□ Electrical □ Mechanical □ Water Meters
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8 th January 2001

OPERATING MANUAL FOR:

WOODVALE ESTATE FOREST LAKE
ROXWELL STREET SUBMERSIBLE PUMP STATION
SP 294

CLIENT:

CIVDEC CONSTRUCTIONS PTY. LTD.

BRISBANE WATER
SEWERAGE UTILITY SERVICES

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 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) PUMP DETAILS

Size: 2 X 30.0 Kw submersible pumps.

Coating: Enamel coated.

Length: NA

Location: Roxwell Street Forest Lake
UBD 217 Q19

Construction Drawings:

486/6/25-AA1C0023E	Cathodic Protection Rectifier Unit.

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Impressed Current.

(4.2) Rectifier: Standard 24 Volt, 5.0 amp direct current output enclosed in a PVC board inside the stainless steel switchboard. Rectifier has a 240V supply from the stainless steel switch board distribution panel.

(4.3) Cathode: The cathode point is located on the pump motor and also the pipe. One reference anode is also fitted to the pipe in the well. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.

(4.4) Anodes: One silicone iron anode is suspended from the roof of the well .

(4.5) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the pumps and pipes. On these pumps and pipes test points have been brought out to the cathodic protection switch board.

(4.6) Associated Drawings:
Standard Rectifier Wiring Diagram - 486/6/25-AA1C0023E

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

(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.

(5) Foreign Structure Interference Survey and Mitigation.

(6) Final Potential Survey and Commissioning.

(6.0) CONCLUSION

Full Cathodic protection has been achieved on these pumps and pipes.

(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 water potentials.

8 th. January 2001
Electrical Engineering Unit.
Cathodic Protection

CPS Monthly Maintenance Details.

Required:

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

Labour:

One trades person, 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.

8 th. January 2001.
Electrical Engineering Unit.
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 trades person electrical, one labourer, 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.

8 th January 2001.
Electrical Engineering Unit.
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.

Labour:

One trades person electrical, one labourer, 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 test point terminals for tightness.
12/ Check all switchboard and test points 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 re-register system if applicable

Roxwell Street Submersible Pump Station.

CPS No 188

Date 08/01/2001.

Unit set at 2.0 volts 0.13amps.

Potentials to copper sulphate reference cell.

Natural (mV)	On (mV)	Off (mV)
-729	-1005	-889

Interference Testing.

	On	Off	Swing
Rebar	+44 mV	+43 mV	-1 mV
Fence	-825 mV	-825 mV	0 mV
Water pipe	-546 mV	-546 mV	0 mV

Insulated Joints.

The two insulated joints were tested and the resistance between bolt to flange was greater than 350 ohms and flange to flange were all greater than 3.4meg ohms.

Tested by J. Taylor.

RECTIFIER UNIT

FIELD

A
N
E
RECTIFIER UNIT MAIN SWITCH
VARISTOR
NEON
K1
REMOTE INTERRUPT
K2.1
MANUAL INTERRUPT SWITCH
VARIAC
TRANSFORMER GAYRAD (SEE NOTE 1)
DIODE FUSE 25A
BRIDGE
VOLTMETER
+VE
-VE
VARISTOR
+VE OUTPUT SEE NOTE
-VE
AMMETER
CURRENT SHUNT 0 to 500mV 0 to 5 AMPS
R1
K3.1
4 5 -/+ 0
E A N
+(-)
K2
K3
K1.1
4 5 + -
FTX/DNV
E A N
9 10 11
+ -
15 14
Telstra Supply
N
A
E
4 to Earth
(-ve)
Common OUTPUT CURRENT
CATHODE REF PUMP P1
Zn REFERENCE PUMP P1
CATHODE REF PUMP P2
Zn REFERENCE PUMP P2
ALARM RESET
BUZZER ALARM OFF PB/LED
POWER AVAILABLE
REMOTE DE-ENERGISE
REFERENCE RELAY
ALARM
TO TELEMETRY EQUIPMENT
CATHODE REF. RETURN PUMP P1
ZINC REFERENCE PUMP P1
CATHODE REF. RETURN PUMP P2
ZINC REFERENCE PUMP P2
BANANA PLUG SOCKETS ON FRONT PANEL
TO ANODE
CATHODE PUMP P1
CATHODE PUMP P1
CATHODE REF RETURN PUMP P1
ZINC REF PUMP P1
CATHODE PUMP P2
CATHODE PUMP P2
CATHODE REF RETURN PUMP P2
ZINC REF PUMP P2
R-BAR CONNECTION
4c 2.5mm2 PVC
4c 2.5mm2 NEOPRENE
TO PUMP No.1
4c 2.5mm2 PVC
4c 2.5mm2 NEOPRENE
TO PUMP No.2
BLACK
WHITE
GREY
BLUE
GREEN

