



Underground Distribution Construction Manual


Section C6 – Cables

Approved by: A Smith-de Perez

CIVIL WORKS

SECTION C6 - CABLES

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ORIGINAL ISSUE	A	DATE	B	APP'D	R. ENGLISH	CKD	D. TAYLOR	DRN	A. SYMONDS	SUB-SECTION 2 TITLE CHANGE TO INCLUDE THE WORD MECHANICAL	 © COPYRIGHT 2011 ENERGEX This drawing must not be reproduced in part or whole without written permission from ENERGEX	UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL CIVIL WORKS CABLES SECTION INDEX	APP'D	R. ENGLISH	CAD
	B		31/5/11		R. ENGLISH		D. TAYLOR		A. SYMONDS				10/10/08	6229-A4	B
	R. ENGLISH		D. TAYLOR		A. SYMONDS		SECTION		SUB-SECT.						
	D. TAYLOR		A. SYMONDS		SECTION		SUB-SECT.		SHT 1 OF 1						
	A. SYMONDS		SECTION		SUB-SECT.		SHT 1 OF 1		FILE UDC-C6-0-1B.DWG						

**INSTALLATION OF CABLE
GENERAL REQUIREMENTS**

1.1 Construction

Cables shall be installed entirely in accordance with this document, the Electricity Supply Association of Australian “Guide to the Installation of Cables Underground C(b)2 1989 (Clause 6)” and accepted working practices. The recommendations incorporated in this document and in the Installation Guide shall be binding on the Service Provider unless otherwise negotiated.

Any disused / abandoned cables (direct layed normally) shall be removed clear of any live plant, sealed with heatshrink caps each end and have label fixed each end.

1.2 Cable Hauling Tension

Whatever method (mechanical equipment and using a cable stocking grip on the cable nose) is used to haul the cable into the trench or duct it is of utmost importance that the maximum pulling tension allowable for that particular type and size of cable is not exceeded.

Tension control devices shall be used to measure or limit the actual pulling tension to the maximum allowable for the cable. Much of the force produced by the winch hauling cables is used in overcoming frictional forces which can be reduced by lubrication and utilising accepted practices.

1.3 Cable Bending Radius

The hauling radius for individual cables shall not be less than the minimum hauling radius specified for the cable.

Refer to cable bending radius on drawing Section C6-1.2.

1.4 Cable Hauling Eyes for Anchors in Reinforced Concrete Jointing Pits

Cable hauling anchors shall be installed entirely in accordance with ENERGEX specifications.

Cable installed utilising hauling eyes or anchors shall be in accordance with ESAA “Guide to the Installation of Cables Underground” C (b) 2.


Existing hauling eyes or anchors in concrete constructions shall be assessed for their SWL in accordance with trained course methods prior to installing any cables. (Reference: Esitrain Course “Power Winching - Lesson 2”).

1.5 Cables Crossing Footpaths

Where practical cables shall cross footpaths at 90 degrees (except road crossings and where there are obstructions).

1.6 Cables Crossing Roads

Where practical cables shall be placed on a line between real property survey pegs.

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							B	20/8/15	DATE	10/10/08	6229-A4		B
	CIVIL WORKS						RECD		SECTION	C6	SUB-SECT.	1.1	
	CABLES						CKD	P.BARNEY	SHT 1		OF 4		
	INSTALLATION						DWN	F.AMANPOOR	FILE UCD-C6-1.1-1A.DWG				
GENERAL REQUIREMENTS													

1.7 Cable Damage and Sheath Reinstatement

Where the cable is installed in open trenches, in pits or excavations at sharp bends, it is important to avoid standing on the cables after installation and to take care that cables are not damaged by sharp tools or by objects falling onto the cables.

Where damage to the cable sheath/serving has occurred, the Project Manager shall be immediately notified and arrangements shall be made to repair the cable in the manner specified by the cable manufacturer and approved by ENERGEX.

Location of such repairs shall be recorded (by the Operator), on "as constructed" drawings.

1.8 Cable Ends - Sealing

Heat shrink end caps shall encapsulate the ends of all 11kV cables at all times to prevent the ingress of moisture and other foreign matter.

Ends of 11kV cables, in trenches or unused lengths (greater than 10 metres) on drums shall be resealed immediately using a heat shrink cap after cutting. This is particularly important for high voltage cables (paper or XLPE insulated) to prevent the ingress of moisture and foreign material.

During 11kV cable hauling, the cable shall have a heat shrink end-cap fitted to prevent the ingress of moisture or foreign matter. Cable supplied cut to length from the manufacturer is supplied with heat shrink caps only. For all hauling of LV cables a heat shrink cap must be fitted to the cable ends.


All LV and HV cable ends which are not jointed or terminated immediately after installation and are left in an open trench or exposed to the elements shall be fitted with a heat shrink cap.

Immediately after the installation of cable, sealed cable ends shall be checked to ensure that the sealed ends are in good condition and will continue to prevent the ingress of moisture or other matter until such time as cable ends can be jointed or terminated. Damaged cable seals shall be replaced immediately upon inspection to verify the integrity of cable conductor and insulation.

LV cable cut at loop positions for the installation of pillars shall be protected from direct moisture (water) entry, with the use of a heatshrink cap.

1.9 Overhead to Underground Construction

Where practicable cable should be installed on the opposite pole side to oncoming traffic.

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		CIVIL WORKS CABLES INSTALLATION GENERAL REQUIREMENTS		DATE	10/10/08	6229-A4 A	
				RECD		SECTION	SUB-SECT.
				CKD	P.BARNEY	C6	1.1
				DWN	F.AMANPOOR	SHT 2 OF 4	
				FILE UCDC6-1.1-2A.DWG			

2. HAULING (PULLING) OF CABLE

2.1 Live Low Voltage Cable Zones

For cables pulled into live low voltage cable zones:

- cables shall be capped with a heat shrink cover
- cable stocking (if used), shall be suitably insulated (with plastic Wrap and/or tape, etc). from the cable
- pulling rope used in the vicinity of live switchgear shall be non-conductive.
- personnel working in the vicinity of the live LV shall wear LV safety gear.
- team leader of the cable-pulling crew shall be a qualified licensed Electrical Worker, Electrical Mechanic or Electrical Jointer acceptable to Queensland Department of Industrial Relations, and shall personally supervise any locations where LV contact is possible.

2.2 Direct Laid Cables - Open Trench

Prior to installing direct laid cable into the open trench:

- All excavation and reinstatement shall conform to Section C2
- The trench base and side walls shall be free from rocks and protrusions that may damage cable
- 50mm of bedding sand shall be placed in trench-base prior to cable installation
- Cable rollers must be placed in the base and corners of the trench to prevent distribution cables rubbing against trench floor and walls during installation.

