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Eagle Farm Q

4009

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25th November.2002

OPERATING MANUAL FOR:

WELLERS HILL to MT.GRAVATT
TRUNK MAIN
S45 TRUNK MAINS
CPS 195 PERONNE Rd.
CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER
WATER SYSTEM SERVICES

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DRAWINGS

486/6/25-AA1C0021E	Standard Rectifier Wiring Diagram
(No Number)	Bimonthly Maintenance Program

(1.0) INTRODUCTION

Steel when immersed or covered in water has a tendency to corrode (or rust) as the oxidized form is more stable than the metal.

Because of this, precaution must be taken to stop or minimize the corrosion reaction to an acceptable level consistent with the design life of the structure. This is normally achieved by the use of protective coatings which control the corrosion reaction by isolating the steel from its surrounding environment.

However, it is not practical to achieve a perfect coating and coating damage will always occur with time. Because of this, corrosion may occur at imperfections in the paint coating, causing further deterioration in the coating as well as loss of metal.

As a result of this, the coating defects must be rectified by periodic maintenance or an additional method of protection used to prevent this deterioration and corrosion occurring. This additional protection is achieved by the cathodic protection system.

(2.0) CORROSION AND CATHODIC PROTECTION

Corrosion is an electrochemical process in that it is accompanied by a flow of electrical current.

Corrosion occurs on the surface of metals at active areas known as anodes, which are electrically continuous with less active or passive areas known as cathodes. The electric current flows from the anode through the electrolyte to the cathode, with the circuit being completed by the electrical continuity between the cathode and anode. In practice anodes and cathodes are generally part of the same metallic surface and individual anodic areas may be small.

In applying cathodic protection an external current is applied to the surface so that the entire surface to be protected acts as a cathode. This involves the use of an auxiliary anode and when the current flow from this anode is sufficient, no part of the structure acts as an anode.

An external source of direct current such as a transformer rectifier is used in conjunction with an anode consisting of material with a very slow corrosion rate.

While it is the flow of current which achieves the cathodic protection of the surface it is impractical to measure these currents over individual anodic areas to determine when cathodic protection has been achieved. However, with the flow of cathodic protection current, the structure becomes more negative with respect to the surrounding electrolyte. Because of this, it is possible to state values of metal/electrolyte potential at which corrosion does not occur. This metal/electrolyte potential is generally measured against a standard reference electrode which allows a reproducible potential at which corrosion does not occur to be quoted.

(3.0)

MAINS DETAILS

Size: 910 mm Dia mild steel cement lined.

Coating: Enamel Coated.

Length: Appox 5.5 Km.

Location: From Valve 190 corner Weller Rd. and Fernvale Rd. Tarragindi
to Valve 1037 corner Broadwater Rd and Newham Rd. Mt. Gravatt East.
and to Valve 197 Logan Rd. Mt Gravatt.

Construction

Drawings:

486/1/22-C0024E Cathodic Protection Standard Switchboard Cabinet

486/1/22-AAT0001E Cathodic Protection Test Points

(4.0) CATHODIC PROTECTION DETAILS

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Standard 20 Volt, 20 amp direct current output enclosed in a stainless steel switchboard. This system has 1 rectifier installed. The rectifier is in the park at the corner of Peronne and Messines Ridge Rds. Tarragindi and has a 240V supply from Energex Pole No.18031, located in Peronne Rd.
- (4.3) Cathode: The cathode point is located on the 910 mm dia mains at the manhole, on the corner of Messines Ridge and Peronne Roads Tarragindi. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.
- (4.4) Anodes: Four 1500 x 75mm silicone iron anodes were installed approximately 100 metres from the trunk mains, in a vertical bed 4 metres deep, at the rear corner of the park at Peronne Rd. The anodes are backfilled with cokebreeze thereby improving anode - ground resistance. The anodes are identified by a marker post and label. See layout drawing.
- (4.5) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the mains. On these mains thirteen test points have been installed on the trunk main which can be identified from the layout drawing.
- (4.6) Associated Drawings:
- | | |
|--|---------------------|
| Cathodic Protection Test Point Details | - 486/1/22-AAT0001E |
| Standard Rectifier Wiring Diagram | - 486/6/25-AA1C0021 |
| Cathodic Protection Test Point & Anode | |
| Bed Locations S45 Trunk Main | -2/10. 1104-01 |
- (4.7) Associated Standards:
- | | | |
|---------------|------|---|
| AS/NZS 3000 | 2000 | Electrical Installations |
| AS/NZS 2832.1 | 1998 | Cathodic Protection of Metals- Pipes and Cables |
- (4.8) Government Regulations:
Queensland Electricity Safety Rules and Regulations.

(5.0) **PERFORMED TESTING**

- (1) Natural Potential Survey.
- (2) Testing of Insulated Flanges, Joints.
- (3) Soil Resistance Testing.
- (4) Current Drain Survey.
- (5) Pipe Coating Anomaly Survey.
- (6) Rectifier Loop Resistance.
- (7) Foreign Structure Interference Survey and Mitigation.
- (8) Final Potential Survey and Commissioning.

(6.0) **CONCLUSION**

Full Cathodic protection has been achieved on this section of trunk mains. The cathodic protection system is registered with the Electrical Safety Office, Department of Industrial Relations, and has approval to operate.

(7.0) **MAINTENANCE**

The cathodic protection system is maintained on a bimonthly basis after commissioning. These checks involve testing rectifier operation and recording of pipe to soil potentials.

25th November, 2002.

Cathodic Protection Unit.

CPS Bimonthly Maintenance Details.

Required:

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.

Labour:

One tradesperson, one vehicle. 20 minutes per site.

Procedure:

- 1/ Identify installation.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Comments.
- 6/ Log entry.

25th November. 2002.

Cathodic Protection Unit

CPS 6 Monthly Maintenance Details.

Required:

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.
- 3/ Set of tools. (Electricians)
- 4/ Multimeter.
- 5/ DC clampmeter.
- 6/ Copper sulphate reference cell and leads.
- 7/ Cleaning equipment.
- 8/ Gatic cover lifters.

Labour:

One tradesperson electrical, one laborer, one vehicle.
Two hours per site.

Procedure:

- 1/ Identify system.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Record "on" potentials for all test points.
- 6/ Record "instant off" potentials for all test points.
- 7/ Record "off" potentials for all test points.
- 8/ Perform loop resistance and record.
- 9/ Check and record anode string currents.
- 10/ Comments.
- 11/ Log entry.

25th November, 2002.

Cathodic Protection Unit

CPS 60 Monthly Maintenance Details.

Required:

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.
- 3/ Set of tools. (Electricians)
- 4/ Multimeter.
- 5/ DC clampmeter.
- 6/ Copper sulphate reference cell and leads.
- 7/ Cleaning equipment.
- 8/ Gatic cover lifters.
- 9/ Rectifier load bank.
- 10/ PCS2000 Detection Equipment.