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-GREY

LEGEND

K1 - 240V RELAY
K2,K3 - 24V DC RELAYS
R1 - SHUNT RESISTOR (SIZED TO PRODUCE A 1V DROP AT FULL LOAD)
R2,R3 - VOLTAGE DIVIDER (SIZED TO PRODUCE A VOLTAGE OF 1V ACROSS R2 AT MAX. OUTPUT VOLTAGE)
+VE AND -VE DC FUSES TO BE SIZED APPROX. 5AMPS ABOVE NORMAL OUTPUT CURRENT

NO.	BY	DATE	REVISION	CHECK	APPR
B	R.L.	16.1.95	WIRE NUMBERS ADDED		
A	R.L.	22.12.94	CIRCUIT CHANGES		
0	R.L.	25.8.93	ISSUED FOR CONSTRUCTION		

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

PROJECT: STANDARD CATHODIC PROTECTION SUBMERSIBLE PUMP STATION

TITLE: RECTIFIER UNIT WITH DATA LOGGING FACILITIES WIRING DIAGRAM

	NAME	DATE		NAME	DATE	SCALE	SIZE
DRAWN	R.L.	19.10.93	SUPER ENG.	M.J.	1.11.93		A3
DESIGN	J.S.	15.10.93	SENIOR ENG.				
CHECKED	J.S.	22.10.93	ELECT. ENG.				

DRAWING NO. 486/6/25-AA1C0023E
ACADR12 FILE No. A625C23
AMEND B

FTX/DCV -/+ 1Vdc
FTX/DNV -/0-50mA

24VDC SUPPLY FOR LEVEL AND PRESSURE TRANSDUCERS & ATTENTION INDICATOR (SHT.5 & 6)

12V/24V CONVERTER (86)

240VAC FROM SUB-DISTRIBUTION BOARD (SHT.2)

P/S 13.8V DC (85)

2 X 6.5 Ah BATTERIES

RADIO (88)

SD (45)

PF (83)

BC (82)

BD (84)

K1 K2 K3 K4 K5

PDS500 TELEMETRY UNIT

ADDRESS HEXADECIMAL DECIMAL ADDRESS = 11 (90)

PUMP No.1 (SHT.3 & 6)

PUMP No.2 (SHT.3 & 6)

24V DC INPUT MODULE 1 (91)

24V DC INPUT MODULE 2 (91)

DUMMY MODULE (92)

FROM SHT.1

DIGITAL OUTPUT MODULE 1 (93)

PUMP No. 1 — PUMP STATUS, RUN RELAY

PUMP No. 2 — PUMP STATUS, RUN RELAY

DIGITAL OUTPUT MODULE 2 (93)

SPARE, ATTENTION INDICATOR, CATHODIC PROTECTION ALARM, DE-ENERGISE RECTIFIER UNIT, CONNECT REFERENCE ELECTRODE

ANALOGUE INPUT MODULE 1 (94)

SPARE, PUMP No. 2 CURRENT, PUMP No. 2 POWER, PUMP No. 1 CURRENT, PUMP No. 1 POWER

ANALOGUE INPUT MODULE 2 (94)

SPARE, DELIVERY PRESSURE, WELL LEVEL, SPARE, REFERENCE ELECTRODE No. 2, REFERENCE ELECTRODE No. 1, RECTIFIER VOLTAGE, RECTIFIER CURRENT

RTU 24VDC+ J6

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- RTU DIGITAL INPUT
- RTU DIGITAL OUTPUT
- RTU ANALOG INPUT
- (00) EQUIPMENT ITEM No.