Following cable installation, 75 mm (minimum depth) of bedding material shall be placed over cables prior to trench backfilling. Bedding material shall be compacted to ensure the cover is maintained.

Polymeric cable protection covers shall be installed 75 mm above the direct laid cables prior to backfilling.

Electrical warning tape shall be placed in the trench during backfilling of the remainder of the trench.


2.3 Ducted Cables - Conduit

Conduit through which cable is to be hauled shall be tested to ensure conduit is free of foreign material and blockages. Cables entering duct/conduit through a hauling pit or jointing pit shall ensure that no cable damage occurs during hauling.

When hauling cables into duct lines, lubricate cable before entering duct line to reduce frictional forces between cable & duct.

Following cable installation, ends of ducts/conduits shall be blocked to prevent the entry of sand and other foreign matter.

If hauling through asbestos conduits, separate stockings and ropes shall be used to avoid spread of fibres. Under no circumstances shall compressed air be used in ACM conduits. Refer Work Practice 1017.

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								CKD	P.BARNEY	C6	1.1		
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							CIVIL WORKS CABLES INSTALLATION GENERAL REQUIREMENTS						

3. CABLES INSTALLED BY TRENCHLESS TECHNIQUES

Cables installed by trenchless technology shall have a minimum depth of cover exceeding 900 mm below the finished surface level.

The cables shall be identified by the placement of ground markers or above ground cable markers in accordance with the construction drawings.

All cables installed by trenchless techniques shall be fitted with heat shrink caps to prevent the ingress of moisture and foreign material.

4. XLPE INSULATED CABLES WITH STEEL WIRE ARMOURING

XLPE cables with steel wire armouring will have a significantly larger bending radius for cable pulling and setting, which may restrict the locations this cable can be installed.

Cable jointers shall also secure ends of steel wire armours during stripping the sheath to avoid the armour wires springing out during sheath removal and causing an injury to the jointer.

5. CABLE SPACING IN PITS AND BASEMENTS

To avoid mutual heating and de-rating of cables that are touching, cables shall not be laid directly over the top of each other in substation basements and pits. They shall be separated by at least one cable diameter where they cross.

Cables shall be supported in the vertical position by the correct size cleats at no more than 1m intervals.

In a zone substation basement, cables shall be supported off the basement floor on cable stands to reduce the probability of water in the basement affecting the cable.




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	A	ADDED NOTES 4 & 5.				DWN	F.AMANPOOR	SHT 4 OF 4		FILE UCD-C6-1.1-4A.DWG	
					CIVIL WORKS CABLES INSTALLATION GENERAL REQUIREMENTS						

Table 1: Minimum Bending Radius and Maximum Hauling Tension of Typical Cable during Installation

LV CABLES

CABLE DESCRIPTION	CABLE O.D (mm)	MAX TENSION (KG FORCE)	MAX. TENSION (kN)	MINIMUM BENDING RADIUS (mm)	
				HAND	PULL
1.5 sq mm Cu 2-core PVC/PVC	7.3x10.9	20	0.2	45	65
4 sq mm. Cu 2-core PVC/PVC	8.3x13.5	61	0.6	50	75
6 sq mm. Cu 2-core XLPE/PVC H.Dn Circ	12.0	163	1.6	70	110
10 sq mm Cu 2-core XLPE/PVC H.Dn Circ	14.8	275	2.7	90	130
16 sq mm Cu 2-core XLPE/PVC	10.7x17.8	224	2.2	65	95
16 sq mm Cu 4-core XLPE/PVC AS 4026	22.0	459	4.5	90	130
25 sq mm Cu 4-core XLPE/HDPE AS 4026	27.5	714	7.0	410	690
50 sq mm Cu 4-core XLPE/HDPE AS 4026	33.0	1428	14.0	500	630
70 sq mm Cu 4-core XLPE/HDPE AS 4024	40.0	1999	19.6	600	1000
120 sq mm Al 4-core XLPE/PVC stranded	40.7	2447	24.0	330	490
120 sq mm Al 4-core XLPE/PVC solid	37.4	1468	14.4	300	450
185 sq mm Cu 3.5-core PLYHDPE stranded	46.8	3967	38.9	700	1170
185 sq mm Al 4-core XLPE/PVC stranded	44.4	1530	15.0	350	550
185 sq mm Cu 3.5 core XLPE/SWA/HDPE stranded	57.4	2597	24.4	860	1435
185 sq mm Cu 4 core XLPE/MDPE stranded	48.8	2040	20.0	400	750
240 sq mm Al 4-core XLPE/PVC stranded	57.1	4895	48.0	460	690
240 sq mm Al 4-core XLPE/PVC solid	52.7	2937	28.8	420	630
240sq mm Al 4-core XLPE/PVC/MDPE	55.7	683	6.7	836	1393

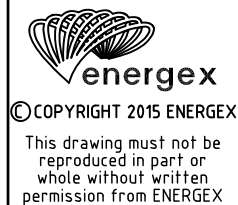
11kV CABLES

CABLE DESCRIPTION	CABLE O.D (mm)	MAX TENSION (KG FORCE)	MAX. TENSION (kN)	MINIMUM BENDING RADIUS (mm)	
				HAND	PULL
25 sq mm Cu 3-core PLYHDPE	35.5	540	5.3	530	880
95 sq mm Cu 3-core PLYHDPE	43.3	2039	20.0	650	1080
185 sq mm Cu 3-core PLYHDPE	52.8	3967	38.9	790	1320
240 sq mm Cu 3-core PLYHDPE	60.5	5139	50.4	910	1510
300 sq mm Cu 3-core PLYHDPE	62.3	6424	63.0	930	1560
35 sq mm Al 3-core XLPE/SCR/HDPE	47.0	540	5.3	710	1180
95 sq mm Al 3x1C TR XLPE/SCR/HDPE	56.1	1457	14.3	561	840
95 sq mm Al 3-core XLPE/SCR/HDPE	58.0	1458	14.3	870	1450
240 sq mm Al 3x1C TR XLPE/SCR/HDPE	71.2	3669	36.0	712	1068
240 sq mm Al 3-core XLPE/SCR/HDPE	75.0	3671	36.0	900	1350
400 sq mm Al 3x1C TR XLPE/SCR/MDPE	89.7	6136	60	720	1080
185 sq mm Cu 3x1C TR XLPE/SCR/HDPE	73.3	1916	18.8	735	1100
185 sq mm Cu 3-core XLPE/SCR/HDPE	69.4	3989	39	1040	1740
240 sq mm Cu 3x1C TR XLPE/SCR/HDPE	78.9	2201	21.6	785	1180
240 sq mm Cu 3-core XLPE/SCR/HDPE	75.9	5154	50	1140	1900

NOTE :

1. USE TABLE AS GUIDE ONLY - REFER TO MANUFACTURER'S DATA FOR CONFIRMATION. (FIGURES BASED ON OLEX CABLES 1997 GENERALLY, TRIPLEX CABLES 2009)
2. MAX. PULLING TENSIONS ARE BASED ON STOCKING GRIP OVER THE OUTER SHEATH.

