Document Reference: CDS-GTS-01-001-R0

HV Underground Cable

Technical Schedules

Revision History

R0	21/05/2021	Major revision of CDS-HTS-01-001 TS, new file name: physical, electrical and tech schedule tab fully revised. Standard dwgs added	Daniele Giustini	Aidan Geoghegan

This document supersede CDS-HTS-01-001 TS

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Physical Characteristics of Crosslinked Polyethylene Cables

Note: All dimensions to be filled in where applicable.

Item	Query	S.I. Units	Required	offered
1	Conductor:		IEC 60228 in general (Plus Contractors Dimensions)	
	(a) Material			
	(b) Type e.g. round, etc.			
	(c) Design e.g. stranded, solid, etc.			
	(d) Ovality			
	(e) Nominal diameter	(mm)		
	(f) Cross-sectional area	(mm^2)		
	(g) Uni-directional or Bi-directional stranding			
	(h) No. of Milliken sections			
	(i) Is there a centring conductor piece			
	(j) Diameter and material type of centring conductor			
	(k) Enamelled/Coated			
	(l) Semi-Conducting tape binder			
	(m) Method of water blocking			
	(n) No. of layers of water blocking			
2	Inner Semi-conducting Layer:		Manufacturer Dimensions	
	(a) Material			
	(b) Nominal thickness	(mm)		
	(c) Minimum thickness at a point	(mm)		
3	Insulation:		EirGrid Spec CDS-GFS-00-001-R1	
	(a) Material			
	(b) Nominal thickness	(mm)		
	(c) Minimum thickness	(mm)		
	(d) Diameter over insulation = Ovality of cable Core	(mm)		
4	Outer Semi-conducting Layer:			
	(a) Material		Manufacturer Dimensions	
	(b) Nominal thickness	(mm)		

	(C) Minimum thickness at a point	(mm)		
5	Nominal diameter over cable core	(mm)	EirGrid Spec CDS-GFS-00-001-R1	
	Roundness of cable core	(mm)		
	Ovality of cable core < 0.9mm for HV			
6	Radial thickness of insulation including semi-conducting layers		Manufacturer Dimensions	
	(a) Nominal	(mm)		
	(b) Minimum	(mm)		
7	Bedding Layer/Water Barrier		Manufacturer Dimensions	
	(a) Material			
	(b) Thickness	(mm)		
	(c) OD of bedding layer	(mm)		
	(d) Overlap percentage of tape	%		
	(e) Method of electrical connection between 4 and 8			
	(f) Method of water blocking			
8	Screen Wires		EirGrid Spec CDS-GFS-00-001-R1	
	(a) No. of screen wires	No.		
	(b) Diameter of screen wires	mm		
	(c) Aluminium or copper screen wires			
	cross sectional area	mm2		
	Nominal OD of sheath	mm		
	(c) Nominal thickness	mm		
	(d) Lay length of wires	mm		
	(e) Max spacing between any individual screen wire = 8mm	mm		
	(f) Average spacing between screen wires <=4mm	mm		
	(g) Width of counter helix tape	mm		
	(h) Thickness of counter helix tape	mm		
	(i) Lay length of counter helix tape	mm		
?	Water Blocking Tape		Manufacturer Dimensions	
	(a) Thickness of water blocking tape	mm		
	(b) Outer diameter of water blocking tape	mm		
	(c) Overlap percentage of water blocking tape	%		
9	Sheath:		EirGrid Spec CDS-GFS-00-001-R1	
	(a) Material			
	(b) Type, corrugated or smooth			
	(c) Nominal thickness	(mm)		
	(d) Mean diameter	(mm)		
	(e) Cross-sectional area	(mm^2)		
	(f) Diameter over crest of corrugations	(mm)		

