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Brisbane Water
Engineering Services

22 OCTOBER 1996

OPERATING MANUAL FOR:

CORONATION DRIVE TRUNK MAINS DEVIATION

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER
WATER MAINTENANCE SECTION

MANUAL CONTENTS

DRAWINGS

(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 and 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:	New Dia 600 mild steel cement lined. .
Coating:	Medium Density Fusion Bonded Polyethylene
Length:	Appox 300 metres.
Location:	Cnr Coronation Drive and Hale Street (ex Boomerang St.) Milton.
Construction Drawings:	

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Sacrifical (Galvanic) System.

(4.2) Cathode: The cathode point is located on the 600 Dia mains, in the valve pit. The cathode point is where the cabling from the sacrifical anode is attached to the structure under cathodic protection. In this valve pit three cathode connections have been made to allow for future extensions.

(4.3) Anodes: Two 10 Kg Magnesium anodes were installed approximately 5 metres from the trunk mains in a horizontal bed.The anodes are on the Hale St. side of the valve pit. The anodes were firstly packaged with cokebreeze thereby improving anode – ground resistance.

(4.4) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the mains. On these mains one test point has been installed on the new 600 Dia main. This test point is located in the new valve pit.

(4.5) Associated Drawings:

(4.6) Associated Standards :
AS 3000 1986 Australia Wiring Rules
AS 2832.1 1985 Pipes, Cables, Ducts, Guide to Cathodic Protection, Part One.

(4.7) Government Regulations :
Queensland Electricity Acts 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) Final Potential Survey and Commissioning

(6.0) CONCLUSION

Full Cathodic protection has been achieved on this section of trunk mains. .

The expected life of the galvanic anodes (magnesium anodes) for this main is 16 years from Oct 1996.This was calculated at a current draw of 62 mA & an efficiency of 50%.

(7.0) MAINTENANCE

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

12th October 1992
Electrical Workshop
Cathodic Protection

CPS Monthly 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.

13th October 1992
Electrical Workshop
Cathodic Protection

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.

13th October 1992
Electrical Workshop
Cathodic Protection

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 for "continue to operate" permit if applicable.

Brisbane Water Engineering Services

CP Form No. 20

Electrical Engineering Unit

Sacrifical Anode Testing Details Form

Project CORONATION DRIVE DEVIATION **Date** 22 nd Oct 96

ANODE TYPE: MAGNESIUM

ANODE SIZE: 2 x 10Kg.

CATHODE TO CATHODE RETURN (Resistance): 0.2 Ω

ZINC REFERENCE TO PIPE (Natural Potential): + 344 mV

CuSo4 REFERENCE TO PIPE (Natural Potential): - 782 mV

ANODE TO PIPE POTENTIAL (Open Circuit): - 1703 mV (CuSO4)