Labour:

One tradesperson electrical, one laborer, one vehicle.
Eight hours per site.

Procedure:

- 1/ Identify system.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Record "on" potentials for all test points.
- 6/ Record "instant off" potentials for all test points.
- 7/ Record "off" potentials for all test points.
- 8/ Perform loop resistance and record.
- 9/ Check and record anode string currents.
- 10/ Load test rectifier for 10 minutes.
- 11/ Check all switchboard and testpoint terminals for tightness.
- 12/ Check all switchboard and testpoints are labelled and I.D. tags attached.
- 13/ Check plans are correctly drawn and modify if necessary.
- 14/ Remove and inspect anodes.
- 15/ Recheck all interference (CPS) bleeds.
- 16/ Pipecamp structure if applicable.
- 17/ Apply to reregister system if applicable

Brisbane Water

Network Services

Cathodic Protection System Loop Resistance

Peronne Rd. Rectifier. CPS195

Date: 25th November 2002

Cathodic Protection System:

Wellers Hill to Mt. Gravatt Trunk Main S45

System Operating Volts:

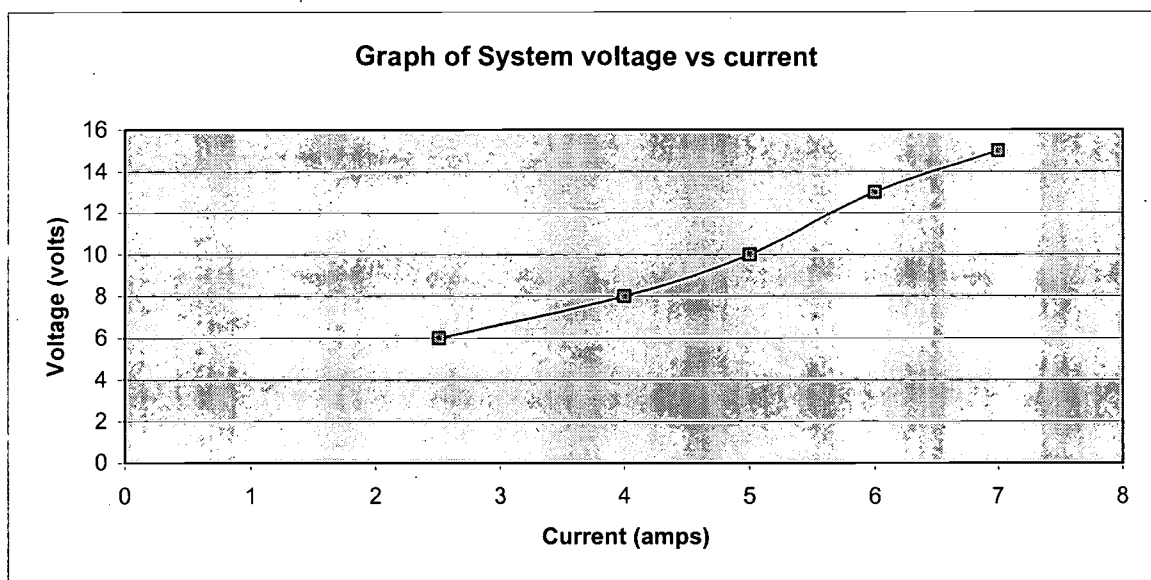
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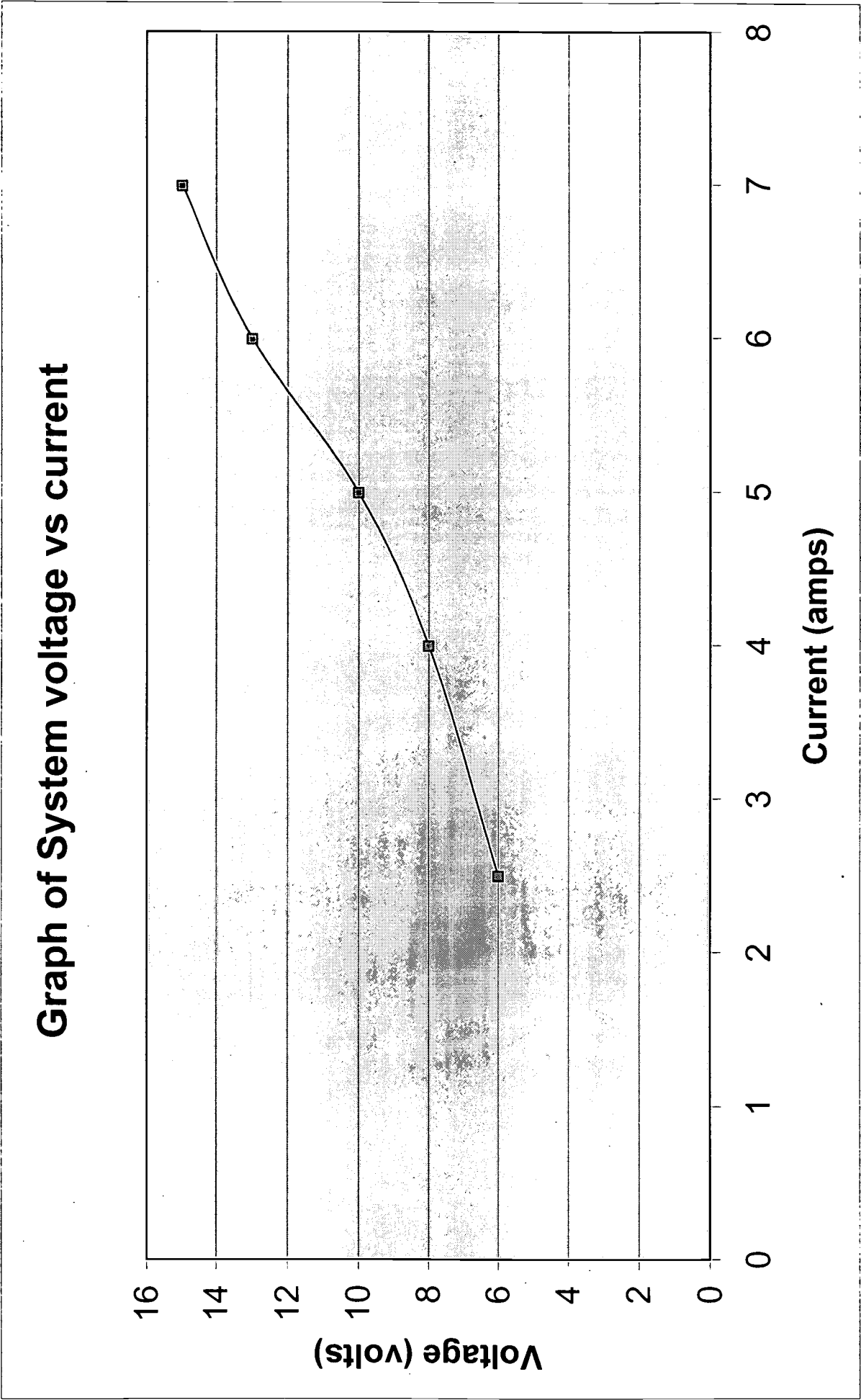
System Operating amps:

5

Test Voltage:		Test Current:	
(volts)		(amps)	
6		2.5	
8		4	
10		5	
13		6	
15		7	

Loop Resistance (ohms)
2.5



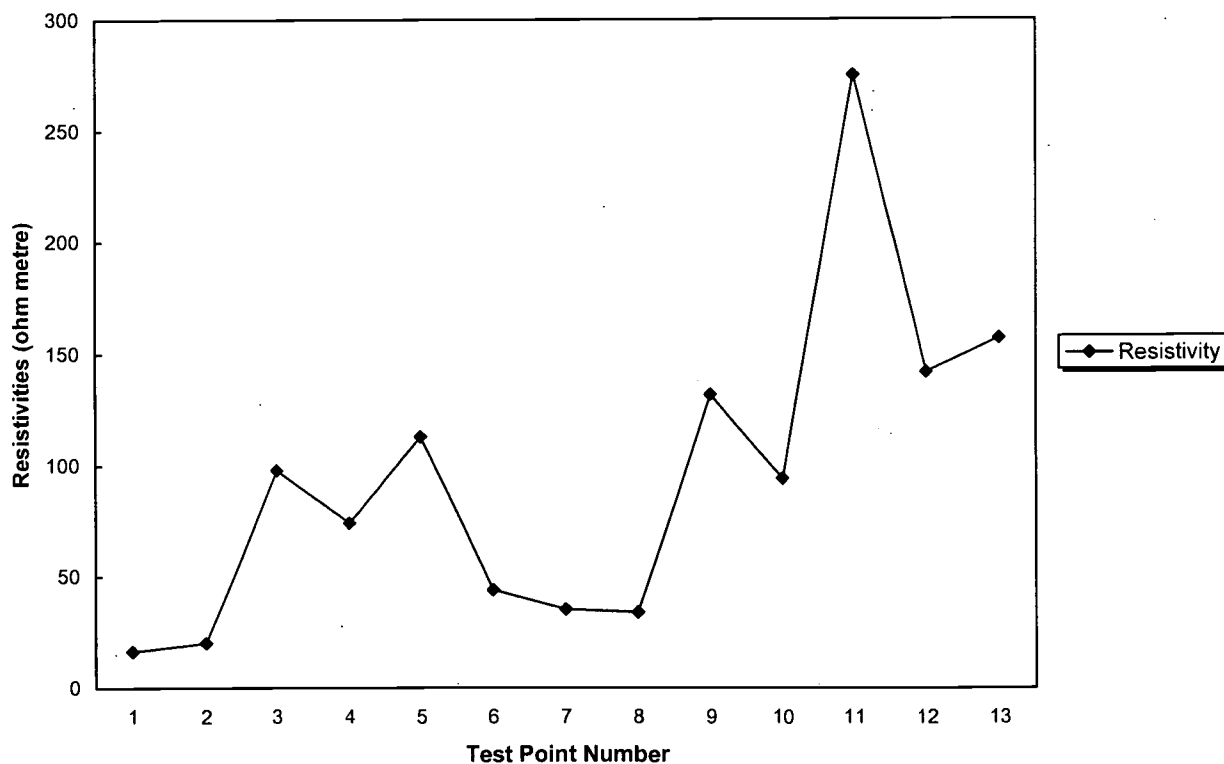


Brisbane Water

CP Form No. 23

Network Services**Cathodic Protection System Resistivities Recording Form****Project** S45 Trunk Main.Wellers Hill to Mt. Gravatt**Date** 25th November 2002

Test Point number	Distances to T.P. (metres)	Resistivities at 2 metres ohm metres
1	0	16.32
2	450	20.09
3	800	97.97
4	1350	74.1
5	1850	113.03
6	2400	43.96
7	2700	35.16
8	3200	33.91
9	3800	131.88
10	4340	94.2
11	4500	275
12	4800	141.9
13	5500	157
14		

Graph of resistivities vs pipelength

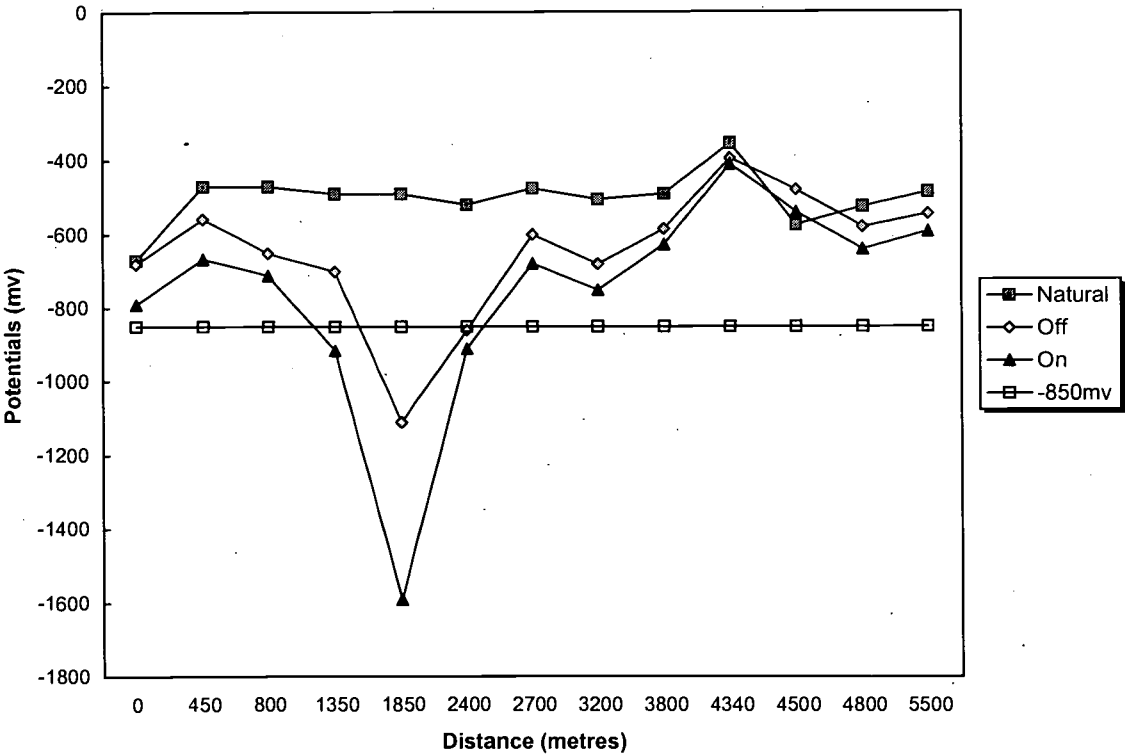
Cathodic Protection System Potential Recording Form