	(g) OD of sheath if not corrugated	(mm)		
10	Adhesive Layer beneath HDPE outer sheath		Manufacturer Dimensions	
	(a) Thickness	(mm)		
	(b) Maximum gaps in adhesive			
11	Outer Sheath:		IEC 60840 IEC 620267	
	(a) Material			
	(b) Density	(kg/m³)		
	© Nominal thickness	(mm)		
	(d) Minimum thickness	(mm)		
	(e) Shore D hardness [Required value 55-61]			
	(f) Shrinkage			
12	Conductive Layer over Outer HDPE Sheath:		Manufacturer Dimensions	
	(a) Coefficient of static and dynamic friction of cable based on sidewall force equal to cable weight/m for straight line pull in HDPE pipe; static and dynamic coefficient (i) For graphite layer (ii) Extruded outer conductive layer [shall be low as possible]			
	(b) Coefficient of static and dynamic friction based on 5000 N/m sidewall force in HDPE pipe; static and dynamic coefficient (i) For graphite layer (ii) For extruded outer conductive layer [shall be low as possible]			
13	Nominal diameter of completed cable	(mm)	Manufacturer Dimensions	
14	Weight of finished cable	(kg/m)	Manufacturer Dimensions	
15	(a) Normal length per drum	(m)	Manufacturer Dimensions	
	(b) Maximum length per drum	(m)		
16	(a) Normal gross weight of loaded drum	(kg)	Manufacturer Dimensions	
	(b) Max gross weight of loaded drum	(kg)		
17	Max. drum dimensions width/height	(m/m)	Manufacturer Dimensions	
18	Minimum radius of bend around which cable can be pulled		Manufacturer Dimensions	
	(a) Laid direct	(m)		
	(b) In ducts	(m)		
	(c) Cable placed in position with former	(m)		
	(d) Cable placed in position without former	(m)		

19	Permissible pulling force allowed on conductors during installation	(kN)	Manufacturer Dimensions	
20	Maximum permissible sidewall forces	(kN)	Manufacturer Dimensions	
21	Cable bending Moment Max Cable bend force (Cenelec Test Method)	N.m kN	Cenelec Bend Test	
22	Cable stiffness Modulus EI	Nm2	Manufacturer Dimensions	
23	Do cable water blocking layers in conductor and cable screen area meet requirements of this specification?		BS 7912 Part 2 and IEC 60840 And IEC 62067	

Electrical Characteristics of Crosslinked Polyethylene Cables

Note: All dimensions to be filled in where applicable.

Item	Query	S.I. Units	Required	offered
1	Maximum DC resistance of conductor at 20°C (For 220 kV 2500 sq AL <= 12 μ Ω/km)	Ω/km	IEC 60228	
2	Maximum AC resistance of conductor at 20°C	Ω/km	Manufacturer Value	
3	Maximum AC resistance of conductor at 90°C (For 220 kV 2500 sq Cu enamelled <= 9.9 μ Ω/km)	Ω/km	Manufacturer Value	
4	Maximum DC resistance of conductor @ 90°C	Ω/km	IEC 60228	
5	Minimum insulation resistance > 5 GΩ.km	Mohm/km	EirGrid Spec CDS-GFS-00-001-R1	
6	Maximum phase inductance	mH/km	Manufacturer Value	
7	Maximum phase capacitance	μF/km	Manufacturer Value	
8	Maximum charging current per phase @ Uo	A/km	Manufacturer Value	
9	Susceptance	S/km	Manufacturer Value	
10	Zero phase sequence impedance for 3-phase cable (R0 + jX0)	W/km	Manufacturer Value	
11	Maximum permissible continuous temperature of conductor/sheath	°C/°C	Manufacturer Value and EirGrid Spec CDS-GFS-00-001-R1	
12	Maximum permissible continuous current rating when installed as per standard drawing;	A (s/w)	EirGrid Spec CDS-GFS-00-001-R1	
	In Air @25 degrees (flat formation with 200 mm separation between conductors)	A (s/w)		
	Electromagnetic fields (EMF) at ground level	μT	<100μT	
13	Single phase maximum AC/DC sheath resistance at 20°C (for smooth Al screen)	Ω/km	EirGrid Spec CDS-GFS-00-001-R1	
13	Maximum AC resistance of screen wires @ 20°C	Ω/km	Manufacturer Value	
13a	Maximum DC resistance of screen wires @20°C	Ω/km	Manufacturer Value	
13b	Maximum AC aluminium foil resistance @20°C	Ω/km	Manufacturer Value	
13c	Maximum DC aluminium foil resistance @20°C	Ω/km	Manufacturer Value	
13d				
14	Losses:			
	(a) Conductor loss per phase at current in item 12(a)	W/m	Manufacturer Value IEC 60840 and IEC 62067	
	(b) Dielectric losses per phase at Uo @90 °c	W/m		
	c) Sheath loss per phase at current in item 12(a)	W/m		
	(d) Copper wire screen losses	W/m		
	(e) Aluminium foil losses	W/m		
	(f) eddy current losses			
	(g) Total losses per phase	W/m		
15	Maximum/expected dielectric loss angle at Uo and a conductor temperature of:		Manufacturer Value IEC 60840 and IEC 62067	
	20°C	%		
	40°C	%		
	60°C	%		
	Maximum operating temperature +5°C	%		

