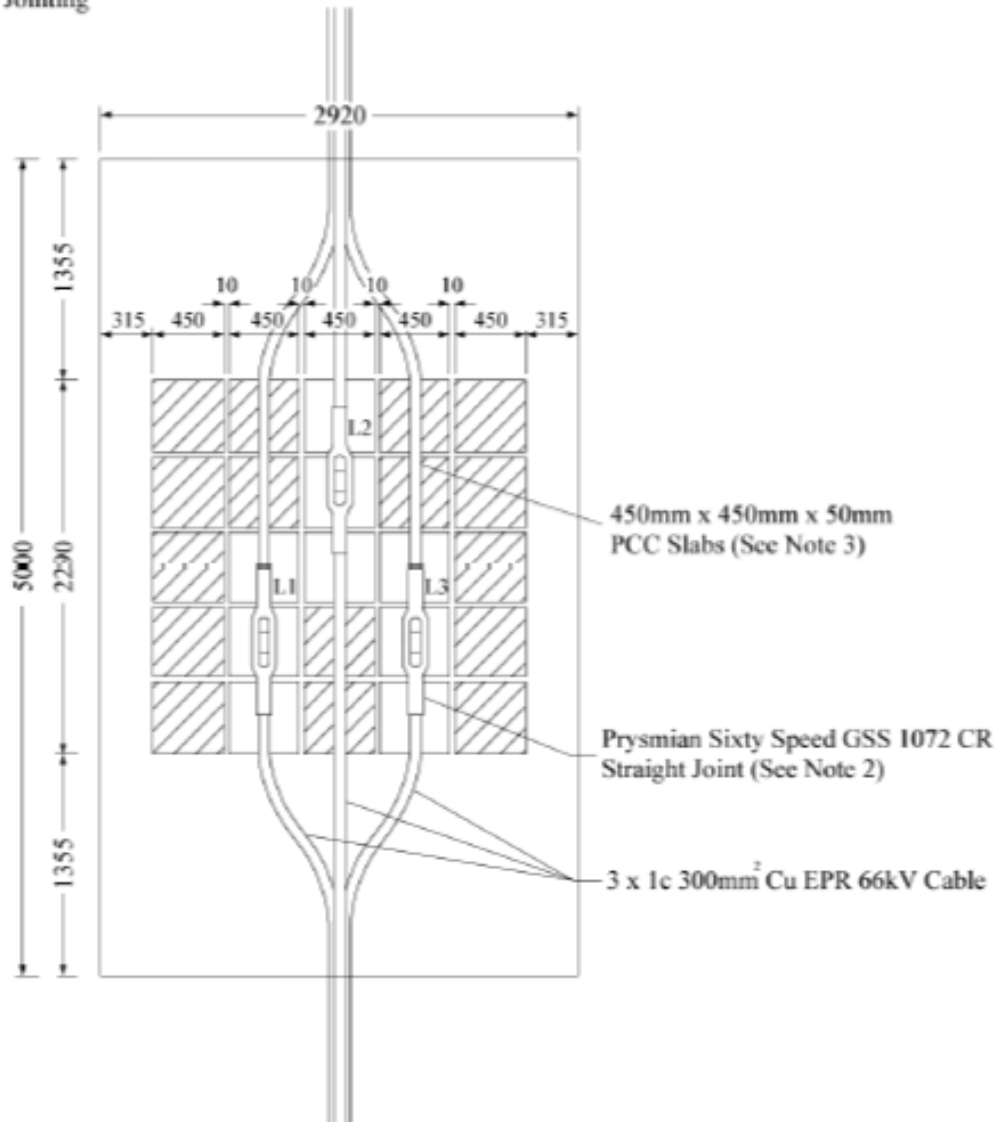
75mm Cover To Marker Tape
75mm Fine Stone Dust Bedding

12	RJB			01/19	SURF RENAMED WPD TELECOMS		
Rev No	Drawn	Chk'd	App'd	Date	Revision		
ORIGINAL ISSUE	DATE	WESTERN POWER DISTRIBUTION Design Department. Avonbank, Feeder Road, Bristol BS2 0TB Tel: 0117 933 2000 Fax: 0117 933 2001.					
Drawn	R. J. B.	05.00			Title	Org. No.	Rev No
Checked	P. K.				LAYING OF WPD TELECOMS DUCT WITHIN 66KV TRENCH CABLES LAID IN TREFOIL	G4064.66	12
Approved							
SCALE	N. T. S.						