F	DATE	29/12/15
APP'D	A.PEREZ	
CKD	J.LANSLEY	
ATHR	P.JUDGE	
Page Numbering Fixed		



UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL
CIVIL WORKS
CABLES
INSTALLATION
BENDING RADIUS & HAULING TENSION

APP'D	R.ENGLISH	CAD	
DATE	10/10/08	6229-A4 F	
RECD	D.TAYLOR	SECTION	SUB-SECT.
CKD	P.BARNEY	C6	1.2
DWN	F.AMANPOOR	SHT 1 OF 1	
FILE UDC-C6-1.2-1E.DWG			

CABLE PROTECTION AND IDENTIFICATION

Typically a minimum two forms of cable protection are required:

- mechanical
- indication.

Cables laid by trenchless techniques are exempt from this requirement.

Where depth of cover is 900 mm, permanent surface/above-ground marker indication is the minimum requirement.

Note tha:cables rising for the purpose of termination require additional mechanical protection in the form of cover strip wherever:

- the cable no longer has minimum depth of cover and
- the cable is outside the footprint of the above plant that it terminates on.

Refer to the Code of Practice for minimum requirements.

Case 1: Direct lay in electricity alignment 600 mm - 900 mm depth of cover

- visual protection shall be marker tape
- mechanical protection shall be cover strip.

Case 2: Conduit in electricity alignment 600 mm - 900 mm depth of cover

- visual indication shall be marker tape
- mechanical protection shall be conduit.


Case 3: Direct lay or conduit in electricity alignment (300 mm to 600 mm cover - REDUCED DEPTH TRENCH)

- visual indication shall be marker tape
- mechanical protection shall be concrete (typically 100mm of 25MPa)

Where 300 mm cover to conduits is not achieved or heavy vehicles are known to cross such cables, refer Section C2-3.2.

Case 4: Direct lay or Conduit outside electricity alignment with 600 mm to 900 mm depth of cover

- visual indication shall be surface/above-ground marker
- mechanical protection shall be:
 - NORMAL COVER - Cover strip
 - REDUCED DEPTH - Concrete (100mm of 25MPa)

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		CKD	D. TAYLOR									CKD	P. BARNEY	C6	2.1
		DRN	G. TREAGLE									DWN	F. AMANPOOR	SHT 1 OF 4	
SEE SHEET 3, NOTE 5.5 ADDED.										FILE UCD-C6-2.1-1C.DWG					

1. Protective Cover Strip

1.1 Product

Polymeric cable protection covers shall comply with the Australian Standard for Polymeric Cable Protection Covers, (AS/NZS 4702), including passing the penetration resistance test as described therein.

1.2 Installation

Polymeric cable protection covers shall be installed as follows:

- 100 mm above the top face of cable bank;
- Lapped 100 mm minimum along the longitudinal axis;
- Lapped 40 mm minimum along the transverse axis;
- Extend 40 mm minimum past the extended vertical edges of the cable or conduit bank;
- Communication conduits shall be placed above cable protection cover strip but may be placed below to gain depth of cover.
-

2. Warning Tape

2.1 Product

Electrical Marked plastic warning tape shall comply with AS/NZS 2648.1.

2.2 Installation

Warning tape shall be installed at a depth of 300 mm and not less than 200 mm above the cable/conduit for all cables/conduits installed directly into an open trench.

3. Surface Markers

Electronic cable markers are no longer supported.

3.1 Location

Surface markers shall be placed to identify the following:

- buried HV cable joints
- live end joint on end of HV cables
- in accordance with items 5 and 6 of Section C6-2.2 Sheet 2.

3.2 Installation

Electric cable marker shall be placed 100 mm above the electrical reticulation plant that is to be identified when buried.

4. Kerb Markers


4.1 General

All electrical cable or conduit road crossing locations shall be clearly marked with a 35 mm diameter brass "E" marker. "E" markers shall be securely embedded in the kerb directly above the cables or conduits.

Where no kerb exists, "E" markers shall be placed in the formed edge of the road, directly above the cables or conduits.

4.2 Community Title Developments

The location of all electricity cables and conduits crossing designated roads shall be identified with "E" markers placed in the edge of kerb. "E" markers shall be placed in the formed edge of the road pavement where no kerb exists.

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								GENERAL REQUIREMENTS		CKD	P. BARNEY	C6	2.1
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	APPD	R. ENGLISH	CKD	D. TAYLOR	DRN	A. SYMONDS							
	SUB-SECTION 2 TITLE CHANGE TO INCLUDE THE WORD MECHANICAL												
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In Community Title Developments, a designated road shall be any road servicing ten or more dwelling units.

Electricity cables and conduits crossing parking bays and driveways are not required to be identified provided that they are located in a 1.5 metre wide service corridor at the edge of the road.

Should ENERGEX cables deviate from the one metre wide service corridor behind the kerb or the edge of the road, the route shall be clearly identified with surface cable markers in formed surfaces (eg. driveways) and grassed areas. Refer to the construction drawing for installation details. In addition above ground markers may be required to provide a high visibility warning that underground electric cables are in the vicinity.

4.3 Tolerance

The maximum horizontal offset between the "E" markers and the cable/conduit to be identified shall be 200 mm.

5. Surface or Above Ground Cable Markers

5.1 General

Electrical Cables and Conduits: The location of buried conduits, cables and joints may be required to be indicated by the placement of surface markers or above ground cable markers. These markers shall be placed at regular intervals, and directly over the cables to identify the route.

5.2 Areas Remote from Footpath Electricity Allocation

Cables in areas such as parkland, easements between streets and public parking areas, surface markers shall be placed in the pavement surface (bitumen or concrete). If there is no pavement (parkland), the surface markers or above ground markers shall be placed in accordance with the construction drawing.

5.3 Spacing Between Markers

Electrical Cables and Conduits: The maximum allowable spacing between consecutive markers shall be 50 metres.

5.4 Tolerance


The maximum horizontal offset between the surface markers and the cable/pipe/conduit to be identified shall be 200 mm.