16	Maximum/expected dielectric loss at 20°C and:		Manufacturer Value	
	0.5 Uo	%		
	1.0 Uo	%		
	1.5 Uo	%		
	2.0 Uo	%		
17	Thermal resistance between conductor and metallic sheath	Km/W	IEC 60287	
18	Thermal resistivity of:		IEC 60287	
	(a) Insulation and semi-conducting layers	Km/W		
	(b) Anti-corrosion serving	Km/W		
19	Design 1.2/50 ms impulse stress for 550/1050kV at conductor/core screen	kV/mm	Manufacturer Value	
20	Design Switching Impulse stress for 1050kV at conductor/core screen	kV/mm	Manufacturer Value	
21	Design AC stress for Uo at conductor/core screen	kV/mm	Manufacturer Value	
22	Average design AC stress across insulation	kV/mm	Manufacturer Value	
23	Minimum 50% flashover voltage of sealing end for a 1.2/50ms wave (nominal), positive/negative	kV	Manufacturer Value	
24	Surface conductivity of outer sheath graphite / extruded semiconductive layer at ambient temperature (Required for all cable types: < 16 kΩ/m)	(ohm/linear m)	Manufacturer Value and EirGrid Spec CDS-GFS-00-001-R1	
25	Surface leakage distance of termination insulator (outdoor)	mm	Manufacturer Value and EirGrid Spec CDS-GFS-00-001-R1	
26	Relative permittivity of dielectric	F/m	Manufacturer Value	
27	Single phase withstand current for the following clearance times		Manufacturer Values and EirGrid Spec CDS-GFS-00-001-R1	
	0.1s	A		
	0.2s	A		
	0.5s	A		
	1.0s	A		
	3.0s	A		
28	Permissible 1 second short time withstand current, corresponding conductor temperature	kA/°C	Manufacturer Value	
29	Permissible steady overload and conductor temperature for 0.5/1/2/4 hours after prior continuous loading of:		Manufacturer Values and EirGrid Spec CDS-GFS-00-001-R1	
	50% of current in Item 12(a)	%		
	75% of current in Item 12(a)	%		
	90% of current in Item 12(a)	%		

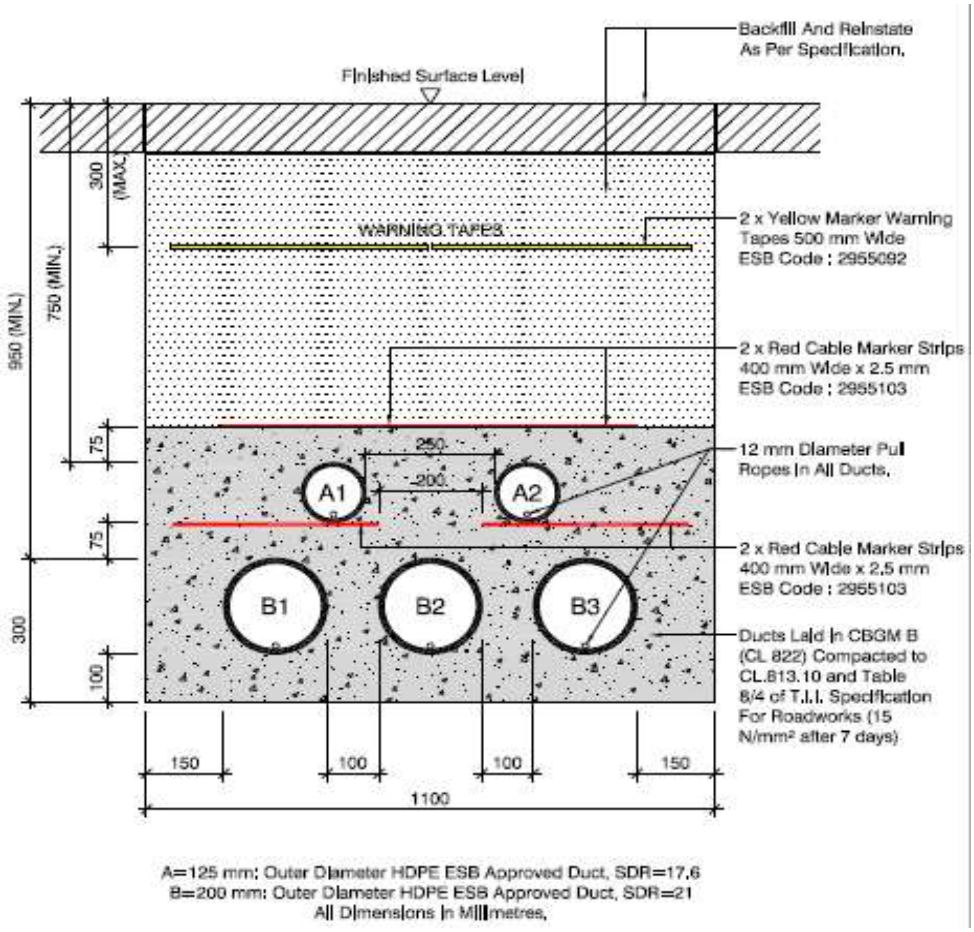
Cable Technical Schedule - Environmental Parameters