66kV Joint Bay Layouts

Note :-

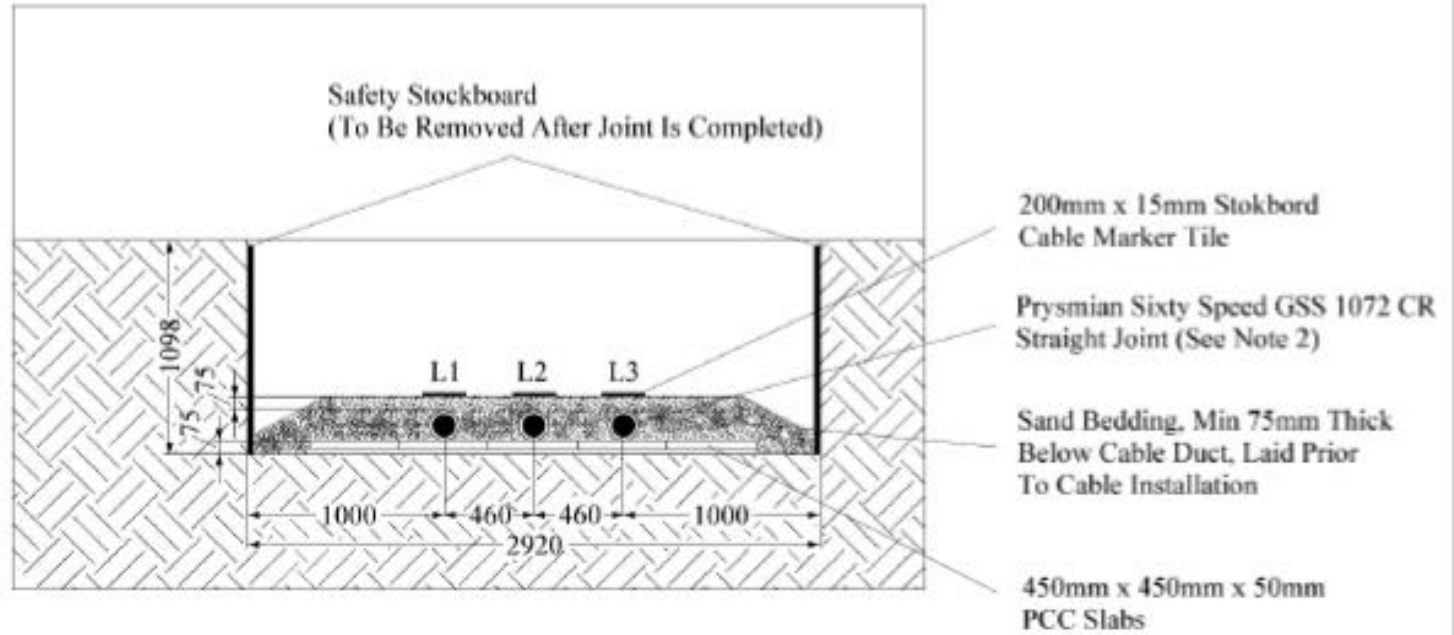
- 1 All Dimensions Are In mm
- 2 Sandbag Support To Be Used As Shown In WPD Technical Standard CA6A/3 (Page 22) For Details
- 3 Hatched Slabs May Be Removed Upon Completion Of Jointing



Rev No	Drawn	Chk'd	App'd	Date	Revision
ORIGINAL ISSUE	DATE	WESTERN POWER DISTRIBUTION Design Department. Arankumbh'pander Road, Oriskal 822 978 Tel: 0117 933 2000 Fax: 0117 933 2001.			
Drawn	RJD	10/16	Title		
Checked			TYPICAL 66kV JOINT BAY LAYOUT		
Approved			Drg. No. 3.7.2 Rev No		
SCALE	N.T.S.				

Note :-

- 1 All Dimensions Are In mm
- 2 Sandbag Support To Be Used As Shown In WPD Technical Standard CA6A/3 (Page 22) For Details



Rev No	Drawn	Drk'd	App'd	Date	Revision
ORIGINAL	ISSUE	DATE	WESTERN POWER DISTRIBUTION Design Department Avonbank Feeder Road, Bristol BS2 0TB Tel: 0117 903 2000 Fax: 0117 903 2001		
Drawn	RJB	10/16	TITIB		
Checked			66kV JOINT BAY CROSS SECTION		
Approved			TYPICAL		
SCALE	N.T.S.		Drq. No.		Rev No
			3.7.2A		