For rural or undeveloped areas marker posts are to be adjacent to fence or property line so as not to be pushed over by vehicles or farm machinery.

The offset is to be stated on the marker disc or plaque.

5.5. Areas where the Footpath Electricity Allocation is not Obvious

Where property boundaries are not indicated by survey pegs, building development fences etc, the electricity alignment may not be obvious. In such cases surface markers shall be installed.


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	DRN	G. TREGLE								DWN	F. AMANPOOR	SHT 3 OF 4	
	NOTE 5.5 ADDED											FILE UCD-C6-2.1-3C.DWG	

6. Cables or Conduits installed by Trenchless Techniques

When cables or conduits are installed by trenchless methods, cables, or conduits have no cover strip or warning tape placed above them.

In these situations the cable or conduit route shall be identified by the placement of surface markers, above ground cable markers or by specially labelled electricity supply service pit lids, keyed into position, along the cable route.

Road crossings installed by trenchless techniques are identified by either kerb markers (see 4.1) or above ground markers as described in section 5.1.

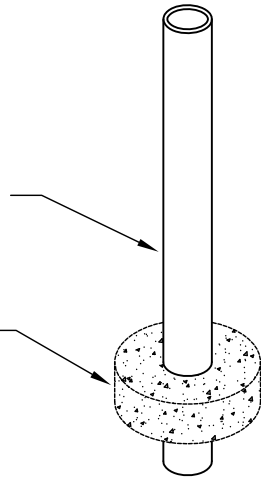
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MATERIAL

STOCK CODE	QTY
18584	1

Bollard 90/100mm Dia.
Galv Pipe Guard
18584

Concrete Base



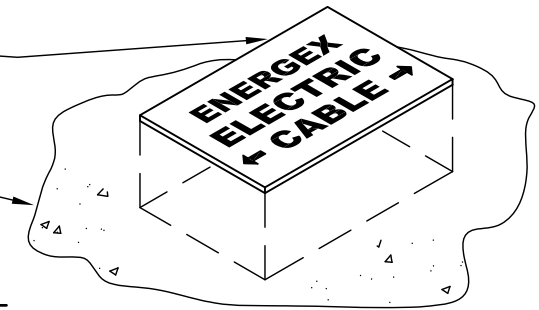
ASSEMBLY 1350-1 - GALVANISED PIPE BOLLARD

MATERIAL

STOCK CODE	QTY
17383	1

Cable Marker
Plate
17383

Concrete
Footing



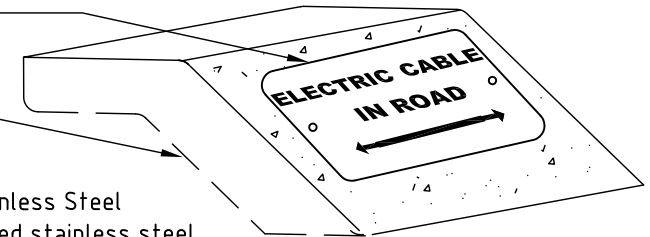
ASSEMBLY 1350-2 - CABLE MARKER PLATE

MATERIAL

STOCK CODE	QTY
20251	1

Cable Marker
Plate

Concrete
Kerb



NOTE: Cable marker plate is 150 x 65mm Stainless Steel with two drilled holes as shown. Two S-shaped stainless steel spikes 50 x 5mm are supplied with cable marker to secure plate to face of concrete kerb. Drill two 5mm ø holes in concrete.

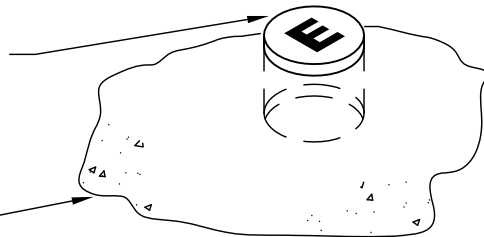
ASSEMBLY 1350-4 - RETRO-FIT CABLE MARKER PLATE

MATERIAL

STOCK CODE	QTY
06682	1

"E" Marker Plate
35mm Dia. Brass.
06682

Concrete
Kerb



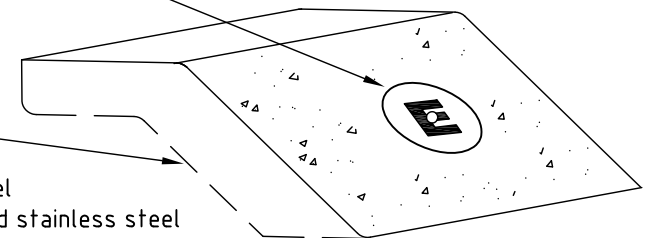
ASSEMBLY 1350-3 - "E" MARKER PLATE

MATERIAL

STOCK CODE	QTY
20890	1

"E" Marker Plate
35mm Dia.

20890
Concrete
Kerb



NOTE: Cable plate is 38mm Dia Stainless Steel with one drilled hole as shown. One S-shaped stainless steel spike 50 x 5mm is supplied with cable marker to secure plate to face of concrete kerb. Drill one 5mm dia hole in concrete.

ASSEMBLY 1350-5 - RETRO-FIT "E" MARKER PLATE

A	ORIGINAL ISSUE	APPD	DATE	A. Smith de Perez	CKD	A. De Costa	DRN	P. Reif	UPDATE HOLE DIAMETER FOR ASSEMBLY 1350-4
	C								



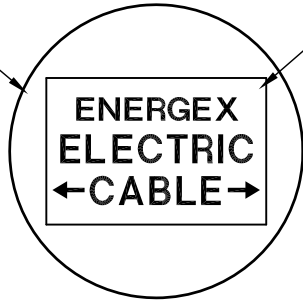
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UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL

**CIVIL WORKS
CABLES
MECHANICAL PROTECTION & IDENTIFICATION
CABLE MARKERS**

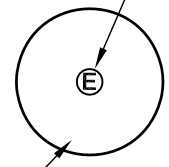
APP'D	R. ENGLISH	CAD	
DATE	10/10/08	6229-A4 B	
RECD		SECTION	SUB-SECT.
CKD	P. BARNEY	C6	2.2
DWN	F. AMANPOOR	SHT 1 OF 2	
FILE UCD-C6-2.2-1B.DWG			

Ø200 concrete footing



Assy 1350-2 Cable Marker Plate

Ø100 min concrete footing (100mm conduit may be used to form the concrete footing)