ZINC REFERENCE TO PIPE (Anode Connected): + 10 mV

CuSo4 REFERENCE TO PIPE (Anode Connected): - 1113 mV

SACRIFICAL ANODE CURRENT: 62 mA

BLEED RESISTOR SIZE (If Installed): N/A

COMMENTS / LOCATION DRAWING

CuSO4 to Pipe "ON" - 1113 mV

" " "OFF" - 845 mV

INSTALLED BY L. GREAVES

Revision 10/30/95

Brisbane Water Engineering Services

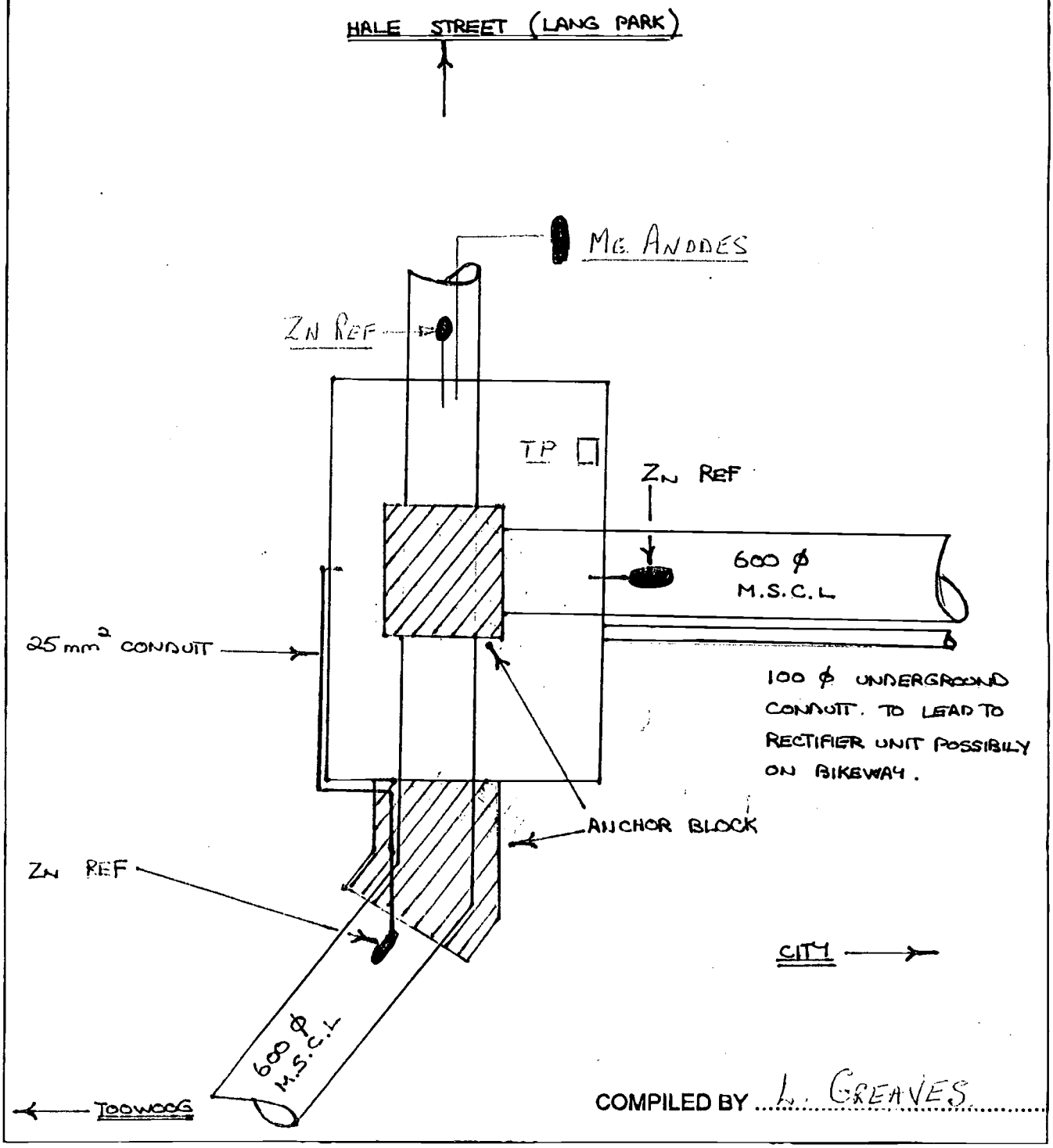
CP Form No. 16

Electrical Engineering Unit

Site Plan Drawing Sheet

Project CORONATION DRIVE - MAIN ROAD WAYS STREET RELOCATION

Date [illegible]

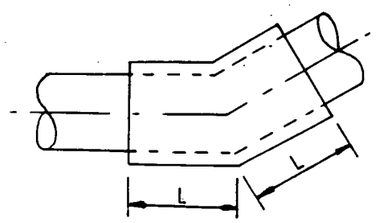


COMPILED BY L. GREAVES

Revision 09/28/95

~~Φ 600~~	~~0 · 790 (A)~~	~~1~~
~~Φ 600~~	~~11 · 000 (A)~~	~~3~~
~~Φ 600~~	~~26 · 500 (A)~~	~~5~~
~~Φ 600~~	~~34 · 210 (A)~~	~~7~~
Φ 660	128 · 409 (B)	22
Φ 660	150 · 267 (B)	24
Φ 660	0 · 790 (C)	25
Φ 660	29 · 568 (C)	31
Φ 660	37 · 568 (C)	35
Φ 660	87 · 786 (C)	41

GRADE N 20 I



BEND

ANCHOR BLO

470 MH BRANCH (WELDED TYPE)

BOOMERANG ST. (to be renamed as Hale St)

Proposed Flyover

31° BEND
E 36 875 · 328
N 30 930 · 606
CH. 88 · 786

Φ 470 M.H. BRANCH (WELDED) TYPE)

Φ 150 SCOUR PIT

470 DIA M.H. BRANCH (WELDED TYPE)

Φ 150 SCOUR IN PIT

1·0° HORIZ. ANGLE

2·5° HORIZ. ANGLE

CORONATION DRIVE

Φ 300 BRANCH (RETIC.)

470 DIA M.H. BRANCH (WELDED TYPE)

470 MH BRANCH (WELDED TYPE)

28° BEND
E 36 875 · 539
N 30 880 · 388
CH. 37 · 568

33° BEND
E 36 878 · 808
N 30 873 · 314
CH. 29 · 568

37° BEND
E 36 876 · 347
N 30 844 · 641
CH. 0 · 790

Φ 470 M.H. BRANCH (WELDED TYPE)

Φ 150 SCOUR PIT

NEW K&C

EXIST. Φ 750 SEWER MAIN

Φ 1050

Φ 1200

	TO BE ABANDONED
	E
	G
	T
	S
	SWD
	W

PLAN
SCALE 1:500