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22nd May 2003

OPERATING MANUAL FOR:

ENOGERA to GROVELY TRUNK MAIN S34 TRUNK MAINS

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER
WATER SYSTEM SERVICES

MANUAL CONTENTS

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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: 600 mm Dia mild steel cement lined.

Coating: Fibreglass Enamel Coated.

Length: Appox 2.9 Km.

Location: From Valve 233 Pickering St. Enoggera,
to Valve 759 Grovely Reservoir.

Construction

Drawings:

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

486/1/22-AAT0001E Cathodic Protection Standard Test Points

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Impressed Current.

(4.2) Rectifier: Standard 30 Volt, 30 amp direct current output enclosed in a stainless steel switchboard. This system has 1 rectifier installed. The rectifier is at the Hay Street Pump Station and has a 240V supply from the distribution switchboard within the Pump Station.

(4.3) Cathode: The cathode point is located on the 600 mm dia mains at the rear of the Hay Street Pump Station. 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 5 metres deep, in the park corner Hay and Hicks St. 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 six 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 S34 Trunk Main - 2/10.2387-01

(4.7) Associated Standards:
 AS/NZS 3000 2000 Electrical Installations
 AS/NZS2832.1 1998 Cathodic Protection of Metals- Pipes and Cables.

(4.8) Government Regulations:
 Queensland Electricity Safety Rules and Regulations. 2002

(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.

0

22nd May, 2003.

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.

22nd May. 2003.

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.

22nd May, 2003.

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

Hay St Pump Station Rectifier. CPS187

Date: 12th June 2003

Cathodic Protection System:

Enoggera to Grovely Reservoir Trunk Main S34

System Operating Volts:

21

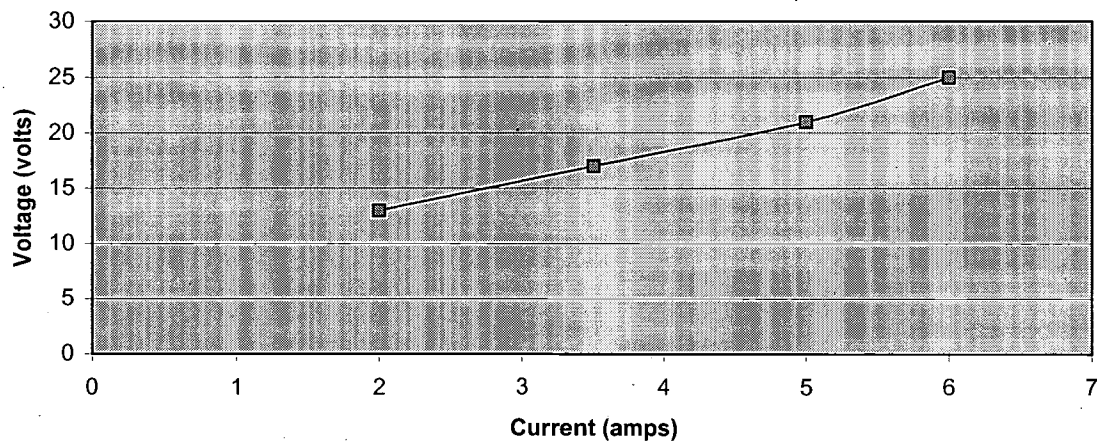
System Operating amps:

5

| Test Voltage: | | Test Current: | |
|---------------|--|---------------|--|
| (volts) | | (amps) | |
| 13 | | 2 | |
| 17 | | 3.5 | |
| 21 | | 5 | |
| 25 | | 6 | |

| Loop Resistance (ohms) |
|---------------------------|
| 4.2 |

Graph of System voltage vs current

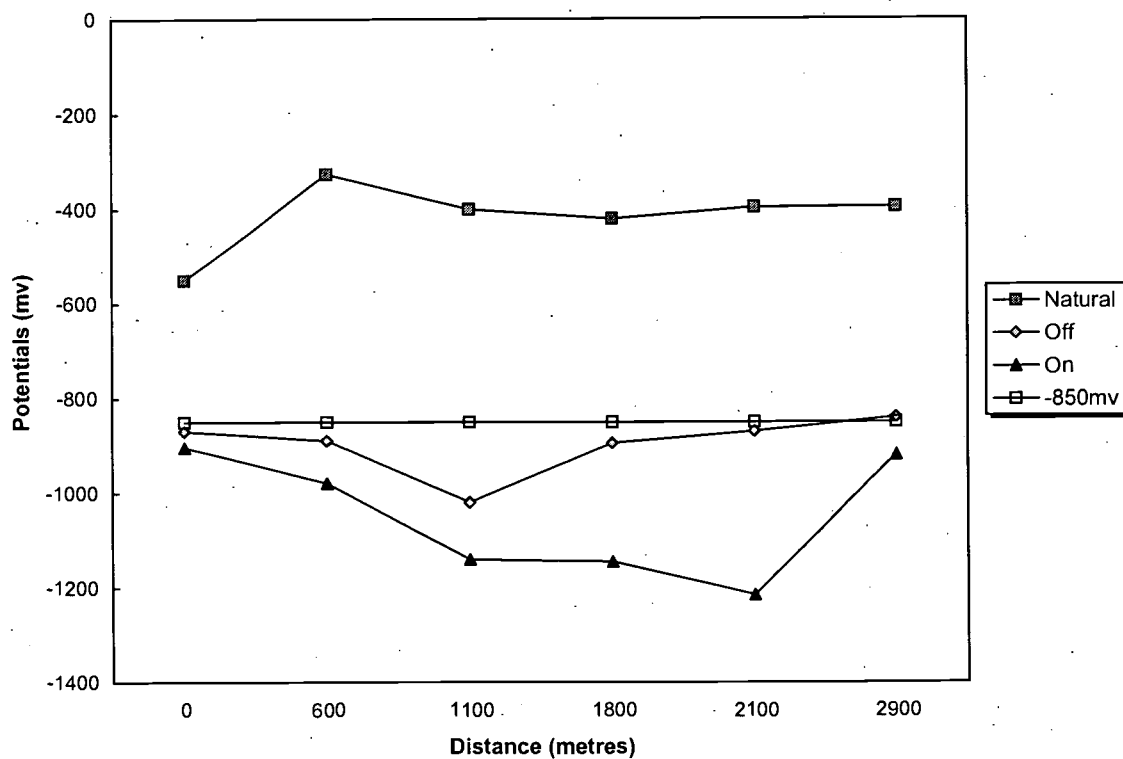


Brisbane Water

CP Form No. 23

Network Services**Cathodic Protection System Potential Recording Form****Project** S34 Trunk Main.Enoggera to Grovely**Date** 12th June 2003