Item No	Description	S.I. Units	IEC Standard Value	Guaranteed Value	Supporting Test Documentation for Tenderered Value
1	Does conductor material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
2	Does semi conducting material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
3	Does insulation contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
4	Does bedding layer/water barrier material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
5	Does screen wire material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
6	Does adhesive layer material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
7	Does HDPE sheath material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
8	Does conductive/graphite outer layer material contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		
9	If powder is used for water blocking, is powder dust emitted during cable stripping?		REACH		
10	Do accessories contain any hazardous materials per European REACH chemical standards? Tender has included MSDS sheet to prove?		REACH		

Please enter any additional information or comments below:

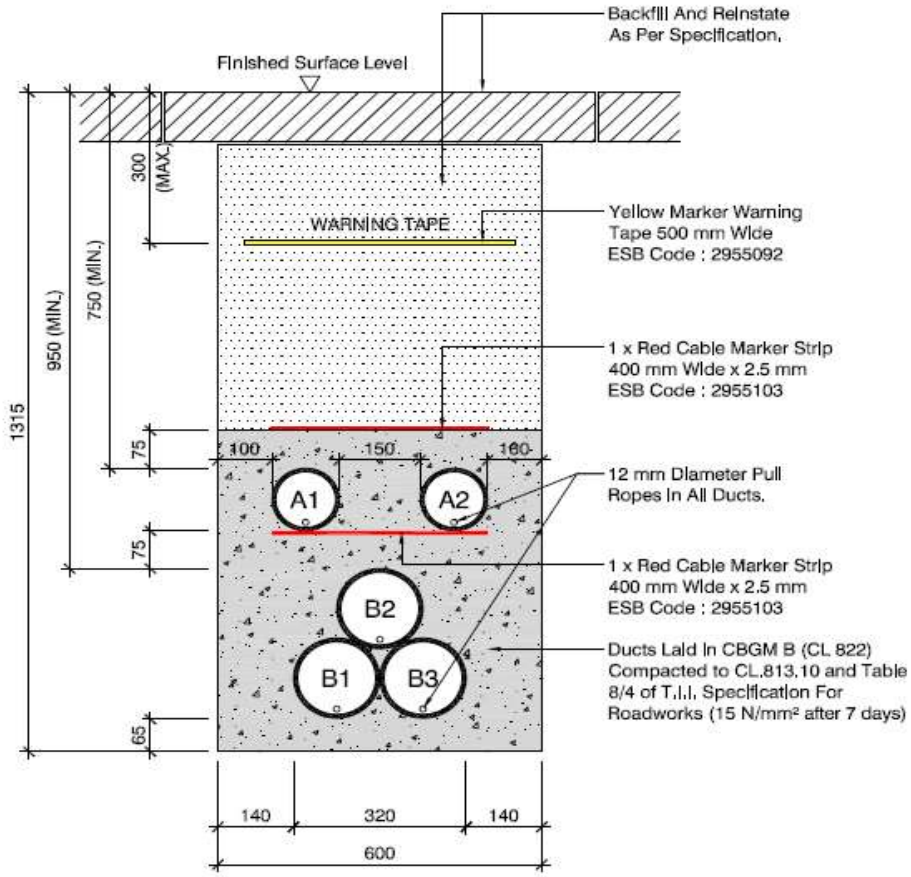
110 kV Standard Trench Cross Sections

110 kV Single Circuit 2,500 mm2 Al and 1,600 mm2 Al Flat Duct Formation Outside Substation



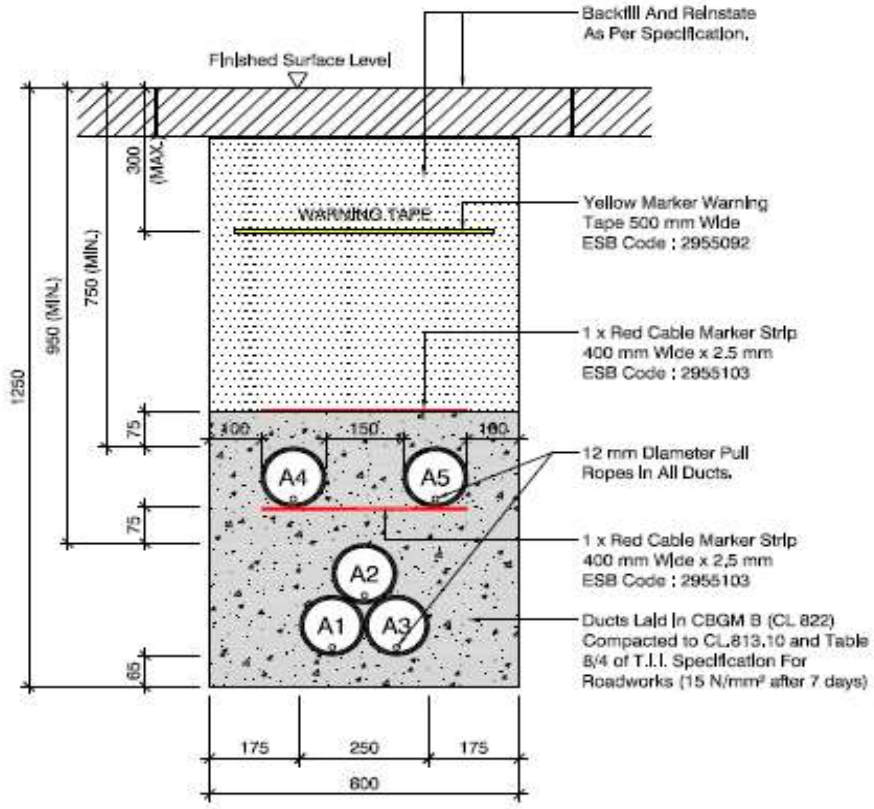
A=125 mm: Outer Diameter HDPE ESB Approved Duct, SDR=17,6
B=200 mm: Outer Diameter HDPE ESB Approved Duct, SDR=21
All Dimensions In Millimetres.

110 kV Single Circuit 1,600 mm2 Al and 1,600 mm2 Cu Trefoil Duct Formation



A=125 mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B=160 mm; Outer Diameter HDPE ESB Approved Duct, SDR=21
All Dimensions In Millimetres.