Project S45 Trunk Main.Wellers Hill to Mt. Gravatt

Date 25th November 2002

Test Point number	Distances to T.P. (metres)	Potentials to CuSO4			
		Natural	Off	On	
		(mV)	(mV)	(mV)	
1	0	-670	-680	-790	-850
2	450	-470	-558	-666	-850
3	800	-470	-650	-710	-850
4	1350	-490	-700	-916	-850
5	1850	-490	-1110	-1590	-850
6	2400	-520	-860	-910	-850
7	2700	-476	-600	-678	-850
8	3200	-505	-680	-750	-850
9	3800	-490	-585	-627	-850
10	4340	-355	-395	-410	-850
11	4500	-575	-480	-540	-850
12	4800	-525	-580	-640	-850
13	5500	-486	-545	-592	-850
14					

Graph of potentials vs pipelength



Please note:
This application must be
accompanied by a fee of
\$200.00



Queensland Government

Department of Industrial Relations

ABN – 52 293 849 579

Electricity Act 1994 (Queensland) (160 and 265)

Electricity Regulation 1994 (186 to 210)

Office use only.
Fees paid:
Receipt no:

APPLICATION TO REGISTER A REGISTRABLE CATHODIC PROTECTION SYSTEM

I/We, as system owner/s, hereby make application to register the registrable Cathodic Protection System described below:

Name and postal address of system owner:	Brisbane City Council / Brisbane Water GPO. Box 1434 Brisbane 4001		
Contact Name:	Telephone no:		
Name and postal address of authorised agent of system owner:	Brisbane Water Network Services 268 Cullen Ave Eagle Farm 4009		
Contact Name:	Jeff Say		
Type of application: (Tick as appropriate)	<input checked="" type="checkbox"/> New system (Note 2) Permit No; <input type="checkbox"/> Alteration to an existing system, Registration No: (Note 3) <input type="checkbox"/> Renewal of system, Registration No:		
Location of system: (Note 4)	Peronne Road Tarragindi 4121 From cnr. Fernvale and Weller Roads Tarragindi to Cnr Broadwater and Newham Rds. Mt. Gravatt East.		
Structure to be protected:	910mm dia Mild Steel Trunk Main		
Maximum operating current:	6.00A	Amperes DC	Maximum operating voltage (Note 5):
Volts			
I/We, being the owner/s of the Cathodic Protection System described above, make application for the registration of this system and certify with respect to the system that:			
(i) I/We have complied with the requirements of Part 4 of Chapter 3 of Electricity Regulation 1994; (ii) the tests pursuant to section 190 of Electricity Regulation 1994 were based on the maximum operating current stated in this Application; (iii) the maximum operating voltage stated in this Application (in the case of the system operating with an anode/s immersed in water or a marine environment corresponds to the maximum operating current mentioned in paragraph (ii); and (iv) any necessary interference mitigation measures for foreign structures (in the case where the system is currently registered) have been tested and are operating satisfactorily.			
Signature of System owner:		Date: / /	

Application should be forwarded with registration fee of \$200.00 to: Electrical Safety Office, Department of Industrial Relations, PO Box 995, SPRING HILL Q 4004. **Please note: This is a GST free supply. No tax invoice will be issued.**

Refer notes overleaflet →

NOTES:

1. (a) A Registrable Cathodic Protection System is an impressed current system the converter of which is capable of delivering a current greater than 0.25A.

(b) A separate application is required for each Registrable Cathodic Protection System.
2. The application for a new system is to be accompanied by a plan indicating full particulars about the system including the names of the owners and location of underground and immersed foreign structures.
3. Application submitted pursuant to section 209 of Electricity Regulation 1994.
4. Sufficient details are required to correctly identify the geographical location of the system. Post Code must be included.
5. The maximum operating voltage is only required for a system operating with an anode (or anodes) immersed in water or a marine environment.

For such systems:

- Refer section 197 of Electricity Regulation 1994.
- The application is to be accompanied by the "Technical Schedule Relating to a Registrable Cathodic Protection installation in Water or a Marine Environment".

Note: There are no bleeds on the Wellers Hill to Mt. Gravatt System

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit

Cathodic Protection Interference Survey Results Form

Project Wellers Hill Init Reading 13.1V 6a Date 16-8-02

	Reading	Test Point I. D.	Location	Swing
On	-316		Logan Rd.	
Off	-300	Men	Pole no 17330	-16
On	-327			
Off	-320	Men	Pole no 17331	-7
On	-333			
Off	-311	Men	Pole no 17334	-22
On	-400			
Off	-359	Men	Pole no 33104	-41
On	-390			
Off	-385	Men	Pole no 43834	-5
On	-375			
Off	-370	Men	Pole no 17336	-5
On	-320		Nursery	
Off	-320	Men	Pole no. 2869	0
On	-240			
Off	-230	Men	Pole no 2866	-10
On	-265			
Off	-265	Men	Pole no 8509	0
On	-247			
Off	-247	Men	Pole no 4033	0
On	-236			
Off	-236	Men	Pole no 63322	0
On	-352		Monash Rd	
Off	-352	Men	Pole no 5095	0
On	-675		Massines Ridge	
Off	-655	Men	Pole no 36631	-20
On	-662			
Off	-555	Men	Pole no 25295	-107
On	-400			
Off	-400	Men	Pole no 9051	0

TESTED BY P. Smyth

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit**Cathodic Protection Interference Survey Results Form**Project Wellers Hill Init Reading 13.5V 6A Date 16-8-02

	Reading	Test Point I. D.	Location	Swing
On	-690		Peronne St	
Off	-222	Men	Pole no 29903	-468
On	-330			
Off	-330	Light	Pole no 300874	0
On	-530		Messines Ridge	
Off	-490	Men	Pole no 31983	-40
On	-480			
Off	-430	Men	Pole no 31982	-30
On	-51			
Off	-51	Men	Pole no 9056	0
On	-319		Turrumurr	
Off	-319	Men	Pole no 40028	0
On	-358		Broadwater.	
Off	-358	Men	Pole no 24739	0
On	-376			
Off	-376	men	Pole no 24738	0
On	-343			
Off	-343	Men	Pole no 2909	0
On	-380			
Off	-380	Men	Pole no 821238	0
On	-10		Cortos.	
Off	-10	Men	Pole no 18178	0
On	-310			
Off	-310	Men	Pole no CB1023	0
On	-274			
Off	-270	Men	Pole no 43626	-4
On	-385		Bearge	
Off	-360	Men	Pole no 16810	-25
On				
Off				

