



NORTHUMBRIAN WATER GROUP

ENGINEERING STANDARD E0702

DESIGN MANUAL
FOR
TWO PUMP SEWAGE PUMPING STATIONS
ON
SEPARATE SEWERS

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CONTENTS

AMENDMENT RECORD.....	4
FOREWORD	5
INTRODUCTION	6
ALLOWANCES FOR INNOVATION.....	6
SECTION A1 : DEVELOPER GUIDELINES	7
1.0 INTRODUCTION	7
2.0 SCOPE.....	7
3.0 OTHER APPLICABLE DOCUMENTS	7
4.0 ROLES AND RESPONSIBILITIES.....	8
5.0 CONSULTATION BODIES.....	9
6.0 PROGRAMME OF WORKS AND INFORMATION TO BE PROVIDED	10
7.0 ADOPTION PROCEDURE.....	11
8.0 DEVELOPER ADVICE.....	12
SECTION A2 : CONSULTANT GUIDELINES.....	13
1.0 INTRODUCTION	13
2.0 SCOPE.....	13
3.0 OTHER APPLICABLE DOCUMENTS	13
4.0 ROLES AND RESPONSIBILITIES.....	13
5.0 CONSULTATION BODIES.....	14
6.0 PROGRAMME OF WORKS AND INFORMATION TO BE PROVIDED	15
7.0 TAKEOVER PROCEDURE	16
SECTION B : DESIGN REQUIREMENTS.....	17
1.0 GENERAL.....	17
2.0 SPECIFICATIONS.....	17
3.0 LOCATION AND SITE ACCESS.....	17
4.0 PUMPING STATION CAPACITIES AND SEPTICITY CONTROL	18
5.0 EMERGENCY OVERFLOW.....	19
6.0 RISING MAINS	19
7.0 WET WELL DESIGN	20
8.0 PUMPS.....	20
9.0 VALVE CHAMBER.....	20
10.0 MATERIAL CORROSION.....	21
11.0 HAZARDOUS AREAS.....	21
12.0 ELECTRICAL INSTALLATION	21
13.0 ELECTRICITY SUPPLY.....	23
14.0 TELEMETRY FACILITY	23
15.0 DESIGN DATA	24
16.0 TESTING AND INSPECTION	24
17.0 STANDBY POWER GENERATION	25
18.0 LIFTING PLANT	25
19.0 CONDITION & PERFORMANCE MONITORING.....	25
SECTION C : DOCUMENTATION	26
1.0 PRIOR TO CONSTRUCTION	26
2.0 PRIOR TO ADOPTION OR TAKEOVER BY NWG	26
3.0 OPERATION AND MAINTENANCE MANUALS.....	26
SECTION D : CIVIL SPECIFICATION	29
1.0 GENERAL.....	29
2.0 ACCESS ROADS.....	29
3.0 PIPES, VALVES AND FITTINGS.....	29
4.0 RISING MAINS	29
5.0 ANCHORAGES AND THRUST BLOCKS.....	30
6.0 AIR VALVES	30
7.0 PENSTOCKS.....	30
8.0 FASTENERS AND FIXINGS.....	31
9.0 CABLE DUCTS.....	31
10.0 ACCESS COVERS	31
11.0 STEEL PALISADE FENCE AND GATES	31