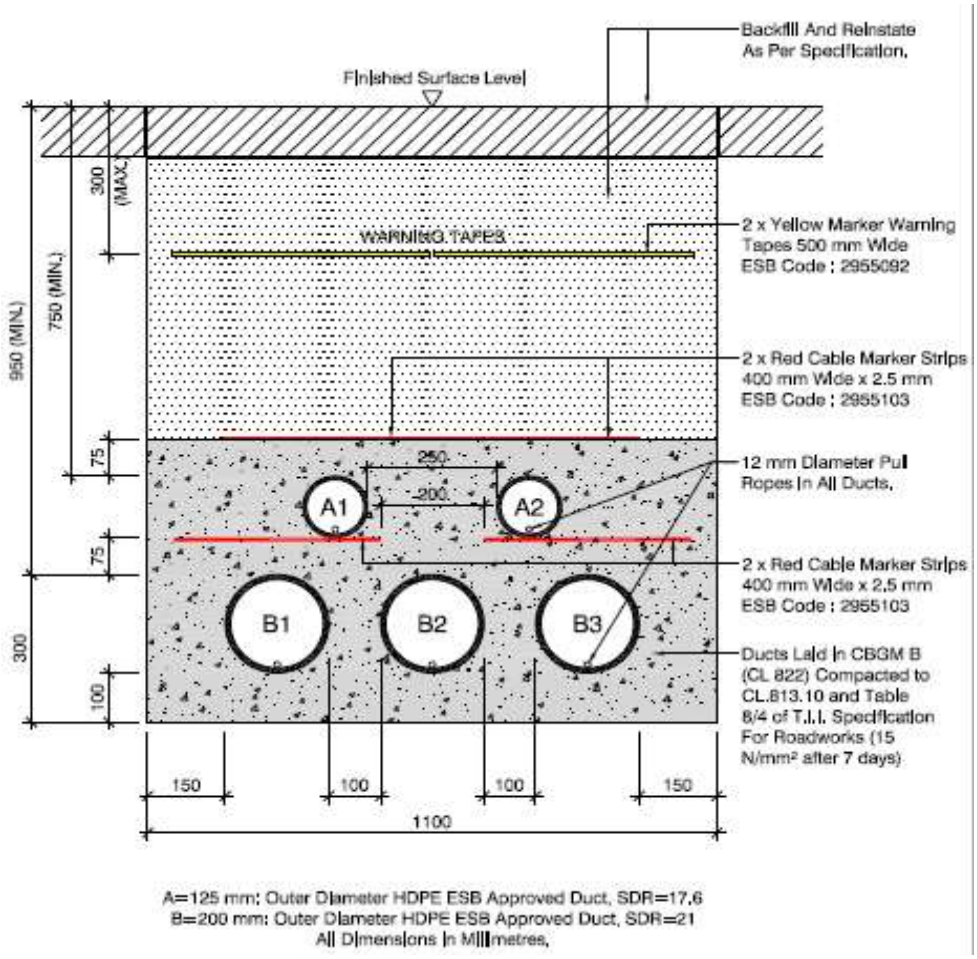
110 kV Single Circuit 1,000 mm2 Al Trefoil Duct Formation



A=125 mm; Outer Diameter HDPE ESB Approved Duct, SDR=17,6
All Dimensions In Millimetres.

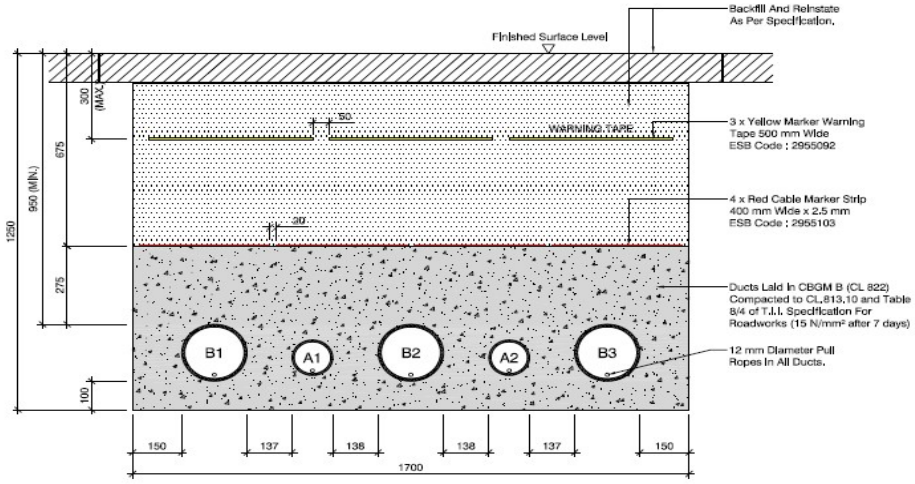
220 kV Standard Trench Cross Sections

220 kV Single Circuit Flat Duct Formation in 200 mm OD Ducts in 1100 mm trench width



A=125 mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B=200 mm: Outer Diameter HDPE ESB Approved Duct, SDR=21
All Dimensions In Millimetres.