TESTED BY P. SMYTH

Brisbane Water Engineering Services

CP Form No. 27

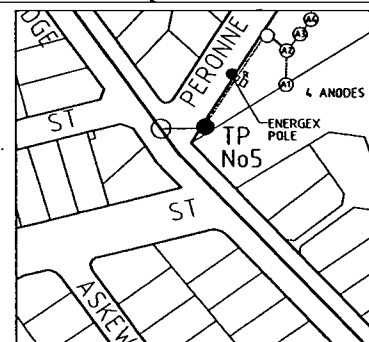
Electrical Engineering Unit**Cathodic Protection Interference Survey Results Form**Project Wellers Rd. Init Reading 13v 6a Date 16-8-02

	Reading	Test Point I. D.	Location	Swing
On	-360		Wellers Rd.	
Off	-360	Men	Pole no 18085	0
On	-347		40696	
Off	-347	Men	Pole no	0
On	-309			
Off	-309	Men	Pole no 23125	0
On	-320			
Off	-320	Men	Pole no 23122	0
On				
Off				
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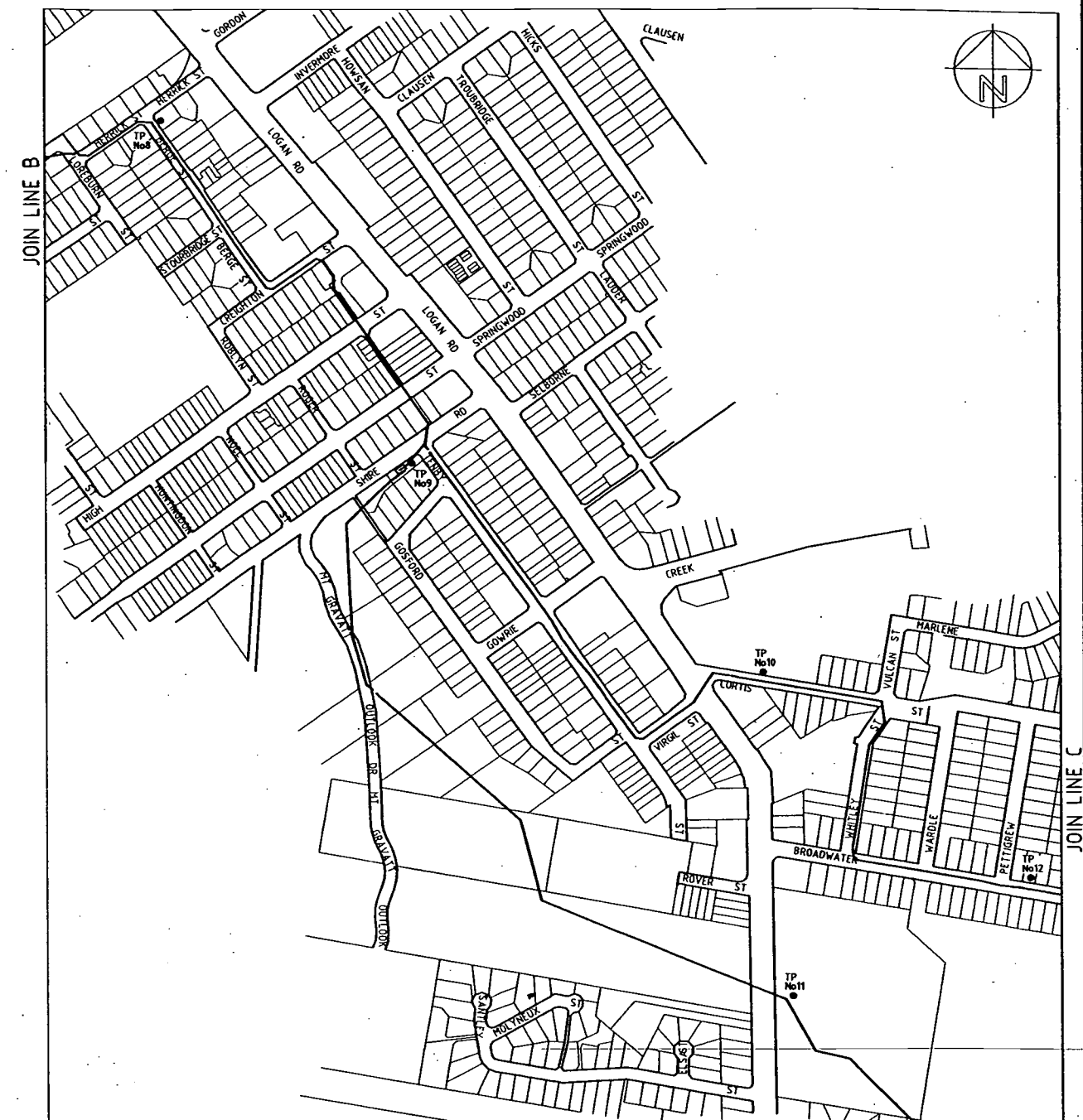
TESTED BY P. Smyth