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uPVC and PE General Specification



uPVC & PE UNDERGROUND DUCT Material Comparison EF450-074



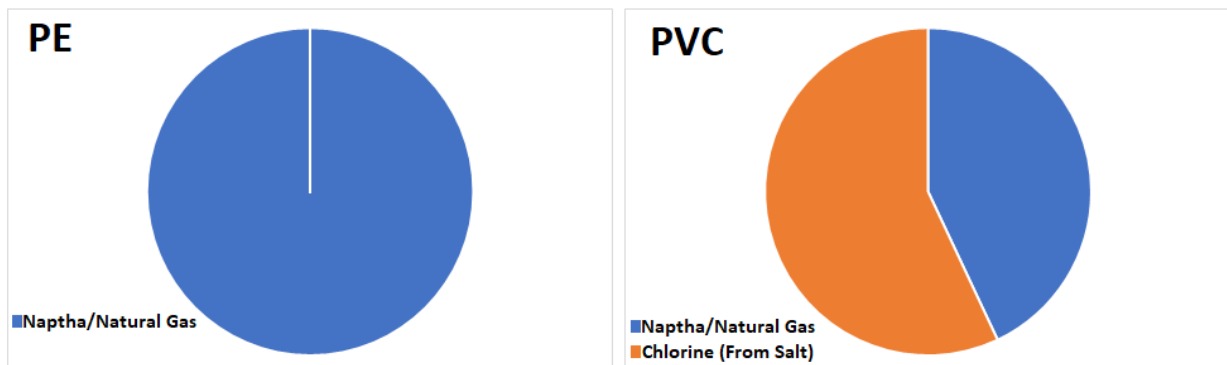
General

Polyethylene (PE) and Poly Vinyl Chloride (PVC) are raw materials used in the manufacture of underground duct systems. This document will compare the material properties, manufacturing requirements, manual handling and the health/environment issues associated with PE and PVC.

Material Chemical Properties

Polyethylene (PE) and Poly Vinyl Chloride (PVC) have very similar chemical structures. PE is similar to PVC but without the chlorine. The polymer chains of both materials would look the same if the chlorine atoms in PVC were replaced hydrogen atoms.

- To make PE resin, 100% naphtha or natural gas (fossil fuel) is used.
- To make PVC resin, 43% naphtha or natural gas and 57% chlorine (from salt).



PVC uses **less than half** the amount of fossil fuel to manufacture. From an environmental perspective, fossil fuel depletion is a long-term concern as it is a non-renewable resource. Consequently, it is not unreasonable to assume that PE will consume more fossil fuel per metre of pipe than what PVC would consume.

PVC requires salt (chlorine from sodium chloride) whilst PE does not. Salt is a hugely abundant natural resource with tens of thousands of years' worth of resources available. This is not the case for naphtha/natural gas which is a non-renewable resource.

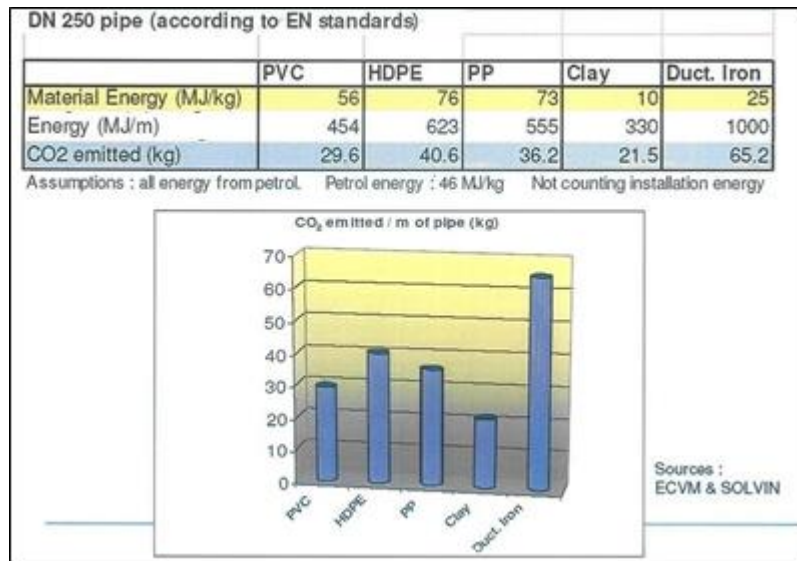
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Manufacturing

The table below details the associated manufacturing energy requirements for 5 types of duct material including PE and PVC. The figures are a comparison based on the manufacture of a 250mm duct.