SECTION E : MECHANICAL SPECIFICATION	32
1.0 PUMP SPECIFICATION.....	32
2.0 PIPES, VALVES AND FITTINGS.....	34
3.0 FASTENERS AND FIXINGS.....	34
4.0 HYDRAULIC TESTING.....	34
SECTION F: ELECTRICAL AND TELEMTRY SPECIFICATION.....	35
1.0 GENERAL.....	35
2.0 APPLICATION OF STANDARD INSTALLATION	35
3.0 TELEMTRY FACILITY.....	36
4.0 EXTENT OF INSTALLATION	36
5.0 CONFIGURATION OF STANDARD INSTALLATION.....	36
6.0 STANDARD ELECTRICAL COMPONENTS.....	37
7.0 ELECTRICITY SUPPLY.....	38
8.0 EARTHING AND BONDING.....	38
9.0 CONTROL PANEL	40
10.0 LEVEL MONITORING SYSTEM.....	44
11.0 CONTROL PANEL HOUSING	44
12.0 CABLE DUCTS AND SEALING SYSTEM.....	45
13.0 CABLING AND ANCILLARIES	46
14.0 INSPECTION AND TESTING.....	47
15.0 DRAWINGS AND SCHEDULES.....	50
APPENDICES.....	53
A1 TWO PUMP SUBMERSIBLE PUMPING STATION DRAWINGS	53
A2 NWG STANDARD DETAIL DRAWINGS	60
A3 WATER INDUSTRY MECHANICAL AND ELECTRICAL SPECIFICATION WIMES 1.02	66
A4 LIFTING DAVITS AND SOCKETS	67
A5 ULTRASONICS PARAMETER SETTINGS.....	68
A6 SEWAGE TREATMENT ASSETS SYSTEM	69
A7 LOCATION PLAN EXAMPLE	70
A8.1 STANDARD ELECTRICAL DESIGN FOR TWO PUMP SUBMERSIBLE PUMPING STATIONS	72
A8.2 OPERATION PHILOSOPHY (SEPARATE SYSTEM).....	73
A8.3 ELECTRICAL DRAWING LIST.....	74
A.9 CONTACT LIST.....	128
A10 PIPES, VALVES AND FITTINGS.....	129
A11 FASTENERS AND FIXINGS.....	132
A12 HYDRAULIC TESTING.....	132
A13.1 NWG P.I.T. SHEET FOR CIRCUIT COMPOSITION AND TEST RESULTS	133
A13.2 NWG P.I..T. SHEET FOR SUPPLY EARTHING AND BONDING TEST RESULTS	134
A13.3 NWG P.I.T. SHEET FOR INSPECTION AND FUNCTIONAL TESTS	135
A13.4 NWG P.I.T. SHEET CONTINUATION OF INSPECTION AND FUNCTIONAL TESTS.....	136

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AMENDMENT RECORD

ISSUE NUMBER	DATE	DESCRIPTION
1	March 1996	New Specification
2	January 1998	Appendix A8.1 - Serck Proteus PS1 "Termination and Compile Sheet" shall supersede any reference to Telemetry Input Signals indicated on E0702 Drawings 127 and 128.
3	August 2000	Modified in line with Issue No4 Sewers for adoption.
4	July 2001	Sections 1.6 & 8.2 Add "or an innovative impellor design which has been approved by NWG".
5	June 2005	Document converted to pdf and drawings embedded.
6	June 2017	Modifications to requirements for Hydraulic testing of pipework in appendix A12. Clarification of System Test Pressure to bring in line with E0102 and reference to CESWI.
7	August 2017	Further amendments to Appendix A12 following discussions with Framework Partners. Clauses added regarding requirements to accommodate future requirements and bolting torque applied to pipework fasteners.
8	March 2020	<p>Significant modifications or Additions to the following:</p> <ul style="list-style-type: none"> • Allowances for Innovation • Clause for adopting pumping stations over 5 years old • Added clause for calculating pump rates and well storage • Amendment to specified covers • Refreshing of wiring/telemetry requirements • Addition of Condition Monitoring section and rising main test certificates • Modifications/additions to refresh: Combined Systems, Discharge Permits, Environmental Regulations & Emergency Overflows

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FOREWORD

This standard provides guidance on the requirements for Two Pump Sewage Pumping Stations, that are to be constructed by Northumbrian Water Group (NWG), or that are intended for adoption by NWG, where the pumping station is on a separate sewer, and each pump is rated at 30 kW or less. NWG has other requirements and specifications for larger sewage pumping stations, and for combined sewer installations.