CROSS REFERENCE TABLE

ITEM	SHEET	LINE
U1 – UNIT	1	10
– 1 N/C	3	8
U2 – UNIT	1	21
– 1 N/C	3	20
LOR61 – COIL	4	4
– 1 C/O	4	4
– 1 N/O	–	–
PFR – COIL	2	5
– 1 C/O	4	3
– 1 C/O	–	–
PR1 – COIL	3	6
– 1 C/O	3	3
– 1 C/O	–	–
PR2 – COIL	3	16
– 1 C/O	3	15
– 1 C/O	–	–
RP11 – COIL	3	30
– 1 C/O	3	8
– 1 C/O	3	13
RP12 – COIL	3	9
– 1 N/O	3	3
– 1 N/O	3	10
RP21 – COIL	3	35
– 1 C/O	3	20
– 1 C/O	3	25
RP22 – COIL	3	20
– 1 N/O	3	25
– 1 N/O	–	–
THR1 – COIL	3	4
– 1 N/O	3	3
– 1 N/C	3	6
THR2 – COIL	3	14
– 1 N/O	3	16
– 1 N/C	3	17
TOL1 – COIL	1	8
– 1 N/O	3	4
– 1 N/C	3	5
TOL2 – COIL	1	22
– 1 N/O	3	14
– 1 N/C	3	15
PUMP No.1 A/TRANSF N/C THERMAL SWITCH	3	8
PUMP No.2 A/TRANSF N/C THERMAL SWITCH	3	18
PUMP No.1 LOW FLOW N/C MICRO SWITCH	3	13
PUMP No.2 LOW FLOW N/C MICRO SWITCH	3	23

NOTE:
THIS DRAWING IS APPROVED AS CONSTRUCTED
SIGNED R.P.E.Q. 1021

FILE NAME:

HAVE YOU ASSESSED THE RISK ASSOCIATED WITH THIS WORK? REPORT PROMPTLY ANY CONDITION LIABLE TO CAUSE AN ACCIDENT REMEMBER YOU ARE RESPONSIBLE FOR YOUR SAFETY

LAST AMENDMENT DATE:

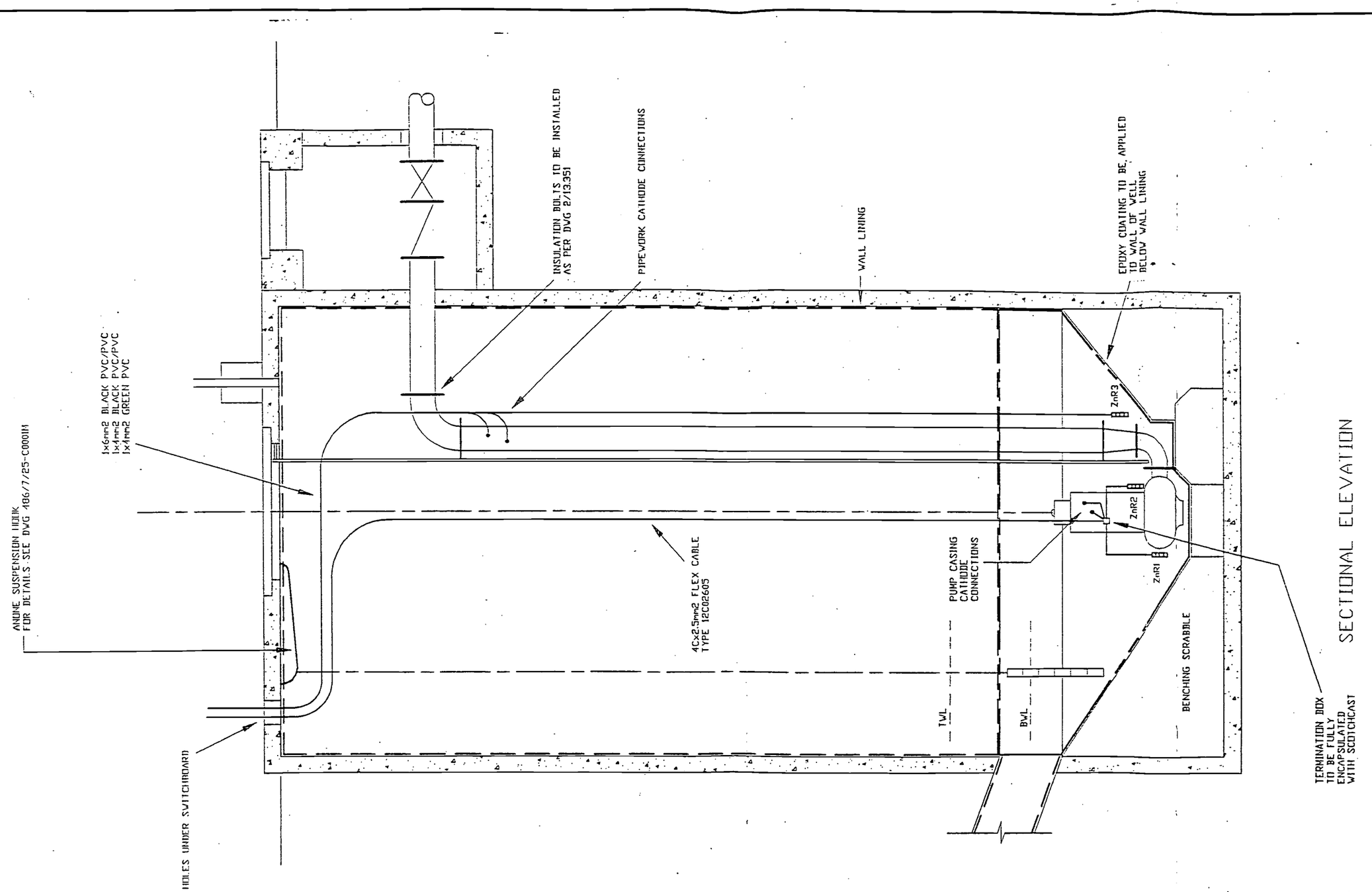
LETTER	DESCRIPTION	DATE	AU'D BY	CHK'D
B	AMEND SOFT STARTER RUNNING INPUT LINES	20-7-00	P.H.	
A	AMEND AS PER MONTGOMERY WATSON FAX DATED 22-6-00	22-06-00	O.MC	B.E.B. 6-00

SCALE	N.T.S.
DESIGNED	B.E.B.
TRACED	P.H.
CHECKED	B.E.B. 11-4-00
DATE	11-4-00
APPROVED	
CLIENT NAME	DELFIN FOREST LAKE Pty. Ltd.
JOB No	32980

J. & P. RICHARDSON
INDUSTRIES PTY LTD – CAMPBELL AVE WACOL 4076
ELECTRICAL CONTRACTORS & ENGINEERS A.C.N 001 957 325
PH(07)3271 2911 Fax(07)3271 3823 Email JPRQJPR.COM.AU

TITLE
FOREST LAKES ESTATE
WOODVALE ESTATE
PUMPING STATION SWITCHBOARD
PLC/RTU
SCHEMATIC WIRING DIAGRAM

DRAWING No
E00–A32960/A4B
SHEET 5 OF 9



				MANAGER DATE:	DIRECTOR OF PLANNING & DESIGN DATE:		
				DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
				ENGINEER IN CHARGE	Active 22/07/2015		
				DESIGN			
				DRAWN	R.LISTON	16.12.93	
				CHECKED			

PROJECT
OXLEY ARCHERFIELD
CATHODIC PROTECTION

TITLE
SUBMERSIBLE PUMP STATION
GENERAL LAYOUT

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

SCALE: NTS | No. 1 OF 1 SHEETS

DRAWING No. | AMEND.