Manufacturing Energy

Due to the increased material quantity required to manufacture PE duct, the manufacturing energy cost is consequently higher too. As a result of this there is a higher cost associated with the purchasing, processing and handling of PE raw materials.

CO₂ Emissions

Carbon Dioxide (CO₂) occurs naturally in the atmosphere as a byproduct of photosynthesis. Levels of CO₂ are also significantly increased by the manufacturing industry through the burning of fossil fuels such as oil and gas. High global CO₂ levels are considered a major contributing factor to global warming. To incentivise the reduction of CO₂ production and slow down the effects of climate change, many countries have introduced a CO₂ tax.

The quantity of CO₂ produced is significantly higher for PE when compared to PVC and as such will have a greater impact on a manufacturer's 'Carbon Footprint'.

COSHH & Environment

Historically PVC duct has been manufactured with stabilizers such as lead which is considered harmful to health & the environment. Today calcium - zinc are used which are modern, safer alternative stabilizers that do not carry the associated health risks of lead.

COSHH assessment for PVC: **See Appendix A**

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Applications

Both provide **exceptional chemical resistance** and longevity especially compared to more traditional materials such as clay or ductile iron. Lifetimes of ducts are typically in excess of 100 years. PVC duct has better weathering performance than PE. Ducts manufactured from either material are generally buried underground and therefore are not exposed to excessive UV radiation.

There are differences in the way these materials can be used to manufacture duct. For example, PVC can be produced via an orientation process which gives exceptional strength. Equally, PE pipes have an advantage in that lengths can be fusion welded together whereas PVC tends to be finished with a socket and a spigot end.

Manual Handling.

Ducts manufactured from PE typically have a higher wall thickness when directly compared to PVC equivalents. As such there is a significantly higher material weight per meter required.

For example, a 6m length 180mm SDR11 duct would weigh an estimated 51.06kg. This exceeds the recommended the manual handling weight (based on 2 people lifting) of 25kg per person.

A 6m 180mm Class 1 PVC duct would weigh an estimated 27.24kg which is safer load at just 13.62kg per person. The table below details the % difference in weight between SDR11 PE & C1 PVC.

Diameter	PE SDR11	uPVC	% Difference
50mm	0.67kg/m	0.54kg/m	-19.40%
110mm	3.17kg/m	1.85kg/m	-41.64%
125mm	4.12kg/m	2.43kg/m	-41.02%
160mm	6.73kg/m	3.57kg/m	-46.95%
180mm	8.51kg/m	4.54kg/m	-46.65%
200mm	10.50kg/m	5.50kg/m	-47.61%
225mm	13.29kg/m	6.31kg/m	-52.52%
250mm	16.34kg/m	7.77kg/m	-52.44%

Installation

PVC duct arrives on site ready to install. Most available PVC duct sizes can be lifted/moved around site between 2 people. Complete with integral sockets and spigots - an entire system can be assembled by hand which provides IP68 joins (IRS) capable of withstanding 10 bar of internal pressure. PVC duct can also be supplied in preformed bends designed to suit the bending radius of power cables. The preformed bends allow PVC systems to navigate around buildings and existing infrastructure underground while keeping the cable secure. Using a preformed bend ensures that there will be no kinks and that cables can be drawn through with ease.



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PE duct arrives on site either on a pallet or coiled up. Coiled duct will need to undergo a relaxation period for it to be laid flat in a trench. Sticks of PE can be installed straight away however they will often require additional equipment to move and join. Either separate couplers or a fusion welding machine will be required to join the plain ends of the duct. Downtime during the relaxation period and additional equipment hire and maintenance make PE a less cost-effective product to work with on site.



Additional PVC Advantages















- No relaxation period required PVC duct (when compared to coiled PE). Duct can be put into service immediately.
- No couplers required for PVC duct. Each length of Emtelle PVC duct is complete with a formed socket available in either an interference fit (IP4X) or an interference ring seal (IP68/10 Bar).
- PVC has a higher chemical resistance to hydrocarbon permeation and chlorine induced oxidation.
- For any given OD, PVC will always have a larger ID, thus greater internal capacity than HDPE.
- PVC is availability in multilayer/foam core duct which drives down the requirement for virgin raw material. Offers a cost saving and a saving on raw material.