Compliance with this NWG Standard does not of itself confer immunity from legal or statutory obligations.

WARNING
<p>This is a Northumbrian Water Guidance document, and will be subject to revision from time to time.</p> <p>Uncontrolled paper copies will not be updated, so users are recommended to check with NWG that they have the current Standard prior to use.</p>

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INTRODUCTION

Guidance for Consultants employed on behalf of NWG and for Developers is provided on the issues and matters requiring consultation, including where to seek advice and details of specifications normally acceptable to NWG.

Information is taken from other industry specifications, and NWG Specifications to minimise the need to cross reference to other sources, and to provide detailed interpretation with respect to two pump submersible pumping stations on separate sewers.

These are the standards that NWG applies to its own projects and expects from Developers who are constructing pumping stations for later adoption by NWG.

Developers are reminded however that they are responsible for all aspects of design for any particular pumping station and must furnish NWG with satisfactory and complete design, testing and operating information before any station can be adopted.

ALLOWANCES FOR INNOVATION

NWG recognise that Suppliers will continually develop products as part of their business processes, and this specification does not intend to stifle such innovation. It is understood that innovations within this field could contribute to the following benefits:

1. Intelligent pump monitoring and control.
2. Reduction in panel /kiosk size for areas that are sensitive.
3. Reduction in whole life cost.
4. Removal of risks from confined space entry or lifting operations.
5. A package solution to simplify installation.

Any deviations from this Specification shall be submitted to NWG using the Engineering Deviation Request form available on NWG SharePoint, the deviations will be assessed against the benefits described above (1-5).

SECTION A1 : DEVELOPER GUIDELINES

1.0 INTRODUCTION

- 1.1 Guidance is provided on the requirements for two pump Submersible Pumping Stations to be adopted and operated by NWG, including information for Developers, Designers and Procurement Engineers.
- 1.2 No combined systems will be adopted by NWG, only separate systems are permitted.
- 1.3 This document shall be used in conjunction with 'Sewers for Adoption' (a design and construction guide for developers). Where there is a conflict between this document and Sewers for Adoption, this document shall take precedence.
- 1.4 A summary of the main requirements for Developers is provided, together with general Design Requirements and Civil, Mechanical and Electrical specifications.
- 1.5 NWG New Development/Asset Investment, can provide advice to Developers and should be contacted at the earliest possible stage of project development to minimise difficulties in the eventual adoption of the Pumping Station.
- 1.6 The pumping of sewage is to be avoided wherever possible and the number of stations is to be kept to a minimum. All options are to be explored and discussed with NWG before the decision to build a pumping station is taken.
- 1.7 NWG will only adopt those installations which conform to the agreed designs.

2.0 SCOPE

- 2.1 This document is intended to provide guidance on the preferred design and equipment requirements for two pump Submersible Pumping Stations, using pumps of up to a maximum of 30 kW each. NWG should be consulted if larger stations are necessary.

Developers must provide fully detailed designs and specifications for each proposed Pumping Station.

3.0 OTHER APPLICABLE DOCUMENTS

- 3.1 This document contains the main requirements for two Pump Submersible Pumping Stations and must be read in conjunction with:
 - Sewers for Adoption - WSA
 - Water Industry Mechanical and Electrical Specification No 1.02 (WIMES 1.02)
 - Civil Engineering Specification for the Water Industry (CESWI) - WSA/WRc
 - Water Industry Act (1991) Sections 102-104 Adoption of Sewers and Disposal Works
 - Environmental Permitting (England & Wales) Regulations 2016
 - Construction Industry Research and Information (CIRIA) Reports

- NWG Electrical Safety Procedures E0303
- Flammable Liquids in Drainage Systems 'FLIDS'
- Environmental Permits: <https://www.gov.uk/government/publications/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows>