JOIN LINE A



DETAIL
SCALE: 1:2000 A1



JOIN LINE C

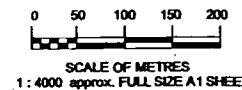


JOIN LINE A

REFER DETAIL A

JOIN LINE B

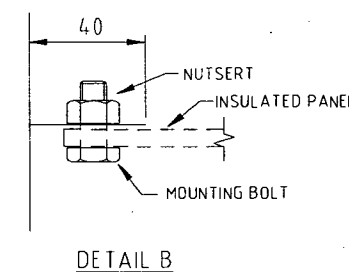
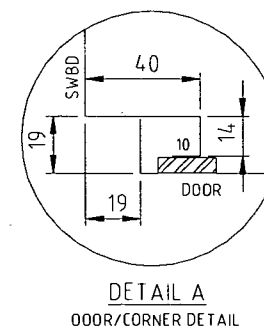
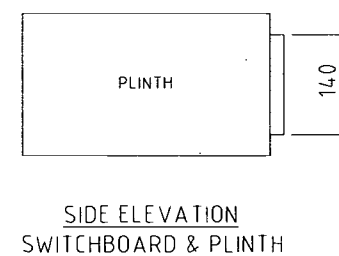
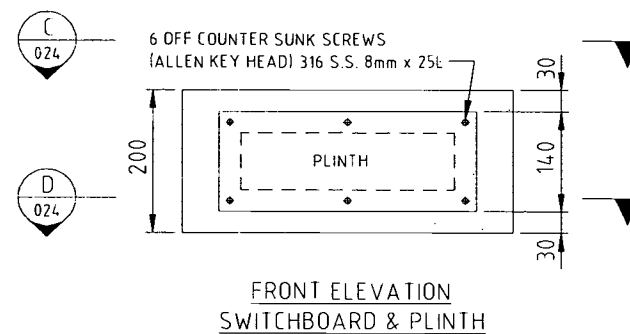
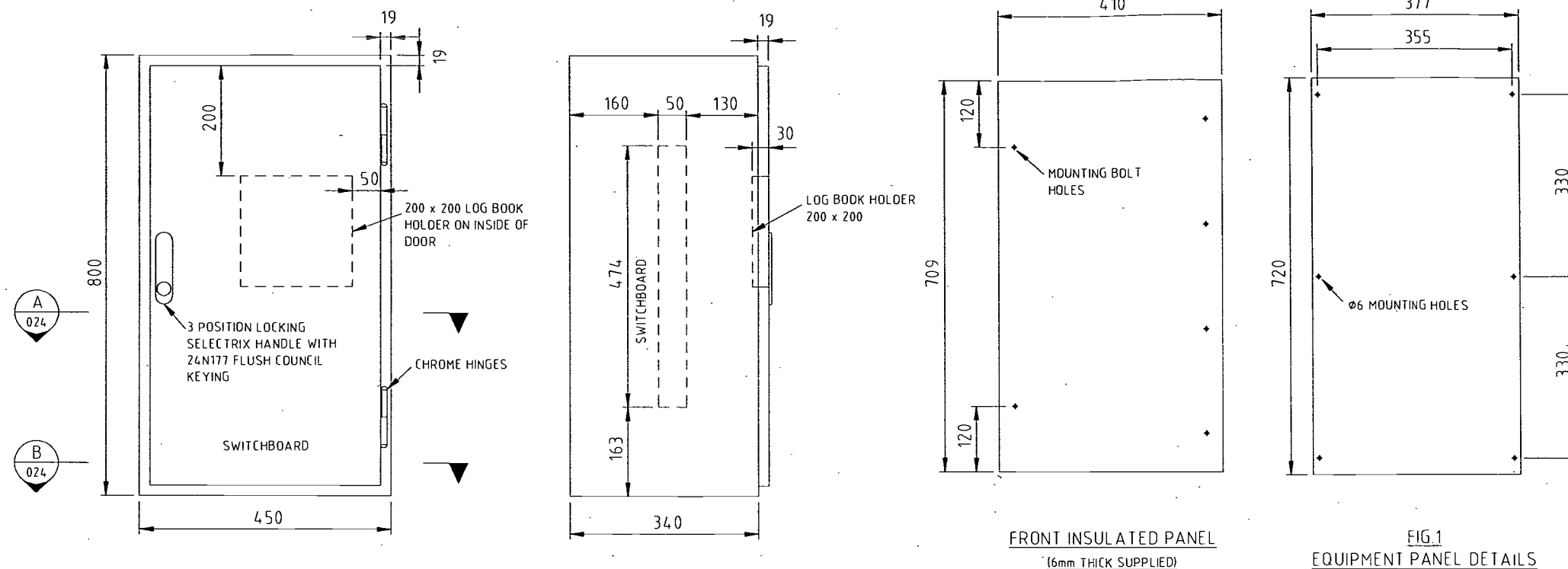
ASSET REGISTER	
TICK APPROPRIATE BOX	
BCC FUNDED	<input checked="" type="checkbox"/> DEVELOPER FUNDED
STATE GOVT. FUNDED	FED. GOVT. FUNDED
AS CONSTRUCTED	
PLOTTED N. KROMAN	DATE 10/02
CHECKED	DATE



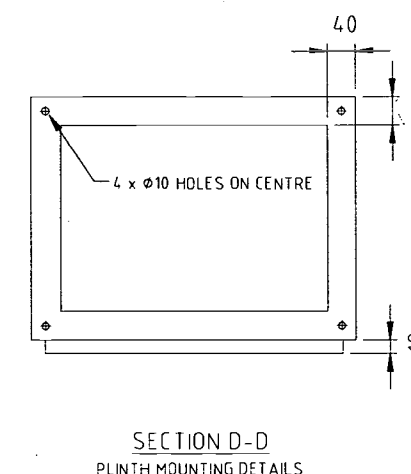
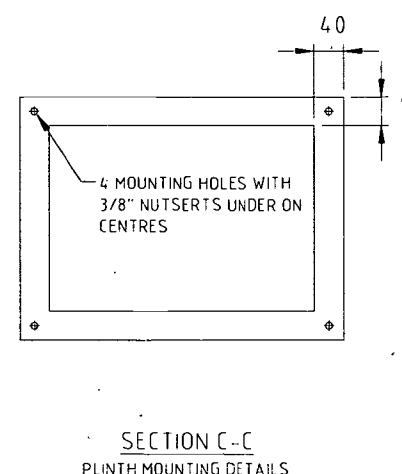
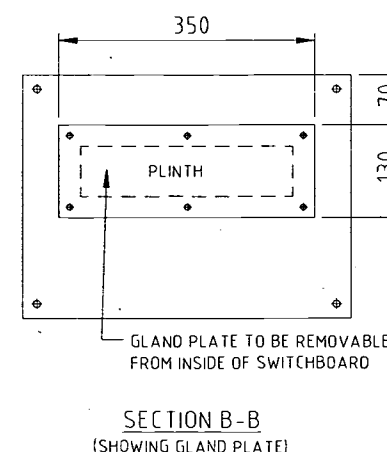
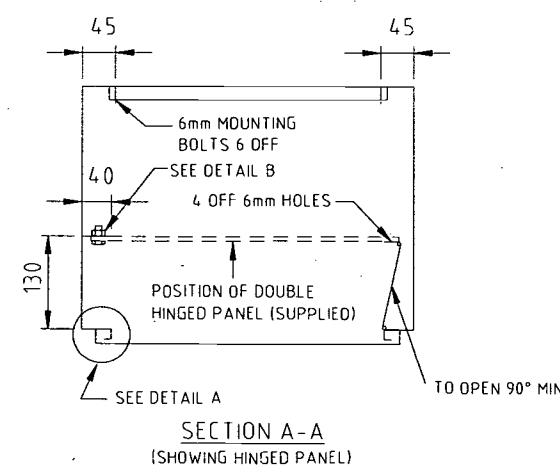
JOIN LINE C



NO. DATE	AMENDMENT	INITIAL	DIRECTOR OF PD & PS	DATE	SUPERVISING ENGINEER	R.P.E.Q. NO.	DATE	DESIGN	SUPERVISING ENGINEER	CADD FILE	210110401	SURVEY NO.	NIL	FIELD BOOK	NIL	DRAWN	N.K.	OCT 02	DRAFTING CHECK	H.W.	NOV 02	PROJECT	MT. GRAVATT TO WELLERS HILL S45 TRUNK WATER MAIN	TITLE	CATHODIC PROTECTION TEST POINT & ANODE BED LOCATIONS	SCALE	AS SHOWN	A.H. DATUM	N° 1 OF 1 SHEETS	DRAWING N°	2/10.1104-01	AMEND.	0