| Test Point number | Distances to T.P. (metres) | Potentials to CuSO4 | | | |
|-------------------|-------------------------------|---------------------|-------------|------------|------|
| | | Natural (mV) | Off (mV) | On (mV) | |
| 1 | 0 | -550 | -870 | -904 | -850 |
| 2 | 600 | -326 | -890 | -980 | -850 |
| 3 | 1100 | -400 | -1020 | -1140 | -850 |
| 4 | 1800 | -420 | -895 | -1145 | -850 |
| 5 | 2100 | -396 | -870 | -1215 | -850 |
| 6 | 2900 | -395 | -840 | -920 | -850 |
| | | | | | |
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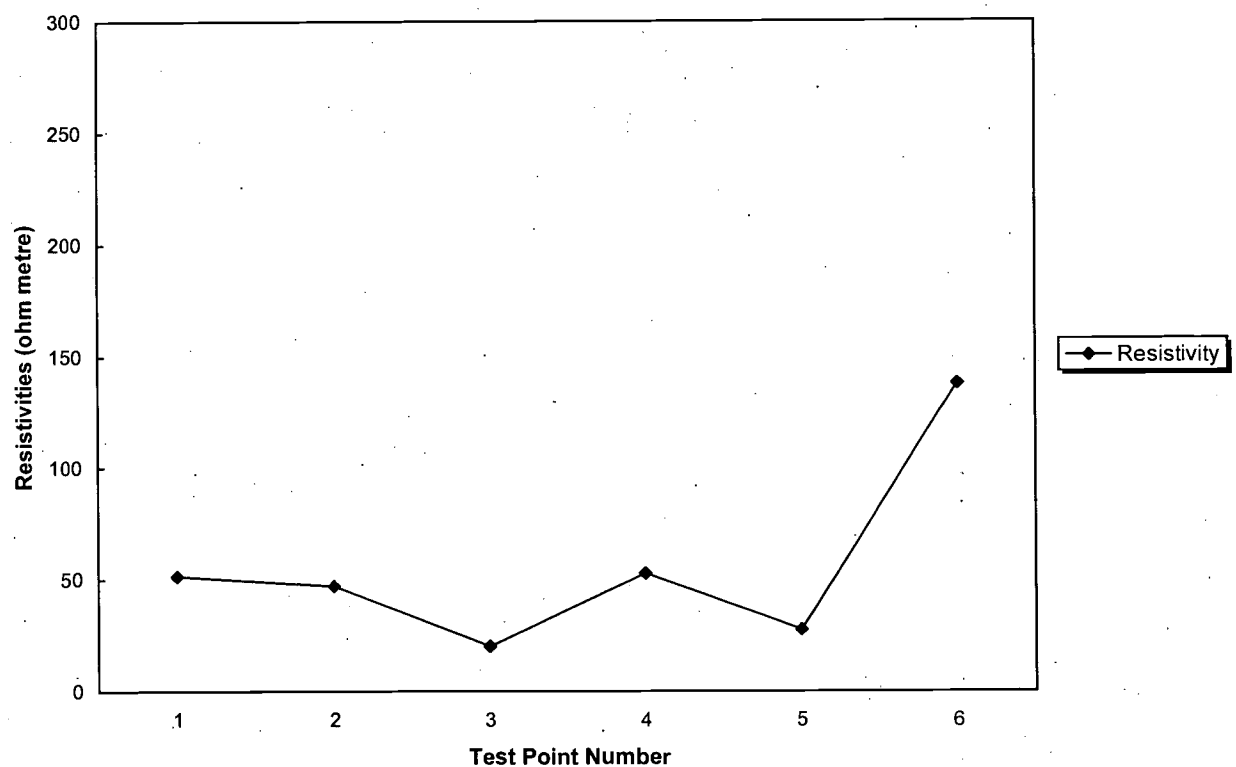
Graph of potentials vs pipelength

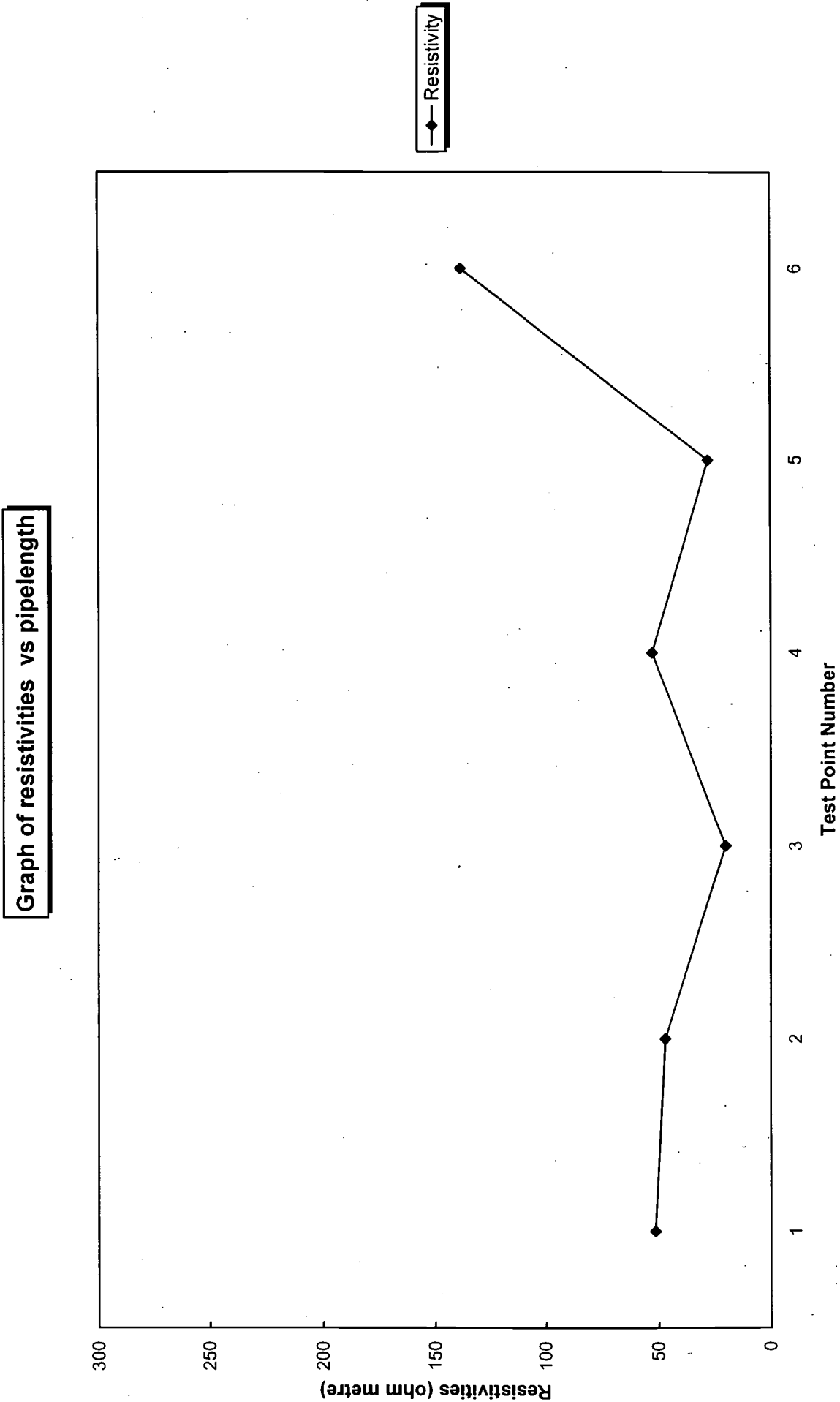
Brisbane Water

CP Form No. 23

Network Services**Cathodic Protection System Resistivities Recording Form****Project** S34 Trunk Main.Enoggera to Grovely Reservoir**Date** 12th June 2003

| Test Point number | Distances to T.P. | Resistivities at 2 metres |
|----------------------|----------------------|------------------------------|
| | (metres) | ohm metres |
| 1 | 0 | 51.4 |
| 2 | 600 | 47 |
| 3 | 1100 | 20.1 |
| 4 | 1800 | 52.7 |
| 5 | 2100 | 27.6 |
| 6 | 2900 | 138 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Graph of resistivities vs pipelength



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

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 (Note 1)

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. T.C. Beirne Centre 315 Brunswick St. Mall. Fortitude Valley 4006. | |
| Contact Name: | | Contact Phone: |
| Name and postal address of authorised agent of system owner: | Brisbane Water Engineering Services 5 Bunya Street Eagle Farm. 4009 Telephone No: 07...../34031849..... | |
| Contact Name: | Jeff Say | Contact Phone: 07-34031854 |
| Type of application: (tick as appropriate) | <input checked="" type="checkbox"/> New system (Note 2) <input type="checkbox"/> Alteration to an existing system, Registration No:.....(Note 3) <input type="checkbox"/> Existing system, Registration No:..... | |
| Location of application: (Note 4) | Hay Street Mitchelton 4053 From cnr Pickering & Wardell Sts Enoggera to Dawson Parade (Grovely Res) | |
| Structure to be protected: | 410 and 600mm Dia Mild Steel Trunk Main. | |
| Maximum operating current:....8.0 A....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 (i); and
- (iv) any necessary interference mitigation measures for foreign structures (in 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 Mines and Energy, GPO Box 995, Spring Hill Q 4004

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 with respect to 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 the Electrical Regulation 1994.
- 4 Sufficient details are required to correctly identify the geographical location of the system.
- 5 The maximum operating voltage is only required for a system operating with an anode (or anodes) immersed in water or 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 five bleeds on the Enoggera to Grovely System.

