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OPERATING MANUAL FOR:

BILLAN ST SUBMERSIBLE PUMP STATION

CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE SEWERAGE OPERATIONS BRANCH

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486/6/25-AA1C0023E	Standard Rectifier Wiring Diagram
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(No Number)	Monthly Maintenance Program

(1.0) INTRODUCTION

Steel when buried or immersed has a tendancy to corrode (rust) as the oxidised form is more stable than the metal.

Because of this, precautions must be taken to stop or minimise 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 practicable to expect a perfect coating during construction and coating damage will also occur with time. Because of this, corrosion may occur at imperfections.

(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 low 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 and is generally measured against a standard reference electrode, which permits a reproducible potential at which corrosion does not occur to be quoted.

(3.0) STRUCTURE DETAILS

Size: 2 x 30KW Submersible Sewerage Pumps

Coating: Tar Epoxy Coating

Length: N.A.

Location: BILLAN ST CARINA UBD 161 L17

Drawings: <u>Construction:</u>

486/5/7-PEO9RC Pump Station Reinforcement

Included Drawings:

486/7/7-GD1T190E Submersible Pump Station

REV.B TO General Layout

486/7/7-GD1T203E Rectifier Unit With Data

REV.B Logging Facilities, Wiring

Diagram

486/6/25-AA1C0023E Standard Cathodic Protection

Submersible Pump Station

(4.0) CATHODIC PROTECTION DETAILS

- 4.1 Type of Cathodic Protection: Impressed Current
- 4.2 Rectifier: Standard 32 Volt, 10 Amp direct current output enclosed in a poly carbonate enclosure, installed in the main switchboard. Rectifier has a 240VAC supply from within the Switchboard of pump station SP 265.
- 4.3 Cathode: The cathode point is made directly to each pump as indicated on the diagrams
- 4.4 Anodes: One 1000×50 silicon iron anode was installed suspended from the top of the wetwell from a suspension bar, cast into the roof of the well.
- 4.5 Testpoints: Testpoints are installed on cathodically protected structures to enable testing to confirm that full cathodic protection of the structure is maintained. On this structure 2 testpoints have been installed on the pumps and connected via disconnect plugs to terminals on the C.P. unit.
- 4.6 Associated Drawings: Nil
- 4.7 Associated Standards:
- AS 2832.1 1985 Pipes, Cables, Ducts, Guide to Cathodic Protection. Part 1.
- AS 3000 1991 Australian Wiring Rules
- 4.8 Government Regulations:

Queensland Electricity Acts and Regulations

(5.0) PERFORMED TESTING

- (1) Natural Potential Survey
- (2) Testing of Insulated Flanges, Joints
- (3) Current Drain Survey
- (4) Rectifier Loop Resistance

(6) Final Potential Survey and Commissioning.

NOTE: Details of above testing have not been included in this manual but are available upon request.

(6.0) CONCLUSION

Full cathodic protection has been achieved on these sewerage pumps.

The cathodic protection system is to be registered with the Queensland Electricity Commission and has approval to operate.

(7.0) MAINTENANCE

The cathodic protection system is maintained on a monthly basis after commissioning. These checks involve testing rectifier operation and recording of pump to electroyte potentials. Monthly, Six momthly and sixty monthly maintenance procedures are detailed as attached below.

(7.1) CPS Monthly Maintenance Details 10B. IBML

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.

(7.2) 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.

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.