1. CABINET TO BE MANUFACTURED FROM 1.6mm 2B STAINLESS STEEL.
2. UNLESS SPECIFIED, SUPPLY CABINET WITH PLINTH. (MOUNT PLINTH TO SWITCHBOARD CABINET USING STAINLESS STEEL SCREWS).
3. REAR EQUIPMENT PANEL TO BE ZINC PLATED STEEL. POWDER COATED 'ORANGE'. (FULL LENGTH, FULL WIDTH & REMOVABLE). SEE FIG.1.
4. DOUBLE HINGED PANEL SUPPLIED BY B.C.C.
5. PROVIDE 1/4" WW STAINLESS STEEL STUDS TO DOOR & SWITCHBOARD CABINET.
6. DEGREE OF WEATHER PROTECTION IP55.
7. SELECTRIX TYPE HANDLE TO BE SUPPLIED & FITTED BY SWITCHBOARD MANUFACTURER. HANDLE TO BE 1107 SS CU1. KEY TO BE 24N177.
8. DOUBLE HINGED PANEL MOUNT TO BE SUPPLIED WITH MOUNTING BOLTS & NUTSERTS TOP & BOTTOM. SEE DETAIL A.



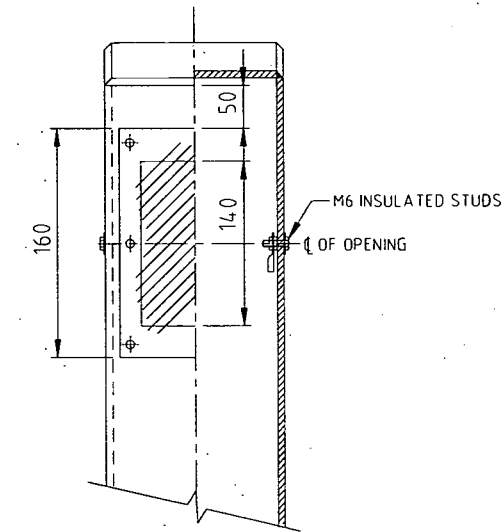
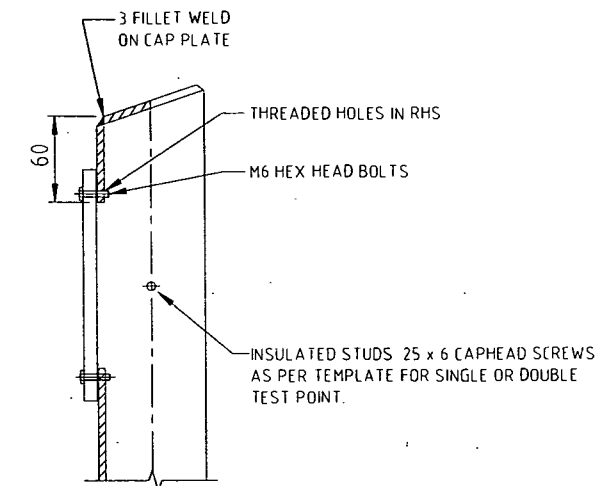
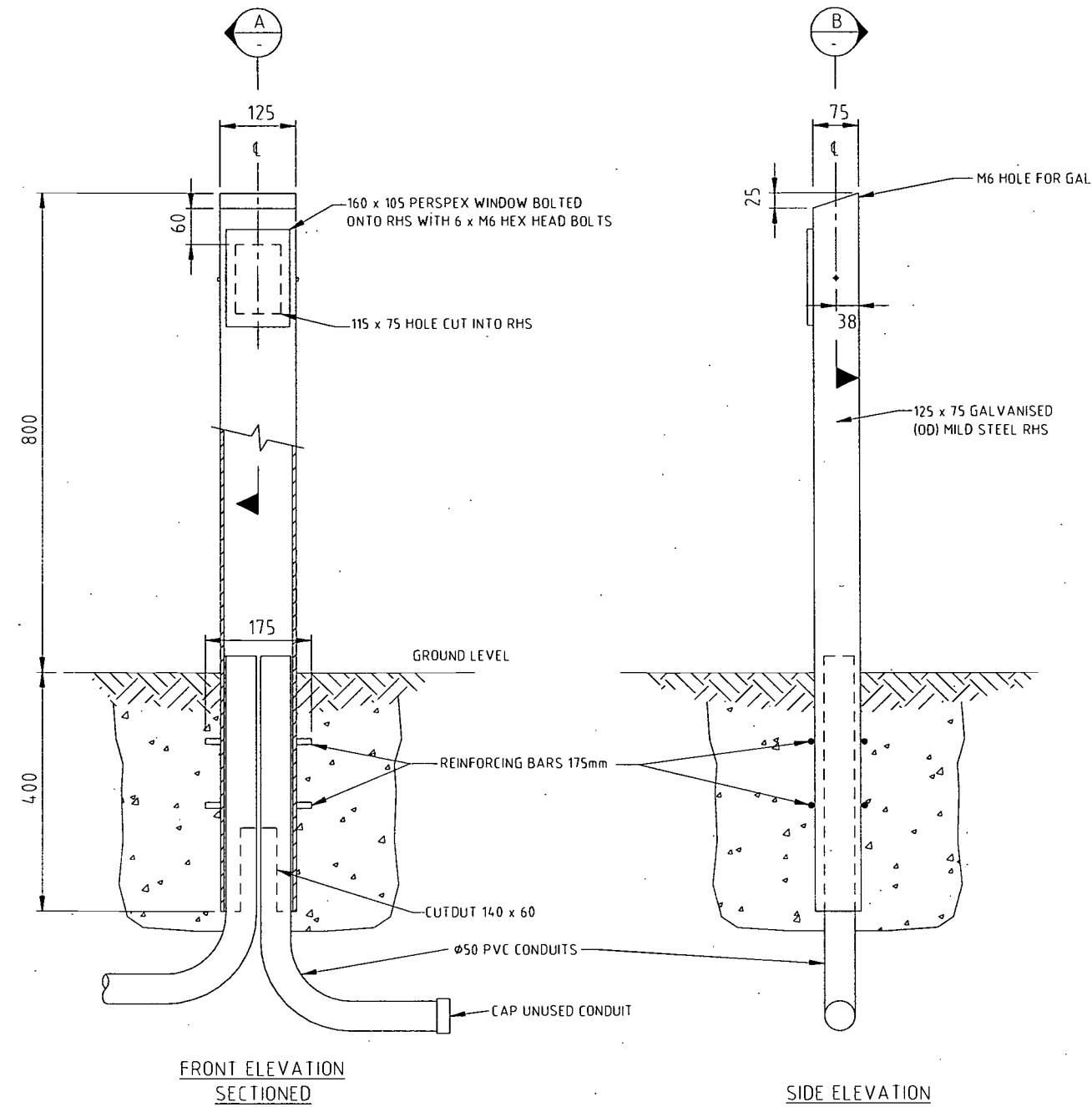
NUMBER OF SWITCHBOARDS REQUIRED	
NUMBER OF PLINTHS REQUIRED	