Brisbane Water identification No. CPB 84 is at Energex pole 32118 Hay St. Mitchelton.

Brisbane Water identification No. CPB 85 is at Energex pole 43209 Gizerah St. Mitchelton.

Brisbane Water identification No. CPB 86 is at Energex pole 23176 Pickering St. Enoggera

Brisbane Water identification No. CPB 94 is on Telstra Cable Pickering St. near Lade St Enoggera

Brisbane Water identification No. CPB 95 is on Telstra Cable Gizerah St near Mashobra St. Enoggera



QUEENSLAND GOVERNMENT

Electricity Act 1994

NOTICE OF REGISTRATION OF CATHODIC PROTECTION SYSTEM**Registration No: 3291****Date of Registration:** 17 September 2001 **Expiry Date:** 17 September 2006

The cathodic protection system referred to below has been registered for a term of five years, and the conditions of registration shown hereunder shall apply in addition to the provisions of the Electricity Act 1994 and Electricity Regulation 1994.

| | |
|--|--|
| Name and Postal Address of System Owner | Brisbane City Council/Brisbane Water 5 Bunya Street EAGLE FARM Q 4009 |
| Location of System | Hay Street (From Cnr Pickering & Wardell Sts Enoggera to Dawson Parade (Grovely Res) MITCHELTON - Post Code: 4053 |
| Structure to be Protected | 410 and 600mm Dia Mild Steel Trunk Main |

CONDITIONS OF REGISTRATION**Maximum Operating Current:** 8.00 Amperes DC
Regulator

/M 9101

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit

Cathodic Protection Interference Survey Results FormProject Enoggera - Grovely Unit Reading 17.7V 7.59 Date 6-3-01

| | Reading | Test Point I.D. | Location | Swing |
|---|----------|--------------------|--------------|-------|
| | On -483 | | Hay St. | |
| | Off -479 | Men | Pole 31389 | +4 |
| | On -470 | | | |
| | Off -470 | Men | Pole 31389 | 0 |
| | On -198 | | | |
| | Off -198 | Men | Pole 16865 | 0 |
| * | On -333 | | | |
| | Off -370 | Men | Pole 32118 | +37 |
| | On -350 | | Taylor's Rd. | |
| | Off -349 | Men | Pole 24913 | -1 |
| * | On -270 | | Gizera Rd. | |
| | Off -290 | Men | Pole 43209 | +20 |
| | On -320 | | | |
| | Off -320 | Men | Pole 522010 | 0 |
| | On -454 | | Sanford | |
| | Off -454 | Men | Pole 23184 | 0 |
| | On -490 | | | |
| | Off -492 | Men | Pole 28169 | +2 |
| | On -460 | | | |
| | Off -460 | Men | Pole 23178 | 0 |
| | On -390 | | Pickering | |
| | Off -398 | Men | Pole 23176 | +8 |
| * | On -370 | | | |
| | Off -438 | Men | Pole 27271 | +68 |
| | On -500 | | | |
| | Off -508 | | Pole 23163 | +8 |
| | On -299 | | Lilly St | |
| | Off -295 | | Pole 27182 | +5 |
| | On -404 | | Fraser's Rd | |
| | Off -409 | | Pole 31053 | +5 |

TESTED BY P. SMYTH

* See Bleed Sheet

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit

Cathodic Protection Interference Survey Results Form

Project Enoggera Grovely Unit Reading 17.7V 7.5a Date 6-3-01

| | Reading | Test Point I. D. | Location | Swing |
|-----|---------|---------------------|--------------|-------|
| On | -297 | Light | Frosters Rd | |
| Off | -331 | Pole | No Number | +4 |
| On | -274 | Light | | |
| Off | -280 | Pole | 4332 | +6 |
| On | -220 | | 27207 | |
| Off | -228 | Men | Glen Retreat | +8 |
| On | -230 | | | |
| Off | -230 | Men | 49897 | 0 |
| On | -325 | | Turnbull | |
| Off | -332 | | 18662 | +7 |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |
| On | | | | |
| Off | | | | |

TESTED BY P. Smyth

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit**Cathodic Protection Bleed Point Details Form**

Project Enoggera - Grovely Date 6-3-01
 Bleed Location Hay St. CPB No. 84

FOREIGN STRUCTURE OWNER: _____

F.S. LOCATION: Men Pole No 32118 Hay St.

F.S. IDENTIFICATION: _____

REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:

REFERENCE TYPE: CuSO₄POTENTIAL OFF: -370 mv ON: -333 SW: +37BLEED TYPE: ZNBLEED MATERIAL: ZN

BLEED WEIGHT: _____

BLEED O/C POTENTIAL: -1012 mv - CuSO₄BLEED CURRENT OFF: 13 ma ON: 13 ma

REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:

| Bond Off (Rectifier Off) | | | Bleed On | | | Resultant Swing |
|-----------------------------|-------------|-------------|-------------|-------------|------------|--------------------|
| Bleed Off | Bleed On | Swing | Bond Off | Bond On | Swing | |
| <u>-370</u> | <u>-590</u> | <u>-220</u> | <u>-590</u> | <u>-555</u> | <u>+35</u> | <u>-185</u> |

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) YesIDENTIFICATION TAG INSTALLED? (Y/N) Yes**COMMENTS:**INSTALLED / TESTED BY P. Smyth

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit

Cathodic Protection Bleed Point Details Form

Project Enoggera Grovely Date 6-3-01
 Bleed Location Gizera Rd. CPB No. 85

FOREIGN STRUCTURE OWNER: _____

F.S. LOCATION: Men Pole 43209 Gizera Rd.

F.S. IDENTIFICATION: _____

REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:

REFERENCE TYPE: CussetPOTENTIAL OFF: -270mv ON: -290mv SW: +20mvBLEED TYPE: ZNBLEED MATERIAL: ZN

BLEED WEIGHT: _____

BLEED O/C POTENTIAL: -980 CussetBLEED CURRENT OFF: 4ma ON: 4ma

REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:

| Bond Off (Rectifier Off) | | | Bleed On | | | Resultant Swing |
|-----------------------------|-------------|-------------|-------------|-------------|------------|--------------------|
| Bleed Off | Bleed On | Swing | Bond Off | Bond On | Swing | |
| <u>-290</u> | <u>-466</u> | <u>-176</u> | <u>-466</u> | <u>-448</u> | <u>+18</u> | <u>-158</u> |

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) YesIDENTIFICATION TAG INSTALLED? (Y/N) YesCOMMENTS:INSTALLED / TESTED BY P. Smyth

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit**Cathodic Protection Bleed Point Details Form**Project Enoggera GrovelyDate 6-3-01Bleed Location Pickering StCPB No. 86

FOREIGN STRUCTURE OWNER: _____

F.S. LOCATION: _____

Men Pole 23176 Pickering

F.S. IDENTIFICATION: _____

REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:

REFERENCE TYPE: CusohPOTENTIAL OFF: -438 ON: -370 SW: +68BLEED TYPE: ZNBLEED MATERIAL: ZN

BLEED WEIGHT: _____

BLEED O/C POTENTIAL: 880 mv CusohBLEED CURRENT OFF: 6ma ON: 6ma

REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:

| Bond Off (Rectifier Off) | | | Bleed On | | | Resultant Swing |
|-----------------------------|-------------|------------|-------------|-------------|------------|--------------------|
| Bleed Off | Bleed On | Swing | Bond Off | Bond On | Swing | |
| <u>-370</u> | <u>-424</u> | <u>-54</u> | <u>-424</u> | <u>-400</u> | <u>+24</u> | <u>-30</u> |

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) YesIDENTIFICATION TAG INSTALLED? (Y/N) Yes**COMMENTS:**INSTALLED / TESTED BY P. SMYTH



Corrosion & Earthing
External Plant Technology
Locked Mail Bag 3583
Brisbane QLD 9008
PTTO2 Jim McMonagle
Ph (07) 3887 4979

Interference Testing

Exchange : MITCHELTON

Related System : 6-6277

or Other Location : Brisbane Water ICU. Hay St Pump

Testing Date : Tuesday 3 April 2001

8:00 am

Voltage : 18 Volts

Current : 9 Amps

Comments : Brisbane Water rep J Taylor. Serious interference problems.
Recommend Brisbane Water to arrange Bleed installations to
mitigate interference.

| Test Point | Interference Type | Location | Bond Off V | Bond On V | Swing V | Anode or Cathode | Distance A/K m | Comment |
|------------|-------------------|--|------------|-----------|----------|------------------|----------------|-------------------------------|
| | Leads, MB | M/H Lhs Pickering St 20m # Dalmarneck | -0.535 | -0.455 | +(0.080) | Anode | 0 | |
| | Lead, MB | M/H Rhs Samford Rd # cnr Dawson Rd | -0.975 | -0.970 | +(0.005) | Anode | 0 | |
| | MB 44 | M/H Rhs Pickering St 40m dist Bowling S | -0.625 | -0.607 | +(0.018) | Anode | 0 | |
| | Lead, MB | M/H Lhs Pickering St 10m dist Lade St | -0.610 | -0.470 | +(0.140) | Anode | 0 | A Bleed of 1.1Amps required. |
| | Lead 44 | M/H Lhs Samford Rd 20m # Bere St | -0.630 | -0.605 | +(0.025) | Anode | 0 | |
| | Lead, MB | M/H Rhs Samford Rd opp # Pickering St | -0.740 | -0.695 | +(0.045) | Anode | 0 | |
| | MB 44 | M/H Lhs Taylors Rd 10m dist Samford R | -0.774 | -0.770 | +(0.004) | Anode | 0 | |
| | Lead 44 | 6 Pit Rhs Mashobra St # side Gizerah St | -0.780 | -0.612 | +(0.168) | Anode | 0 | A Bleed of 0.25Amps required. |
| | Lead 44 | 6 Pit Rhs Frasers Rd dist side Irvine St | -0.645 | -0.735 | -0.090 | Anode | 0 | |
| | MB 44 | M/H Rhs Glen Retreat Rd dist cnr Kooya | -0.850 | -0.940 | -0.090 | Anode | 0 | |