Assy 1350-3 'E' Marker Plate

PLAN

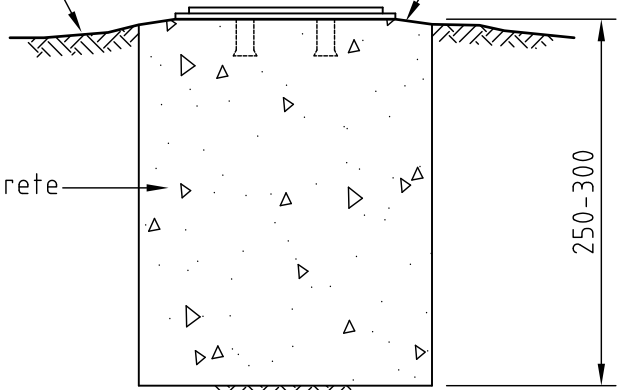
PLAN

Finished Surface Level

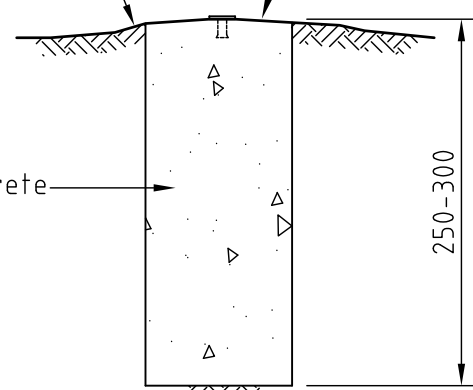
Surrounding Surface to fall away from markers

Finished Surface Level

Concrete



Concrete

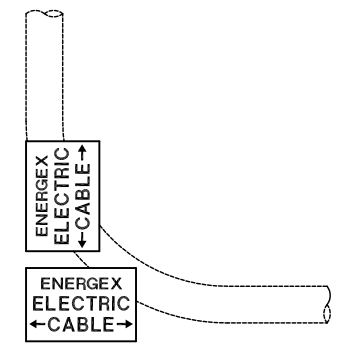


ELEVATION
Cable Marker

ELEVATION
"E" Marker

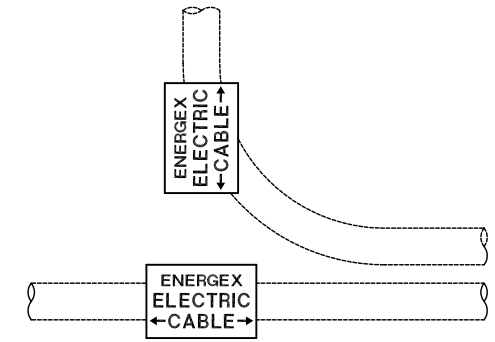
NOTES:

1. All concrete shall have a minimum grade of f'c = 20MPa.
2. For cable marker plate details refer to Drawing No. 10933-A3.



PLAN

Marker Installation at Truncation Point of Cable Route



PLAN

Marker Installation at "T" Intersection of Cables.

A	ORIGINAL ISSUE	B	DATE	31/5/11
	APPD		R. ENGLISH	
	CKD		D. TAYLOR	
	DRN		A. SYMONDS	
SUB-SECTION 2 TITLE CHANGE TO INCLUDE THE WORD MECHANICAL				

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UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL
CIVIL WORKS
CABLES
MECHANICAL PROTECTION & IDENTIFICATION
CABLE MARKERS

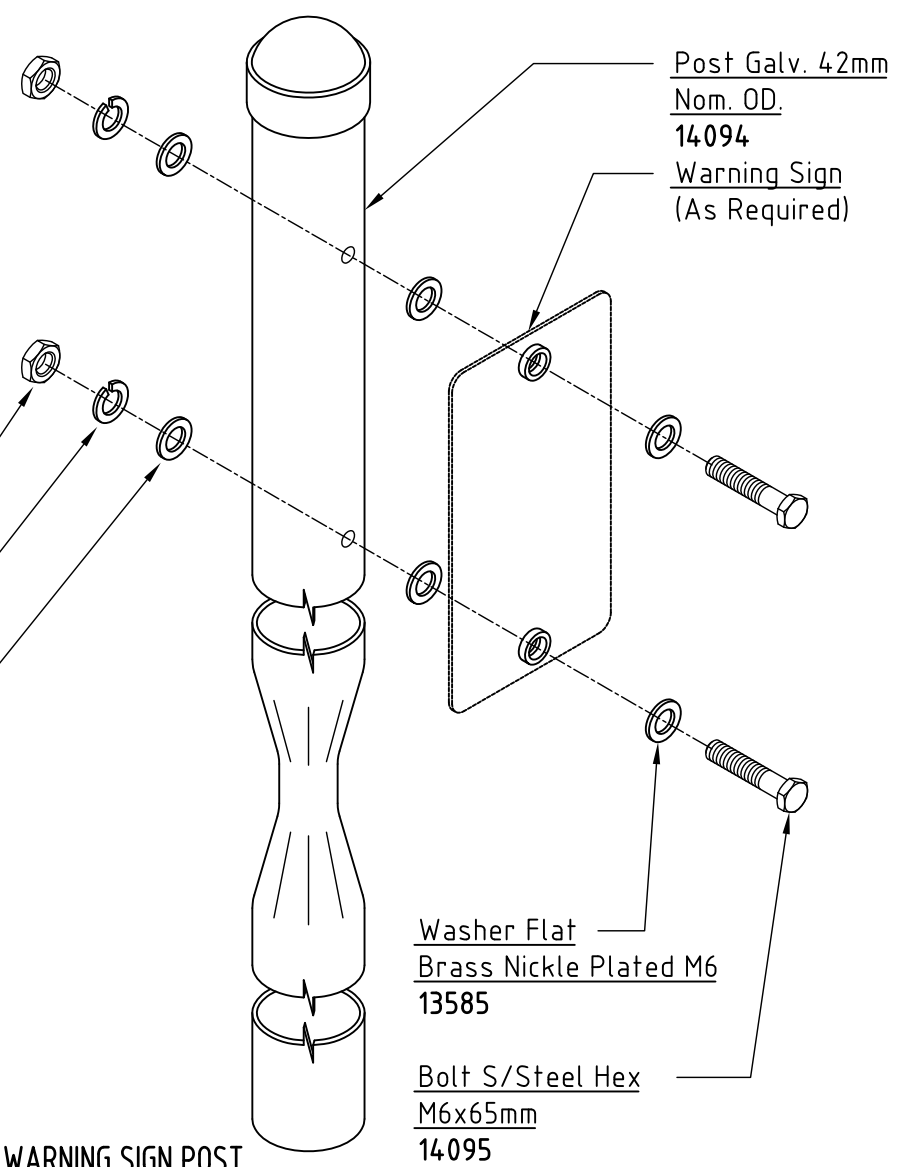
APP'D	R. ENGLISH	CAD	
DATE	10/10/08	6229-A4 B	
RECD		SECTION	SUB-SECT.
CKD	P. BARNEY	C6	2.2
DWN	F. AMANPOOR	SHT 2 OF 2	
FILE UCD-C6-2.2-2B.DWG			