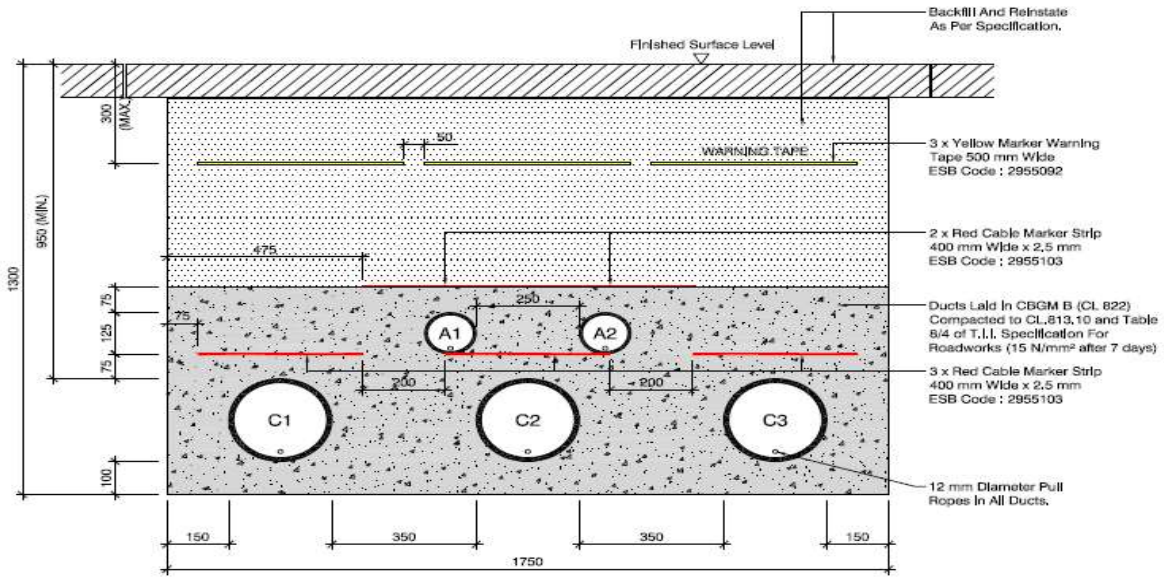
220 kV Single Circuit Flat Duct Formation in 200 mm OD Ducts in 1700 mm trench width



A=125 mm; Outer Diameter HDPE ESB Approved Duct, SDR=17,6
B=200 mm; Outer Diameter HDPE ESB Approved Duct, SDR=21
All Dimensions In Millimetres.