Brisbane Water Engineering Services

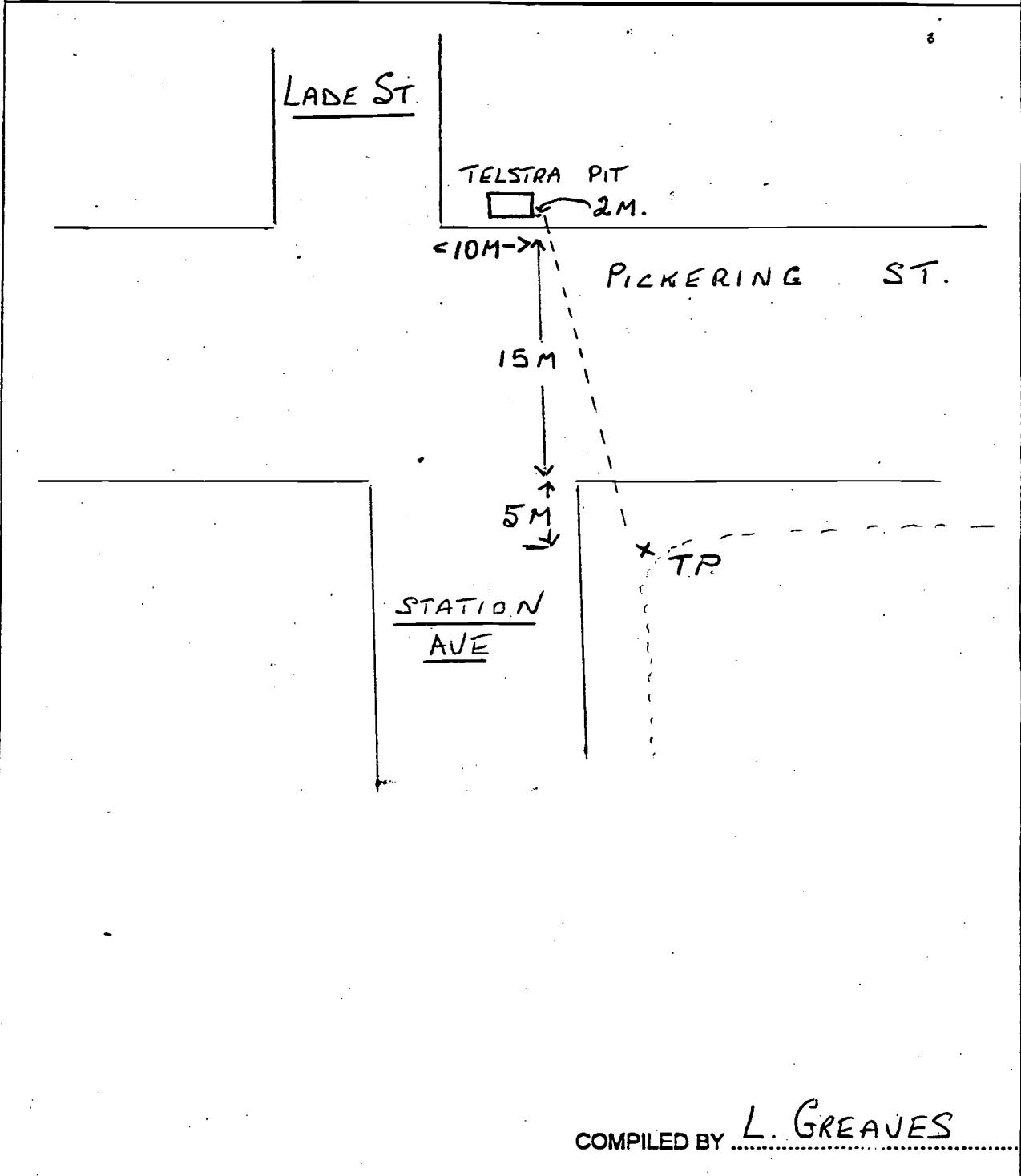
CP Form No. 16

Electrical Engineering Unit

Site Plan Drawing Sheet

Project TELESTRA BLEED PICKERING ST.Date 14-03-02

UBD 138 P8



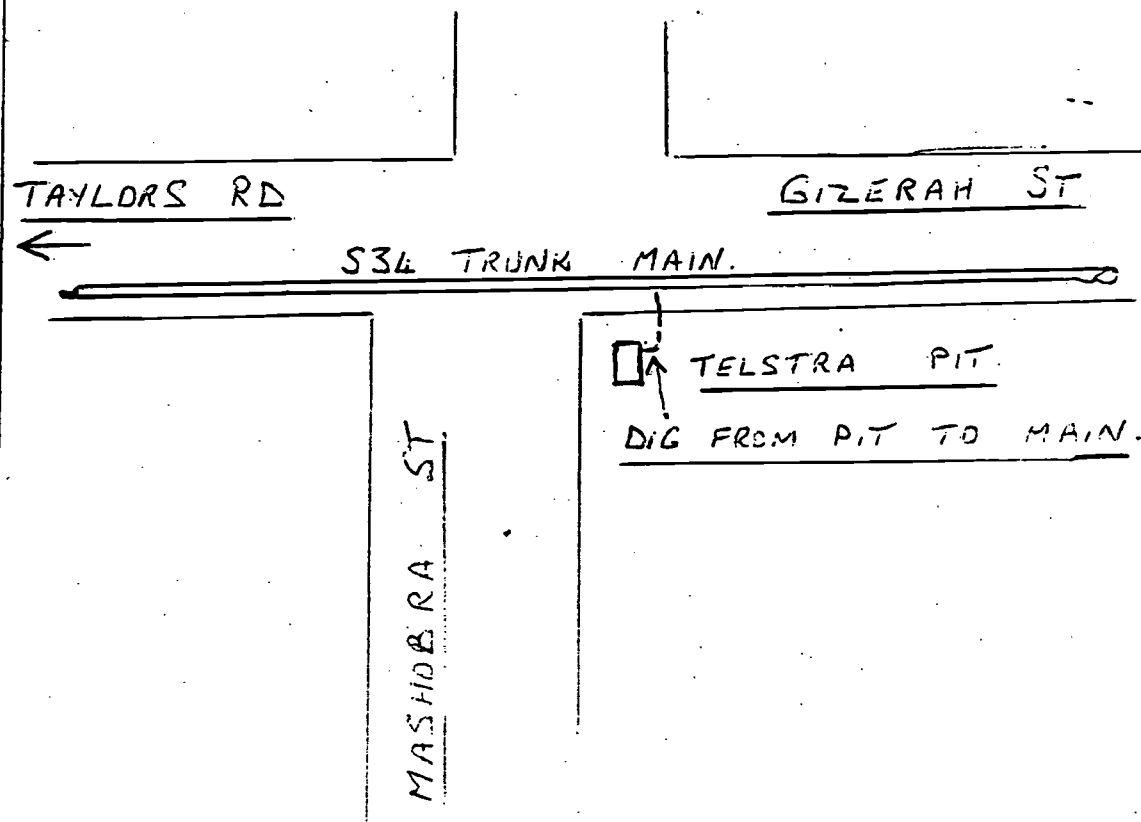
Revision 09/28/95

Brisbane Water Engineering Services

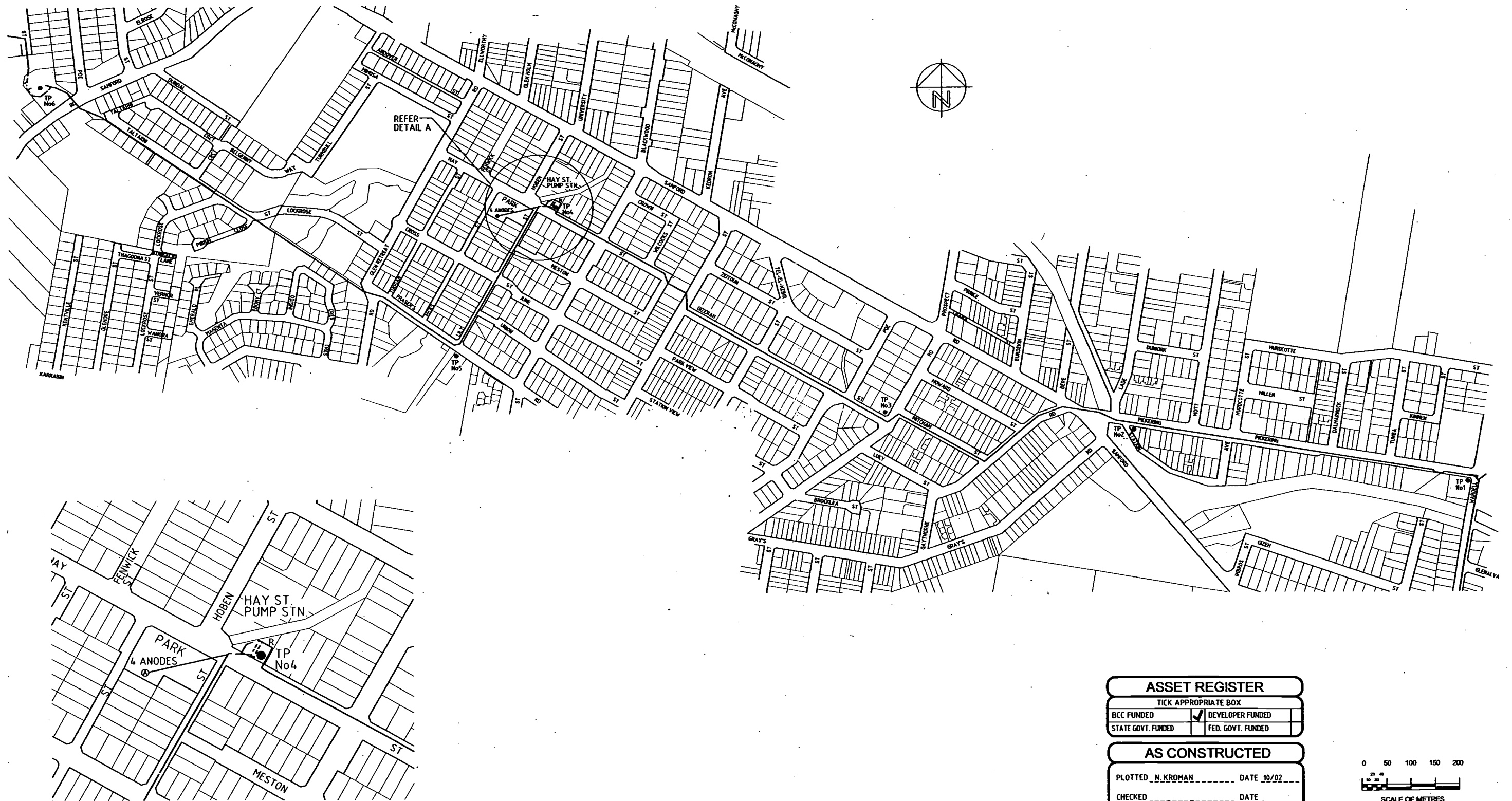
CP Form No. 16

Electrical Engineering Unit

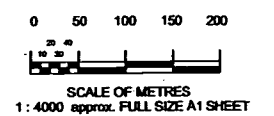
Site Plan Drawing Sheet


Project TELSTRA BLEEDDate 11-02-2002COMPILED BY L. GREAVES

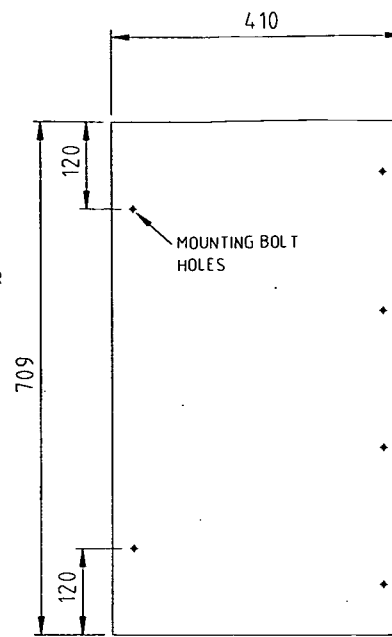
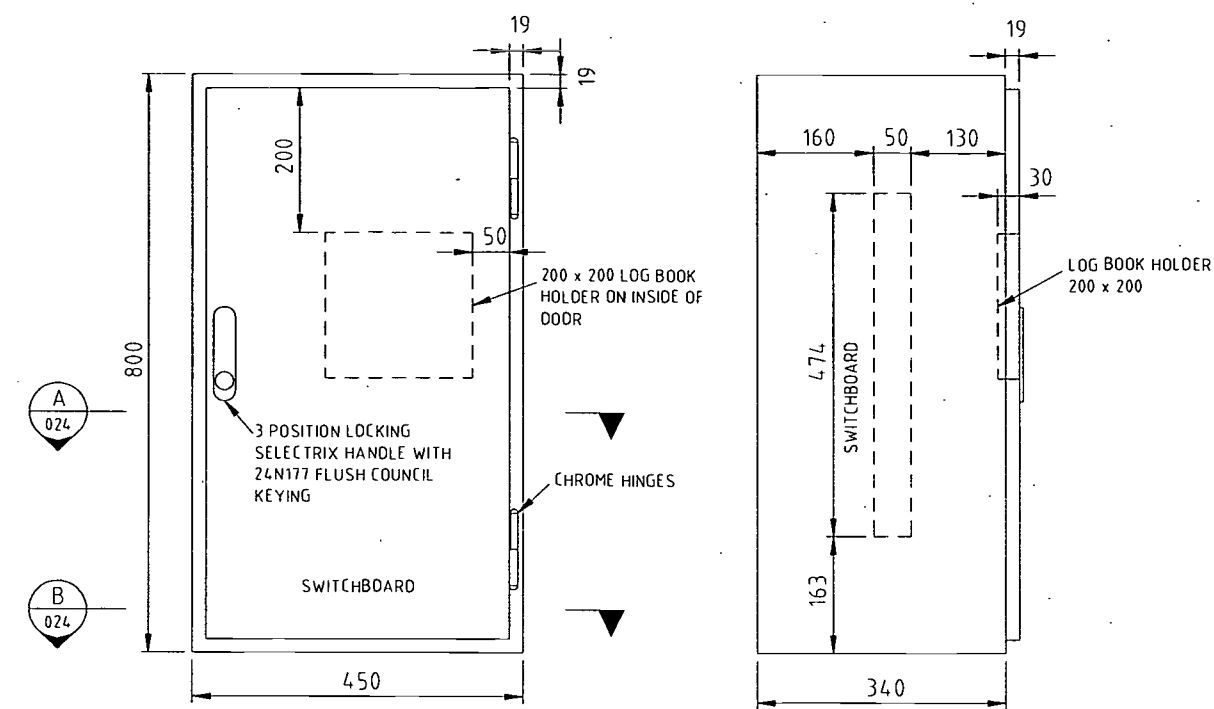
Revision 09/28/95



| ASSET REGISTER | | | |
|-----------------------|-------------------------------------|-------------------|--|
| TICK APPROPRIATE BOX | | | |
| BCC FUNDED | <input checked="" type="checkbox"/> | DEVELOPER FUNDED | |
| STATE GOVT. FUNDED | <input type="checkbox"/> | FED. GOVT. FUNDED | |



| | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|------|-----------|--|---------------------|----------------------|------|----------------------|------|--------------|--|------------|--------------|----------------|------|------|---|----------|--|------------|--|--------------|--|------------|--|--|