MATERIAL	
STOCK CODE	QTY
00619	2
01047	2
01076	2
13585	4
14094	1
14095	2

Nut S/Steel M6
00619

Washer Spring
S/Steel M6
01076

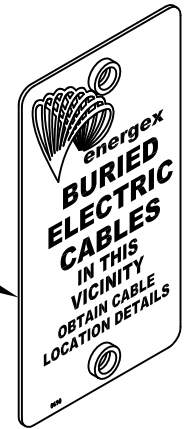
Washer Flat
S/Steel M6
01047



ASSEMBLY 1351-1 - WARNING SIGN POST

MATERIAL	
STOCK CODE	QTY
15335	1

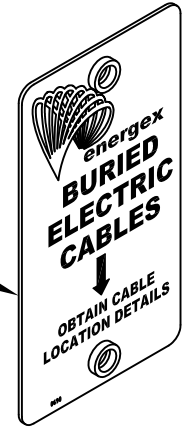
Warning Sign
Type 1
15335



ASSEMBLY 1351-2 - WARNING SIGN TYPE 1

MATERIAL	
STOCK CODE	QTY
15336	1

Warning Sign
Type 2
15336



ASSEMBLY 1351-3 - WARNING SIGN TYPE 2

A	ORIGINAL ISSUE			
	B	DATE	31/5/11	
	APPD	R. ENGLISH		
	CKD	D. TAYLOR		
	DRN	A. SYMONDS		
	SUB-SECTION 2 TITLE CHANGE TO INCLUDE THE WORD MECHANICAL			

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UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL

CIVIL WORKS
CABLES
MECHANICAL PROTECTION & IDENTIFICATION
WARNING SIGNS

APP'D	R. ENGLISH		CAD
DATE	10/10/08	6229-A4 B	
RECD		SECTION	SUB-SECT.
CKD	P. BARNEY	C6	2.3
DWN	F. AMANPOOR	SHT 1 OF 2	
FILE UCD-C6-2.3-1B.DWG			

MATERIAL LIST

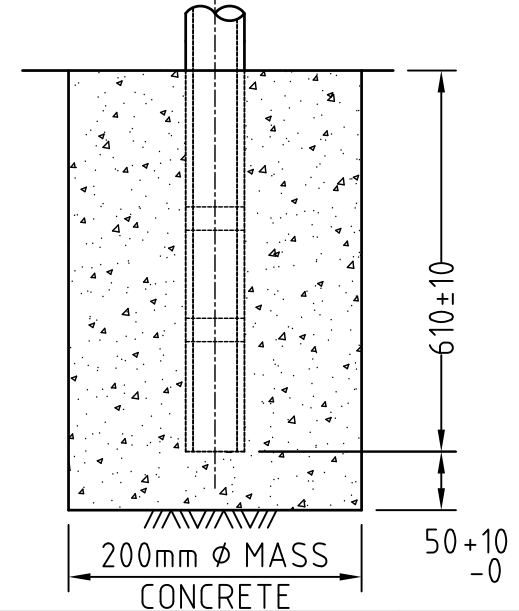
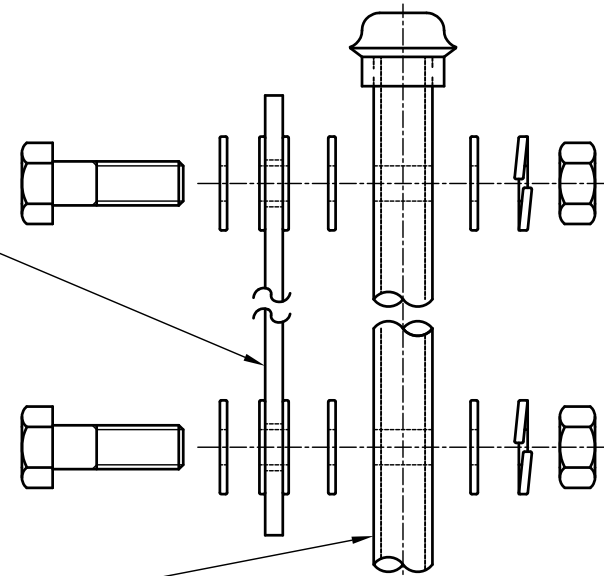
ASSY	DESCRIPTION	CONSTRUCTION	
		WSP 1	WSP 2
1351-1	Warning Sign Post	1	1
1351-2	Warning Sign Type 1	1	-
1351-3	Warning Sign Type 2	-	1
-	Concrete Grade 25 (min)	AR	AR


NOTES

- SIGNS MUST BE FITTED WITH 2 SILICON RUBBER GROMMETS.
- TO PREVENT DAMAGE AND ENSURE INSULATION MAINTAINED TO SIGN WHEN TIGHTENING NUT AND BOLT, COMPRESS FLANGES OF GROMMET TO HALF THEIR NORMAL THICKNESS ONLY AND DO NOT TIGHTEN ANY FURTHER.
- AFTER FIXING OF SIGN TO POST DESTROY THREAD OF BOLT TO PREVENT REMOVAL OF NUT BY VANDALS.
- ALL CONCRETE SHALL BE MINIMUM GRADE $F'c = 25 \text{ MPa}$, BUT SHOULD SATISFY AS 3600 DURABILITY REQUIREMENT