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Appendix A









		COSHH Risk Assessment No:						
Name of chemical: PVC Ducting and Fittings			Manufacturer: Emtelle UK Limited					
Describe the activity or work process. <i>(Include how long and how often this is carried out and the quantity of substance used)</i>		Finished products designed for telecommunications, power, drainage and general use. Dust maybe created if using a grinder blade type cutting device.						
Location of process being carried out?		Used in external applications generally below ground.						
Identify the persons at risk:		Employees	<input type="checkbox"/>	Contractors	<input checked="" type="checkbox"/>	Public	<input type="checkbox"/>	
Classification (state the category of danger)								
	<input type="checkbox"/>	Very Toxic		<input type="checkbox"/>	Irritant		<input type="checkbox"/>	Extremely Flammable
	<input type="checkbox"/>	Toxic		<input type="checkbox"/>	Sensitising		<input type="checkbox"/>	Highly Flammable
	<input type="checkbox"/>	Corrosive		<input type="checkbox"/>	Biological		<input type="checkbox"/>	Flammable
	<input type="checkbox"/>	Harmful		<input type="checkbox"/>	Oxidising		<input type="checkbox"/>	Environmental
Hazard Type								
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Gas	Vapour	Mist	Fume	Dust	Liquid	Solid	Other (State) _____	
Route of Exposure								
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Inhalation	Skin	Eyes	Ingestion	Other	(State) _____			
Workplace Exposure Limits (WELs) please indicate n/a where not applicable								
Long-term exposure level (8hrTWA): PVC resin homopolymer 10mg/m3 Inhalable PNOC (particulates Not Otherwise Classified)				Short-term exposure level (15 mins): 15mg/m3 as total dust				
State the Risks to Health and controls from Identified Hazards								
Emergency Overview : Under normal use conditions considered to present minimal hazard from a human health and environmental standpoint. In case of decomposition may release toxic gas. (HCR)								
Route of Entry : Inhalation : Yes Skin : No Ingestion : No								
Potential Effects of exposure : none form finished products, see dusts below.								
Inhalation (dusts) : Typical of all non- soluble dusts, chronic inhalation may cause pulmonary damage.								
Eyes (dusts) : May cause eye irritation Direct eye contact causes allergic dermatitis and conjunctivitis								
Skin contact : Minimal exposure.								
Ingestion : Minimal exposure.								
Control Measures: <i>(for example extraction, ventilation, training, supervision). Include special measures for vulnerable groups, such as disabled people and pregnant workers. Take account of those substances that are produced from activities undertaken by another employer's employees.</i>								



Exposure controls :
Ventilation : For outdoor use.
Respiratory protection : In case of dust clouds when cutting, wear PP3 dust mask.
Hand gloves : Optional for general handling.
Eye protection : Protective goggles in high dust concentrations if cutting with a disc cutter, hand saw is recommended.
Skin protection : Standard site workwear.

Is health surveillance or monitoring required? Yes No

Personal Protective Equipment (state type and standard)

 <input checked="" type="checkbox"/>	PP3 APPROVED DUST MASK, IF CUTTING.	 <input type="checkbox"/>	
 <input type="checkbox"/>		 <input checked="" type="checkbox"/>	PROTECTIVE GOGGLES IN HIGH DUST CONCENTRATIONS, IF CUTTING.
 <input checked="" type="checkbox"/>	RIGGER TYPE GLOVES	 <input checked="" type="checkbox"/>	SITE SUPPLIED PROTECTIVE CLOTHING FOR GENERAL WORK
 <input checked="" type="checkbox"/>	BOOTS	 <input type="checkbox"/>	

First Aid Measures FOR DUST FROM CUTTING.

Skin contact : None required

Eye contact : Flush eyes with running water for at least 15 minutes whilst keeping the eyelids wide open

Ingestion : If the subject is completely conscious : n/a

Inhalation : Remove the subject to fresh air and support breathing as needed

Storage

Handling :
Use lifting equipment for pallets, single items require manual handling by trained staff.

Storage :

- On level ground

Disposal of Substances & Contaminated Containers



Hazardous Waste Skip Return to Depot Return to Supplier Other

(If Other Please State):

Waste treatment :

- PVC is not a listed hazardous. Waste can be recycled as part of site waste plans in line with local environmental laws and regulations.

RCRA Hazardous waste : Not Listed.

Spillage

Precautions : Avoid excessive dust if cutting use a hand saw that will create swarf rather than dust.

Cleanup methods :

- Clean up swarf by sweeping or vacuum.

Precautions for protection of the environment :

- Clean up residual material by sweeping.
- Do not flush to drain.
- Prevent material from entering public sewer systems or any waterways
- Dispose of cutting waste into land fill skip.

Is exposure adequately controlled?

Yes

No

Risk Rating Following Control Measures

High

Medium

Low

Assessed by: J.Bathgate

Date: 02.02.2016

Review Date: Feb 2018