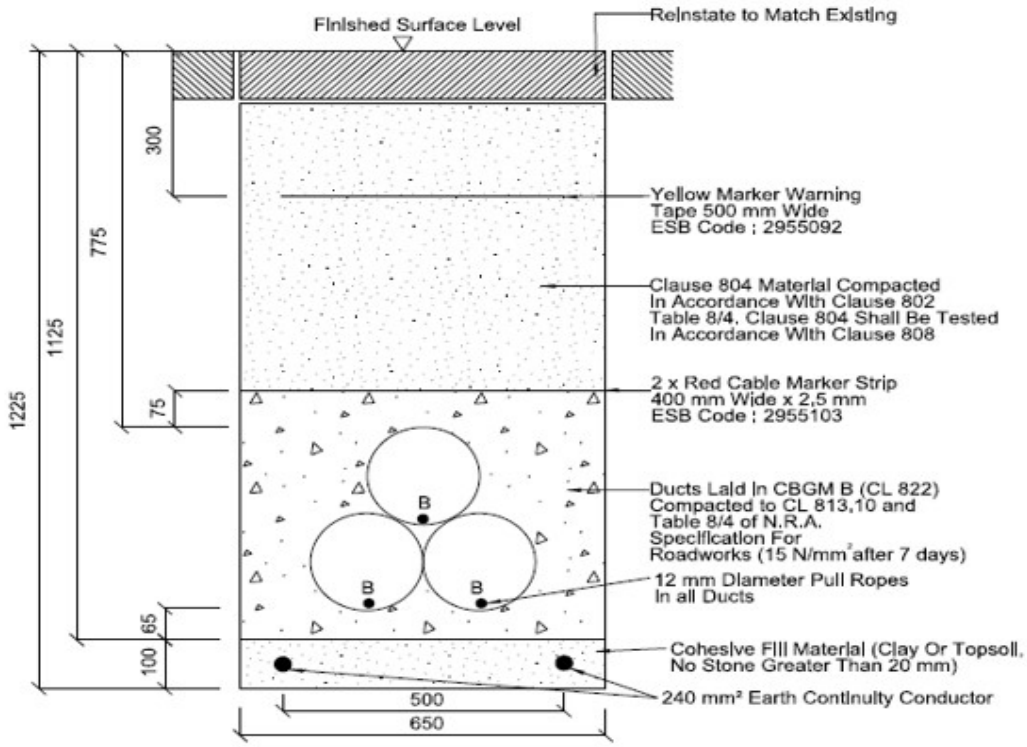
400 kV Standard Trench Cross Sections

400 kV Single Circuit 2,500 mm2 Cu Flat Duct Formation



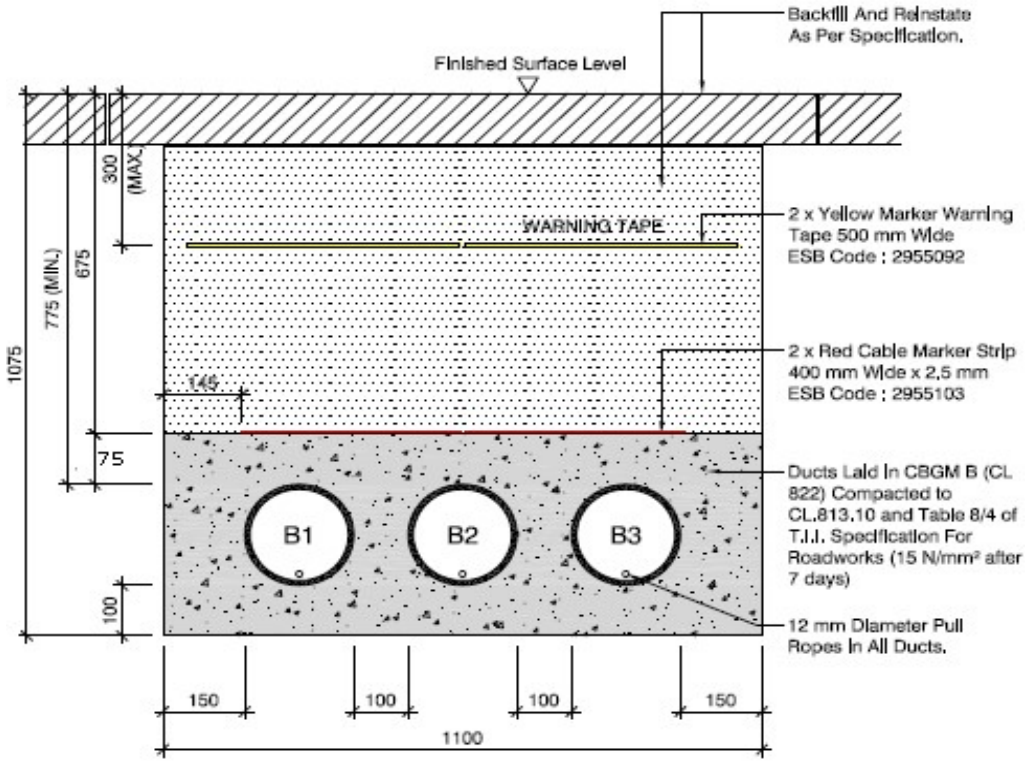
A—125 mm: Outer Diameter HDPE ESB Approved Duct, SDR—17.6
C—250 mm: Outer Diameter HDPE ESB Approved Duct, SDR—21
All Dimensions In Millimetres.

400 kV Single Circuit 800 mm2 Al Trefoil Duct Formation



B=200 mm Outer Diameter HDPE ESB Approved Duct, SDR= 21

400 kV Single Circuit 800 mm2 Al Flat Duct Formation



B—200 mm: Outer Diameter HDPE ESB Approved Duct, SDR—21
All Dimensions In Millimetres.