| | | | | DIRECTOR OF PD & PS | | DATE | SUPERVISING ENGINEER | | R.P.E.Q. NO. | | DATE | DESIGN | | | |  | PROJECT | | TITLE | | SCALE | | A.H. DATUM | | |
| | | | | ENGINEER IN CHARGE | | DATE | CADD FILE | | 210238701 | | | DESIGN CHECK | | | | | AS SHOWN | | N° 1 | | OF 1 | | SHEETS | | |
| 0 | | | | | | | JOB FILE | | | | | DRAWN | | N.K. | | | 29.08.02 | | DRAWING N° | | 2/10.2387-01 | | AMEND. | | |
| NO | DATE | AMENDMENT | | INITIAL | SUPERVISING ENGINEER | | RPEQ No | DATE | SURVEYED | | SURVEY NO. | | DRAFTING CHECK | | H.W. | | NOV 02 | | | | | | | | |
| | | | | | | | | | | | | FIELD BOOK | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |



FRONT INSULATED PANEL
(6mm THICK SUPPLIED)

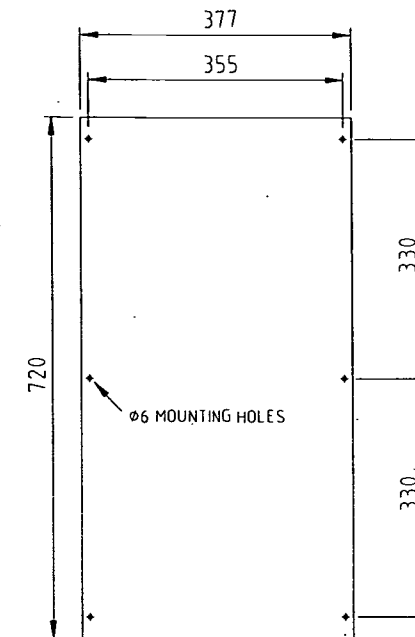
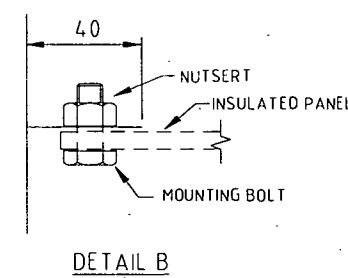
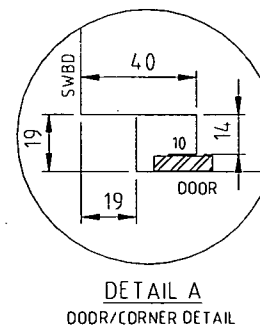
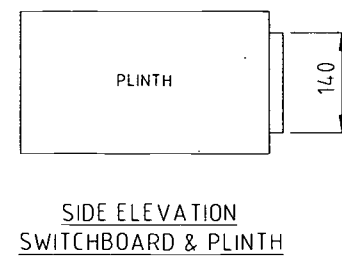
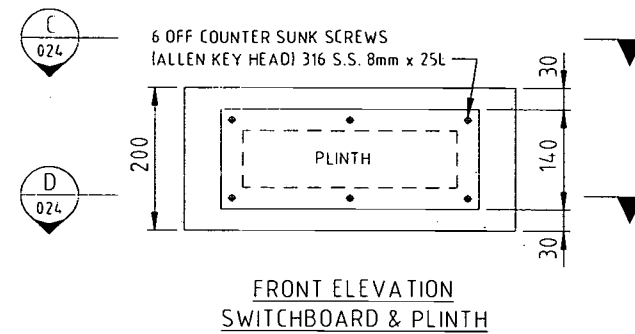
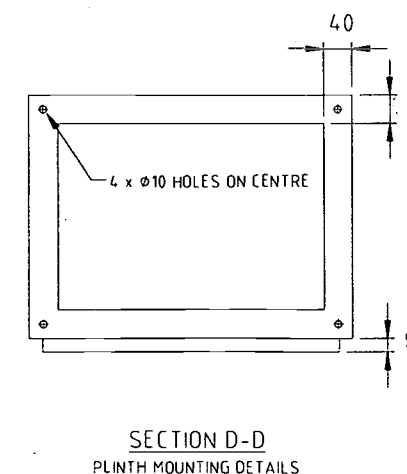
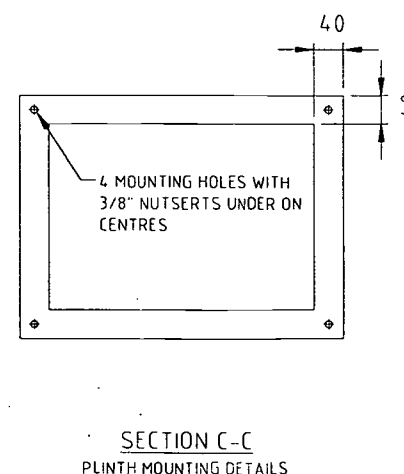
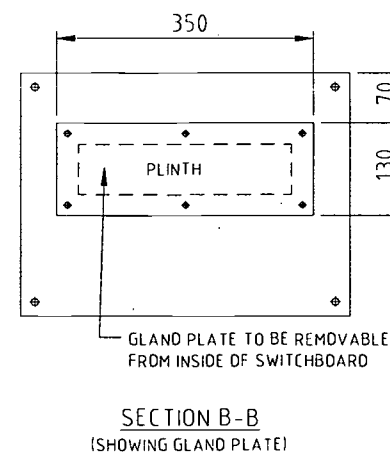
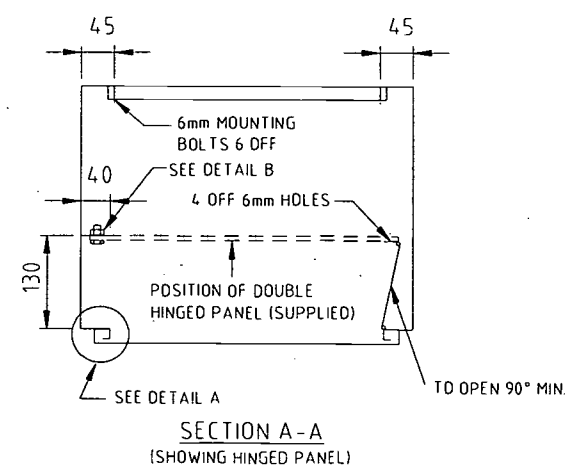