Assy 1351-2
or
Assy 1351-3
Warning Sign

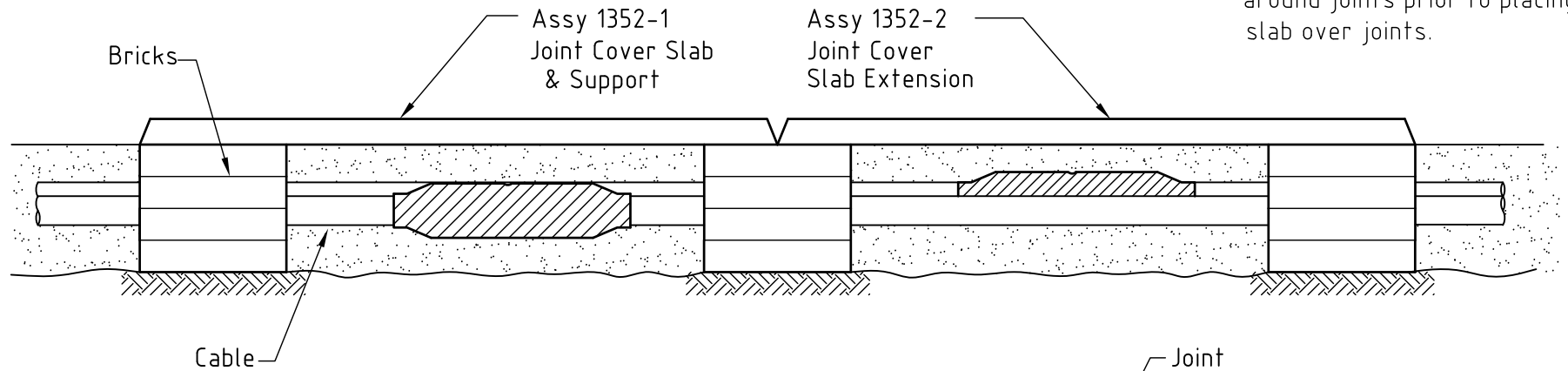
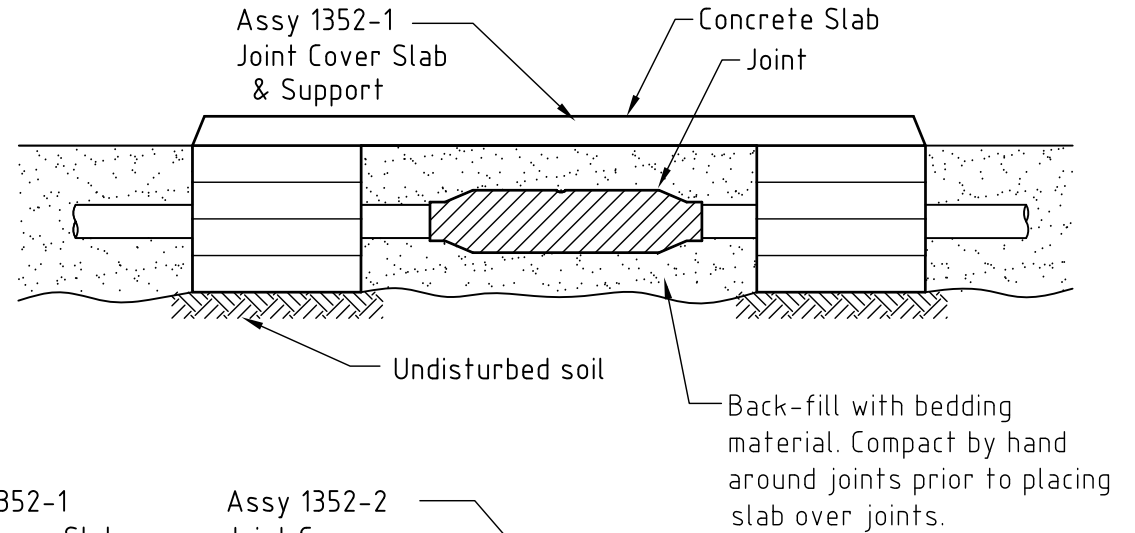
Assy 1351-1
Warning Sign Post



A C	ORIGINAL ISSUE	 © COPYRIGHT 2012 ENERGEX This drawing must not be reproduced in part or whole without written permission from ENERGEX	UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL CIVIL WORKS CABLES MECHANICAL PROTECTION & IDENTIFICATION WARNING SIGNS		APP'D	R. ENGLISH	CAD 6229-A4 C			
	DATE				20/8/15	DATE		10/10/08	SECTION	SUB-SECT.
	APPD				A. Smith de Perez	RECD			C6	2.3
	CKD				A. De Costa	CKD		P. BARNEY	SHT 2 OF 2	
	DRN				P. Reif	DWN		F. AMANPOOR	FILE UCD-C6-2.3-2C.DWG	
UPDATE NOTES										

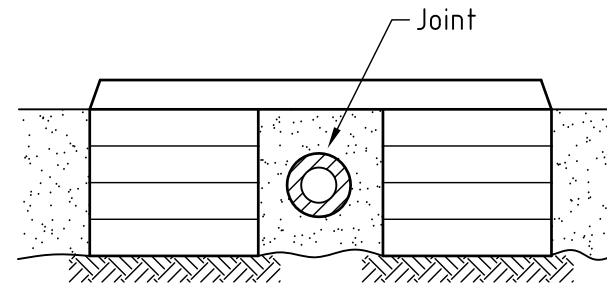
MATERIAL LIST


ASSY	DESCRIPTION	CONST.	
		LVJPR01	LVJPR02
1352-1	Joint Cover Slab & Support	1	1
1352-2	Joint Cover Slab Extension	-	1



NOTES:

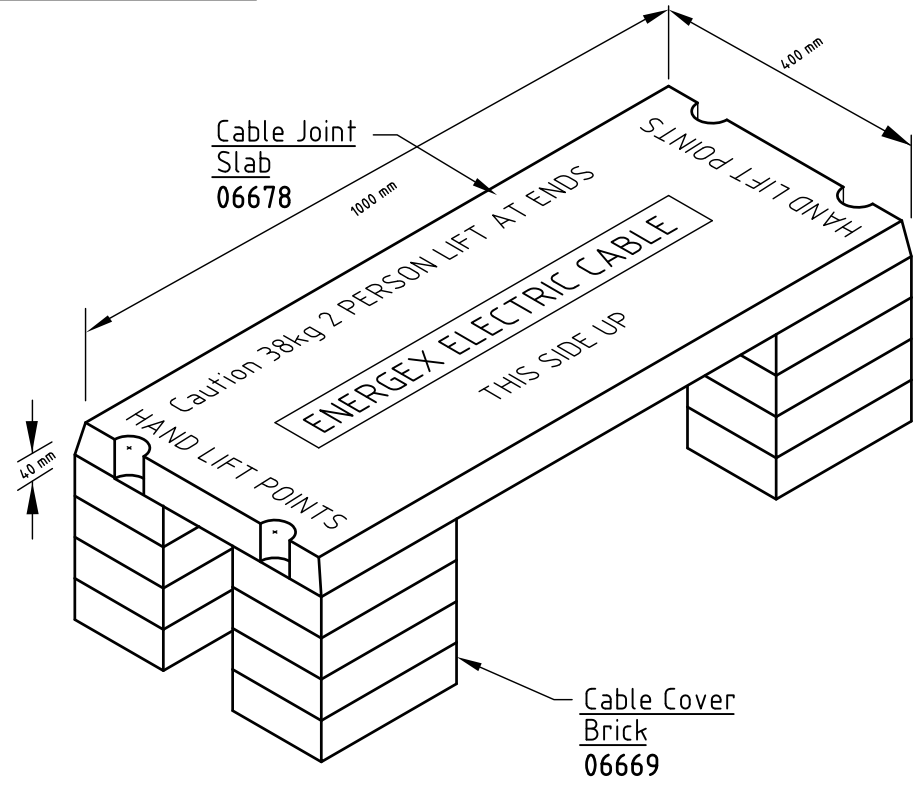
1. This level of protection shall only be used on paper-lead cable joints and joints in the CBD areas where there is a high exposure to damage.
2. Bedding material shall be a well-graded sand or decomposed granite, substantially free from lumps and particles with no dimension in excess of 5mm.