4.0 ROLES AND RESPONSIBILITIES

- 4.1 The **Developer** in addition to the items listed below shall carry out all roles and responsibilities as stated in the latest edition of Sewers for Adoption.
- (a) Be responsible for all aspects of the design and construction and for obtaining the required approvals from the relevant statutory and consultation bodies. This includes ensuring that all the duties of the Designer and Contractor referred to in this document are fully discharged.
 - (b) Discharge all costs associated with design, construction and adoption of the Submersible Pumping Station.
 - (c) Liaise closely with, and provide detailed design, operation, maintenance and test information to NWG.
 - (d) Carry out an assessment of surge potential in the installation from the data provided on the pumping requirements.
 - (e) Propose any modifications considered necessary to the basic design to eliminate surge and, in the event of elimination being impossible, consult with NWG regarding surge control measures.
 - (f) Be responsible for the operation and maintenance of the Pumping Station until it is formally adopted by NWG.
 - (g) Demonstrate to NWG that the Submersible Pumping Station complies fully with the requirements of this document. Any deviations require the prior approval of NWG.
- (h) Be responsible for taking any measures to overcome odour problems prior to adoption.
- 4.2 **NWG New Development/Asset Investment** shall.
- (a) Provide reasonable advice relating to design requirements and equipment selection to the Developer.
 - (b) Provide advice on, and co-ordinate the provision of, any telemetry equipment or services purchased by the Developer from NWG.
 - (c) Provide advice on the range of services that can be purchased from Northumbrian Water.
 - (d) Be the point of contact for all formal communications with NWG.

NWG will not re-design inadequate submissions from Developers/Designers or re-check sub-standard equipment or construction without charge.

5.0 CONSULTATION BODIES

- 5.1 Developers shall consult with NWG at the project inception in order that the requirements of Section 104 of the Water Industry Act 1991 can be fulfilled.
- 5.2 Permits to discharge the Developer shall comply with the latest edition of Sewers for Adoption
- (a) The Developer shall contact the EA at the earliest possible time, to ensure that any permit requirements relating to the Pumping Station emergency overflow are included at the design stage.
 - (b) Emergency overflows should not be proposed in the design unless specifically requested by NWG. The developer shall contact NWG's Asset Investment appointed Pumping Station Engineer to decide if an overflow is required. If an overflow is required and agreed with NWG, the developer shall contact the EA to gain advice on appropriate storage volumes.
 - (c) The permit will relate to the final outfall of the surface water sewer and not to the point where the emergency overflow connects to another sewer. The permit may also stipulate additional storage, standby power supply and/or restrictions on particular size of solid matter discharged.
 - (d) A discharge permit, confirmed as valid by the EA, must be in force prior to adoption. The proposed terms of the permit shall be submitted by the Developer to NWG for agreement **six weeks** before the time limit for objections expires.
 - (e) All EA discharge permits require that the frequency and duration of all emergency overflow discharges are monitored. When a Developer applies for a permit he will be responsible for reporting to the EA any operation of the emergency overflow that has occurred during the period prior to adoption.
 - (f) If the emergency overflow is connected to a public surface water sewerage system, NWG will be required to log failures. The Developer will be required to supply any relevant data to NWG for the period when the station is not connected to the NWG Control Room by telemetry.
 - (g) Costs for the permit, including the annual substance charge, will be borne by the Developer until the Pumping Station has been adopted. The amount charged will be based on the EA's national charging scheme.
- 5.3 Consultation with the following bodies/organisations should be undertaken at project design stage, prior to construction/installation:
- (a) The Regional Electricity Company (REC) to confirm the availability and characteristics of the supply, as described in the Design Requirements section and the Electrical and Telemetry Specification. The Developer shall consult with NWG where the REC is able to provide a choice of tariffs.
 - (b) The Local Authority, to obtain building permit and approval under the Town and Country Planning Act 1971.