FIG.1
EQUIPMENT PANEL DETAILS

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.



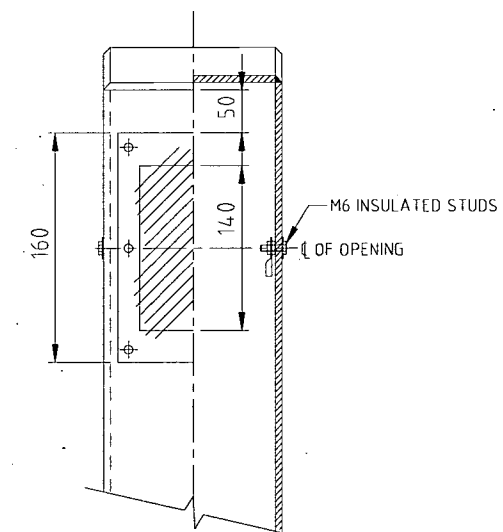
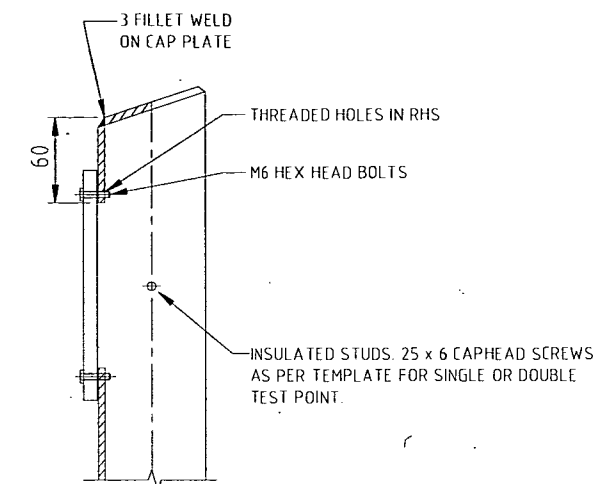
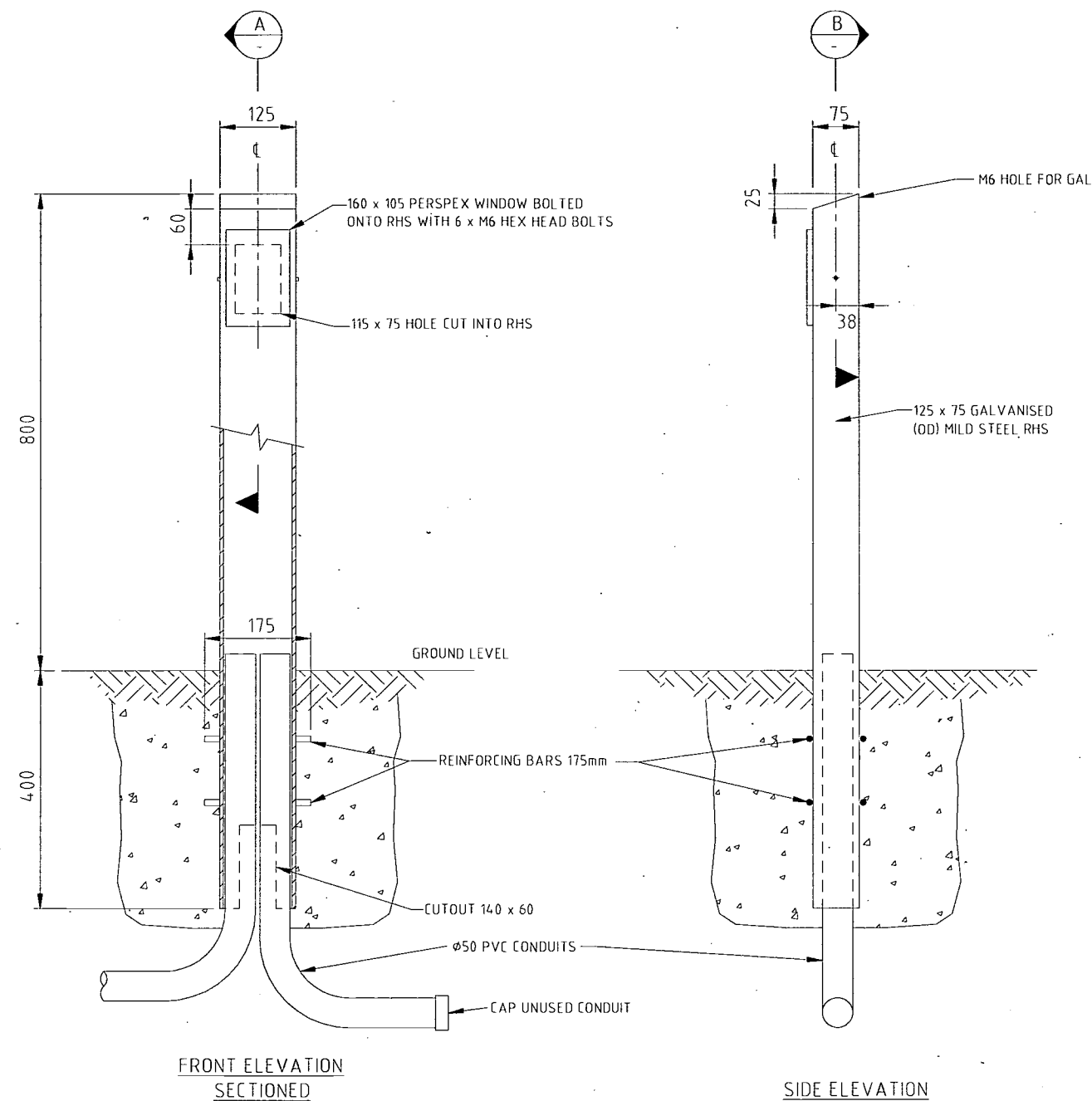
| | |
|---------------------------------|--|
| NUMBER OF SWITCHBOARDS REQUIRED | |
| NUMBER OF PLINTHS REQUIRED | |



| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|--|-------------------------|--|--------------|--|---------|--|------|--|--------|--|------------|--|------------|--|------------|--|---------------------|--|------------------------------|--|------------|--|-----------------|--|------------------|--|
| C 9-02 NOTE 7 REVISED | | DIRECTOR OF P.D. & P.S. | | DATE | | DESIGN | | NAME | | DATE | | JOB FILE | | ACAD FILE | | SHEET SIZE | | A1 | | PROJECT | | TITLE | | SCALE NTS | | N° 1 OF 1 SHEETS | |
| B 10-95 MODIFIED | | ENGINEER IN CHARGE | | DATE | | DRAWN | | DLP | | 7-5-92 | | SURVEY No. | | FIELD BOOK | | A.H. DATUM | | CATHODIC PROTECTION | | STANDARD SWITCHBOARD CABINET | | DRAWING N° | | 486/1/22-C0024E | | AMEND. | |
| A 5-92 ISSUED FOR APPROVAL | | SUPERVISING ENGINEER | | R.P.E.Q. NO. | | CHECKED | | | | | | | | | | | | | | | | | | | | | |
| NO. DATE | | AMENDMENT | | INITIALS | | | | | | | | | | | | | | | | | | | | | | | |

NOTES

1. HOT DIP GALVANISE AFTER FABRICATION.



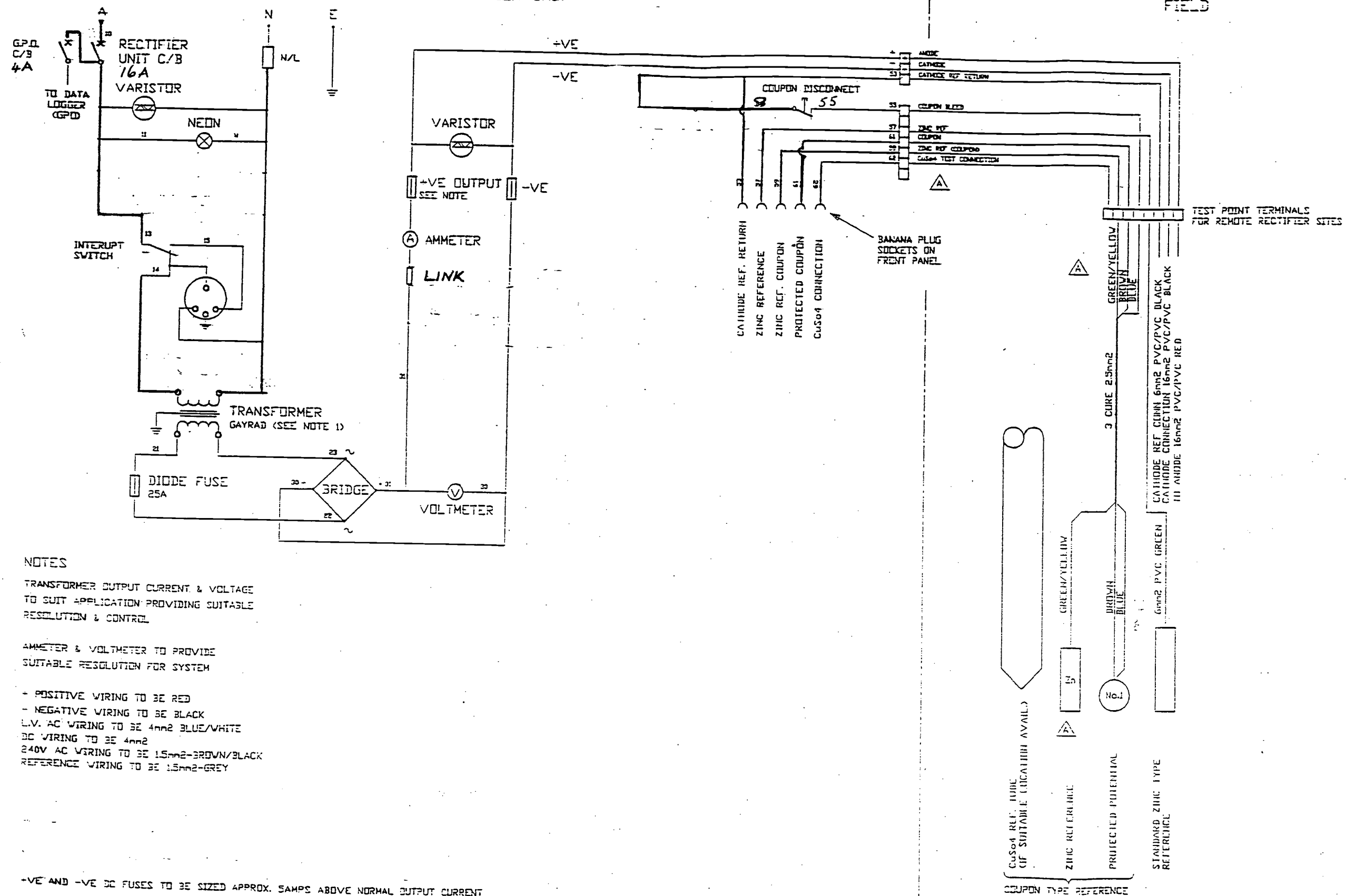
| NO. | DATE | AMENDMENT | INITIALS | DIRECTOR OF P.D. & P.S. | ENGINEER IN CHARGE | DATE | DESIGN | NAME | DATE | JOB FILE | ACAD FILE | 2210001-RevA | SHEET SIZE | A1 | PROJECT | TITLE | SCALE | NTS | N° 1 OF 1 SHEETS | AMEND |
|-----|-------|---------------------|----------|-------------------------|----------------------|--------|---------|--------|--------|----------|-----------|--------------|------------|----|---------|-------|-------|-----|------------------|-------|
| C | 9-02 | NOTE 1 REVISED | | HI | ENGINEER | 5-5-92 | DESIGN | K.M.G. | 5-5-92 | | | | | | | | | | | |
| B | 11-95 | MODIFIED | | DLP | ENGINEER | 7-5-92 | DRAWN | D.L.P. | 7-5-92 | | | | | | | | | | | |
| A | 5-92 | ISSUED FOR APPROVAL | | DLP | SUPERVISING ENGINEER | | CHECKED | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |



CATHODIC PROTECTION

STANDARD TEST POINT
CONSTRUCTION DETAILS

486/1/22-AAT0001E



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 1.5mm2-BROWN/BLACK
- REFERENCE WIRING TO BE 1.5mm2-GRAY

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

| | | | | | |
|---|------|---------|-------------------------|--|------------|
| | | | | | |
| | | | | | |
| | | | | | |
| 1 | R.L. | 1840.93 | CHANGES AS SHOWN | | |
| 2 | R.L. | 258.93 | ISSUED FOR CONSTRUCTION | | |
| 3 | BY | DATE | REVISION | | CHECK APPR |



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

| | |
|---------|----------------------------------|
| PROJECT | STANDARD CATHODIC PROTECTION |
| TITLE | RECTIFIER UNIT WIRING DIAGRAM |

| | | | | | | | |
|--------------------|--------------|----------------|-------------|-------------------|-----------------|-------|--------|
| DRAWN | NAME R.L. | DATE 3.8.93 | SUPER. ENG. | NAME M.L. | DATE 23.8.93 | SCALE | SIZE |
| DESIGN | J.C. | 3.8.93 | SENIOR ENG. | | | | A C |
| CHECKED | J.S. | 25.8.93 | ELECT. ENG. | | | | |
| DRAWING No. | | | | ACADEMIC FILE NO. | | | |
| 486/6/23-AA1C0021E | | | | A625C21 | | | |
| | | | | A | | | |