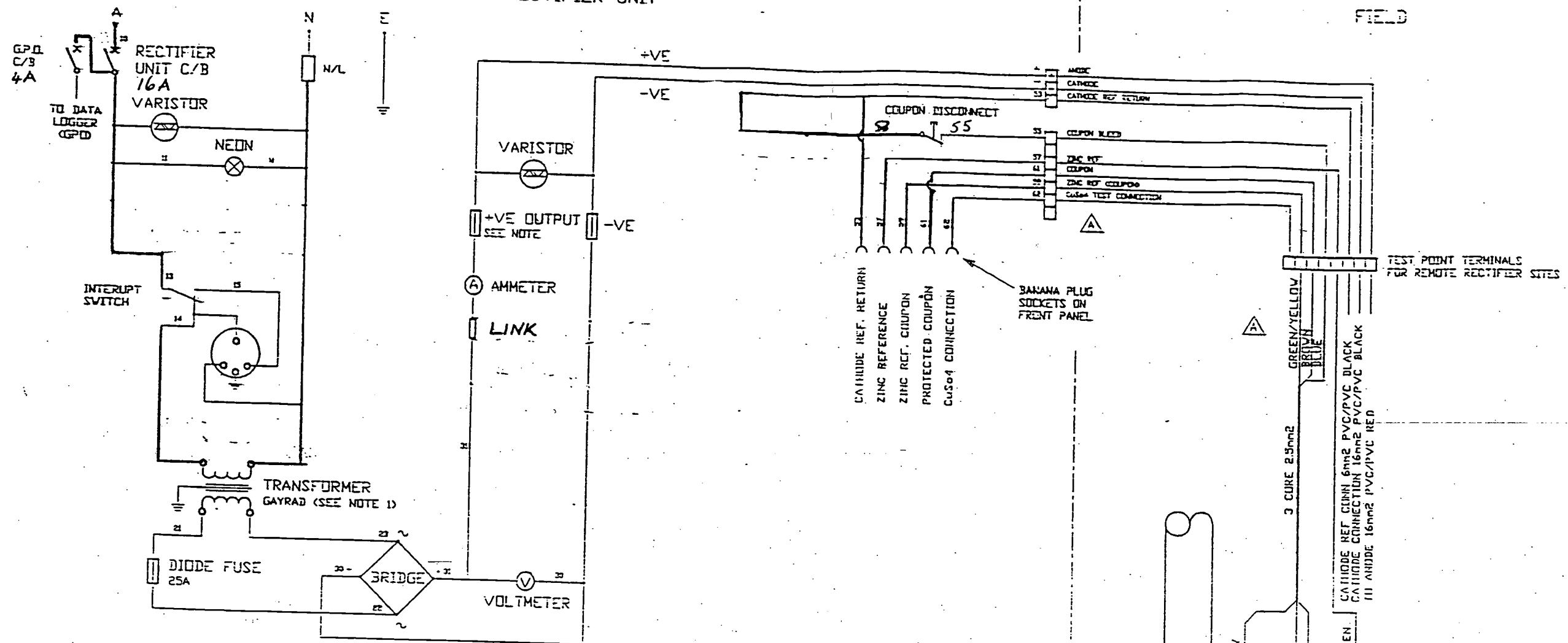
			DIRECTOR OF P.D. & P.S.		DATE			NAME	DATE	 Brisbane City	JOB FILE			 Professional Services Engineering			PROJECT		TITLE STANDARD SWITCHBOARD CABINET		SCALE NTS		N° 1 OF 1 SHEETS	
C	9-02	NOTE 7 REVISED	H1	DATE	DESIGN	K.M.G.	5-5-92	ACAD FILE	22C0024-Rev-C		SHEET SIZE	A1	CATHODIC PROTECTION				DRAWING N°				486/1/22-C0024E	AMEND. C		
B	11-95	MODIFIED	DLP	DATE	DRAWN	D.L.P.	7-5-92	SURVEY No.	FIELD BOOK		A.H. DATUM													
A	5-92	ISSUED FOR APPROVAL	DLP	DATE	CHECKED			SURVEYED																
NO. DATE			AMENDMENT		INITIALS	SUPERVISING ENGINEER		R.P.E.Q. NO.		DATE														

NOTES

1. HOT DIP GALVANISE AFTER FABRICATION.



				DIRECTOR OF P.D. & P.S.		DATE			NAME		DATE	 Brisbane City	JOB FILE					PROJECT CATHODIC PROTECTION		TITLE STANDARD TEST POINT CONSTRUCTION DETAILS		SCALE NTS		N° 1 OF 1 SHEETS	
C	9-02	NOTE 1 REVISED	HT	ENGINEER IN CHARGE	DATE	DESIGN	K.M.G.	5-5-92	ACAD FILE	2210001-RevA	SHEET SIZE		A1	DRAWING N° 486/1/22-AAT0001E								AMEND C			
B	11-95	MODIFIED	DLP	SUPERVISING ENGINEER	R.P.E.O. NO.	DATE	DRAWN	DLP	7-5-92	SURVEY No.	FIELD BOOK														
A	5-92	ISSUED FOR APPROVAL	DLP	INITIALS			CHECKED			SURVEYED			A.H. DATUM												
NO.		DATE		AMENDMENT																					



NOTES

TRANSFORMER OUTPUT CURRENT & VOLTAGE TO SUIT APPLICATION PROVIDING SUITABLE RESOLUTION & CONTROL

AMMETER & VOLTMETER TO PROVIDE SUITABLE RESOLUTION FOR SYSTEM

- + POSITIVE WIRING TO BE RED
- NEGATIVE WIRING TO BE BLACK
- L.V. AC WIRING TO BE 4mm² BLUE/WHITE
- DC WIRING TO BE 4mm²
- 240V AC WIRING TO BE 15mm²-BROWN/BLACK
- REFERENCE WIRING TO BE 15mm²-GREY

+VE AND -VE DC FUSES TO BE SIZED APPROX. 50% ABOVE NORMAL OUTPUT CURRENT

REV	DATE	REVISION	CHECK	APPR
1	RL 18.10.93	CHANGES AS SHOWN		
2	RL 25.8.93	ISSUED FOR CONSTRUCTION		



BRISBANE
CITY COUNCIL
DEPARTMENT OF WATER
SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES

PROJECT
STANDARD
CATHODIC PROTECTION
TITLE
RECTIFIER UNIT
WIRING DIAGRAM

DRAWN	NAME	DATE	SUPER ENG.	SCALE	SIZE
DESIGN	J.S.	3.8.93	SENIOR ENG.		A
CHECKED	J.S.	25.8.93	ELECT. ENG.		AMEND
DRAWING No.	486/6/25-AA1C0021E				A
ADDRESS FILE No.	A625C21				

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