Note: The external appearance and features of an installation must blend satisfactorily with the rest of the development.

- (c) NWG for information regarding the capacity of downstream sewer systems.
 - (d) NWG for telemetry requirements, as described in the Design Requirements section and the Electrical and Telemetry Specification.
 - (e) NWG for emergency overflow monitoring details, where pumps or power failure has occurred as detailed in the Electrical and Telemetry Specification.
 - (f) NWG for details of Hazardous Areas risk assessments “FLIDS”, as described in the Design Requirements section B11.
 - (g) Crown Commissioners, MAFF (Ministry of Agriculture, Fisheries and Farms) and RASWA (Roads and Street Works Act) to ensure that all other relevant permits/approvals/fees or legislation are in place before construction commences.
- 5.4 The Developer will need to ensure that he/she complies with all other legislation which affects his proposal including, but not limited to, those covering conservation areas, SSSIs and ancient monuments.

6.0 PROGRAMME OF WORKS AND INFORMATION TO BE PROVIDED

- 6.1 The Developer shall advise NWG of the intended construction and commissioning programme for the Pumping Station.
- 6.2 The programme shall contain the following information:
- (a) Construction start date, in order that NWG, can monitor progress.
 - (b) Date on which the station control equipment is to be installed, and when the telemetry is required.
 - (c) Dates of the Pumping Station commissioning period.
- 6.3 **Prior to Construction**
- (a) All design data and the programme of work will be provided to NWG at least one month prior to work commencing on site.
- 6.4 **Prior to Adoption**
- The following information must be given to NWG prior to Adoption:
- (a) The documentation detailed in sub-sections 2 and 3 of the Documentation section.
 - (b) All conveyances/transfers and agreements relating to land occupied by, and having access to, the Pumping Station. All such documents shall be sealed/signed by all parties and be ready for completion.
 - (c) The original copy of the EA Permit to Discharge.
 - (d) Name and address of the Developers legal representative(s).

7.0 ADOPTION PROCEDURE

The following must be achieved before NWG will adopt any Pumping Station.

7.1 Documentation

- (a) The documentation specified in the Documentation Section shall be provided to NWG in order that an assessment for adoption can be carried out.

7.2 Adoption Inspection

- (a) Prior to adoption NWG, or its appointed representative, will conduct an inspection of the civil, mechanical, electrical and telemetry installations, and may request detailed testing to be carried out to ascertain satisfactory operation of the Pumping Station and conformity to the design specification. The Developer will be responsible for meeting all costs, and the provision of resources, necessary for carrying out the tests.
- (b) Any defects will be corrected by the Developer and at his/her cost.

NWG reserve the right to impose charges on the Developer for further inspections or tests that may be required to check corrective work or modifications.

- (c) Arrangement for the Adoption Inspection will be made by the Developer with NWG New Development/Asset Investment, giving at least one month's written notice from the date the documentation is provided.
- (d) If the pumping station is more than 5 years old, NWG require the developer to replace the pumps for new models in accordance with correct pump selection procedures. This can be contested if the developer can demonstrate the required performance by means of a flow test and presentation of sufficient maintenance regimes. NWG reserve the right to accept/deny any objections based on the performance and maintenance content provided by the developer.
- (e) The developer shall ensure the inlet to the pumping station and wet well has been cleaned with a tanker/jetter before NWG will adopt the station.

Inspections will not be made without the documentation being in NWG's possession.

7.3 Land Ownership

- (a) The freehold of the land occupied by the Pumping Station will be conveyed/transferred to NWG for a nominal consideration of £1.00. Unobstructed access rights for vehicles along approach roads, from highways, must be provided at all times.
- (b) Where appropriate the freehold ownership of any land occupied by Pumping Station approach roads will be transferred with the Pumping Station, free of charge to NWG.
- (c) Where approach roads are shared, agreement must be obtained from the other owners to give NWG unobstructed access rights.