A	ORIGINAL ISSUE			UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL		APP'D	R. ENGLISH			CAD
	B	DATE	31/5/11	CIVIL WORKS		DATE	10/10/08	6229-A4		B
		APP'D	R. ENGLISH	CABLES		RECD		SECTION	SUB-SECT.	
		CKD	D. TAYLOR	MECHANICAL PROTECTION & IDENTIFICATION		CKD	P. BARNEY	C6	2.4	
	DRN	A. SYMONDS	JOINT PROTECTION SLAB		DWN	F. AMANPOOR	SHT 1		OF 2	
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MATERIAL	
STOCK CODE	QTY
06678	1
06669	16 #

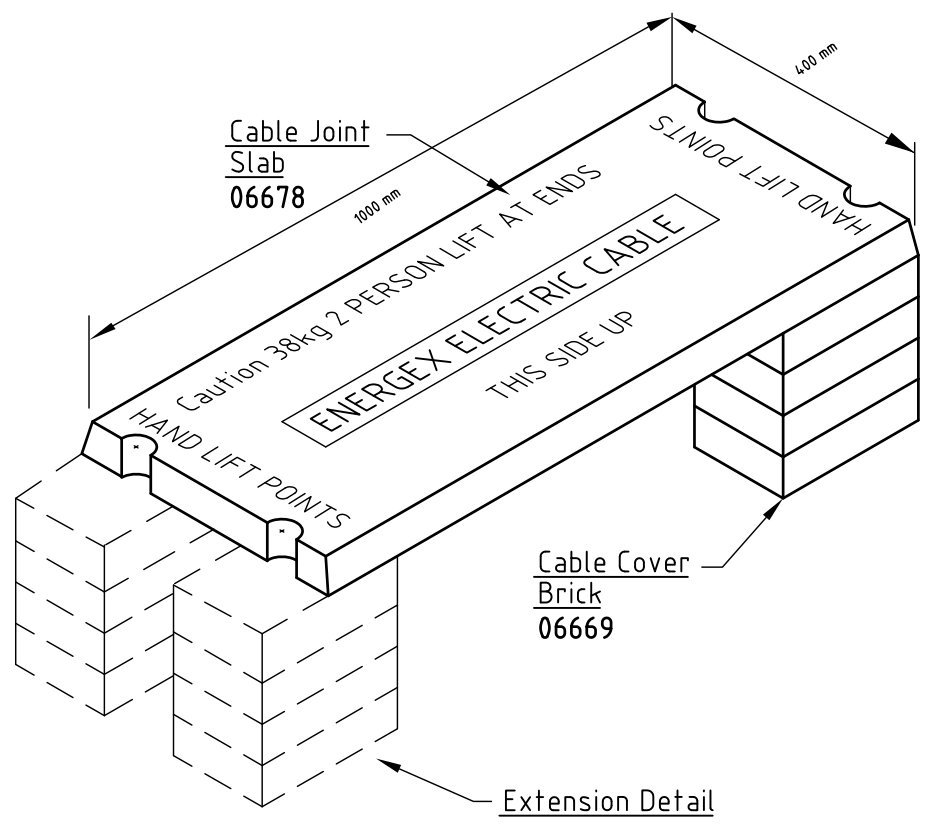
- Additional cover bricks may be required



ASSEMBLY 1352-1 - JOINT PROTECTION SLAB/SUPPORT


MATERIAL	
STOCK CODE	QTY
06678	1
06669	8 #

- Additional cover bricks may be required



ASSEMBLY 1352-2 - JOINT PROTECTION EXTENSION

ORIGINAL ISSUE	
DATE	31/5/11
APP'D	R. ENGLISH
CKD	D. TAYLOR
DRN	A. SYMONDS
SUB-SECTION 2 TITLE	CHANGE TO INCLUDE THE WORD MECHANICAL



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UNDERGROUND DISTRIBUTION CONSTRUCTION MANUAL
 CIVIL WORKS
 CABLES
 MECHANICAL PROTECTION & IDENTIFICATION
 JOINT PROTECTION SLAB

APP'D	R. ENGLISH		CAD
DATE	10/10/08	6229-A4 B	
RECD		SECTION	SUB-SECT.
CKD	P. BARNEY	C6	2.4
DWN	F. AMANPOOR	SHT 2 OF 2	
FILE UCD-C6-2.4-2B.DWG			

CABLE GLANDS			
TYPE	STOCK CODE	DESCRIPTION	USAGE
Heatshrink	21210	Heatshrink type 37-61mm	For 11kV 3c cables up to 185mm ²
Brass Wiping Gland	19674	Brass wiping gland 25-83mm	For 11kV PLY cables up to 300mm ²
Nylon	4691	Two part nylon gland suit OD 9-12.5mm	Suit 50 & 70mm ² earth cables
	4692	Two part nylon gland suit OD 12 - 18mm	
	4693	Two part nylon gland suit OD 17 - 25mm	Suit 16mm ² LV cable
	4694	Two part nylon gland suit OD 22 - 28.5mm	Suit 1 core 95mm ² triplex cable
	4695	Two part nylon gland suit OD 28 - 28.5mm	Suit 1 core 240mm ² triplex cable
	20229	Two part nylon gland suit OD 34 - 44mm	Suit 1 core 400mm ² triplex cable

GLAND PLATES

22160 Tyree 1500kVA GT Gland Plate
 20031 ABB Safelink Type CFC
 20032 ABB Safelink Type CCC
 20033 ABB Safelink Type CFCF

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		CIVIL WORKS CABLES CABLE GLANDS & GLAND PLATES		DATE	2/6/17	6229-A4 A	
				RECD		SECTION	SUB-SECT.
				CKD		C6 2.5	
				DWN	P.RELF	SHT 1 OF 1	
		FILE UCD-C6-2.5-1A.DWG					