8.0 DEVELOPER ADVICE

- 8.1 Advice on consultation issues can be obtained from the contacts provided in Appendix A9.

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SECTION A2 : CONSULTANT GUIDELINES

1.0 INTRODUCTION

- 1.1 Guidance is provided on the requirements for two pump Submersible Pumping Stations to be built for and operated by NWG.
- 1.2 This document shall be used in conjunction with 'Sewers for Adoption' (a design and construction guide for developers). Where there is a conflict between this document and Sewers for Adoption, this document shall take precedence.
- 1.3 A summary of the main requirements is provided, together with general design requirements and Civil, Mechanical and Electrical specifications.
- 1.4 The pumping of sewage is to be avoided wherever possible and the number of stations is to be kept to a minimum. All options are to be explored and discussed with NWG before the decision to build a pumping station is taken.

2.0 SCOPE

- 2.1 This document is intended to provide guidance on the preferred design and equipment requirements for two pump Submersible Pumping Stations, using pumps of up to a maximum of 30 kW each. NWG should be consulted if larger stations are necessary.
- 2.2 The guidelines are generic and intended as a minimum standard only.

3.0 OTHER APPLICABLE DOCUMENTS

- 3.1 This document contains the main requirements for two Pump Submersible Pumping Stations. The documents below are referred to, or will provide additional detailed information on particular aspects:
 - Sewers for Adoption - WSA
 - Water Industry Mechanical and Electrical Specification No 1.02 (WIMES 1.02)
 - Civil Engineering Specification for the Water Industry (CESWI) - WSA/WRc
 - Water Industry Act (1991) Sections 102-104 Adoption of Sewers and Disposal Works
 - Environmental Permits: <https://www.gov.uk/government/publications/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows>
 - Environmental Permitting (England & Wales) Regulations 2016
 - Construction Industry Research and Information (CIRIA) Reports

4.0 ROLES AND RESPONSIBILITIES

- 4.1 The **Consultant** shall:
 - (a) Be responsible for all aspects of the design and construction and for obtaining the required approvals from the relevant statutory and

consultation bodies with the exception of the EA. This includes ensuring that all the duties of the Designer and Contractor referred to in this document are fully discharged.

- (b) Liaise closely with, and provide detailed design, operation, maintenance and test information to NWG.
- (c) Carry out an assessment of surge potential in the installation from the data provided on the pumping requirements.
- (d) Propose any modifications considered necessary to the basic design to eliminate surge and, in the event of elimination being impossible, consult with NWG regarding surge control measures.
- (e) Demonstrate to NWG that the Submersible Pumping Station complies fully with the requirements of this document. Any deviations require the prior approval of NWG.
- (f) Be responsible for recommending measures to overcome any odour problems.

4.2 NWG New Development/Asset Investment shall:

- (a) Provide reasonable advice relating to design requirements and equipment selection to the Consultant.
- (b) Provide advice on, and co-ordinate the provision of, any telemetry equipment or services available from NWG.

5.0 CONSULTATION BODIES

5.1 Discharge Permits:

- (a) NWG shall contact the EA at the earliest possible time, to ensure that any permit requirements relating to the Pumping Station overflow(s) are included at the design stage.
- (b) The permit will relate to the final outfall of the surface water sewer and not to the point where the emergency overflow connects to another sewer. The permit may also stipulate additional storage, standby power supply and/or restrictions on particular size of solid matter discharged. Discharge permits may be refused if the location is in a sensitive environment.
- (c) All EA discharge permits require that the frequency and duration of all emergency overflow discharges are monitored.
- (d) NWG will be required to log failures at a NWG Control Room by telemetry.

5.2 Consultation with the following bodies/organisations should be undertaken at project design stage, prior to construction/installation:

- (a) The Regional Electricity Company (REC) to confirm the availability and characteristics of the supply, as described in the Design Requirements section and the Electrical and Telemetry Specification. The Consultant shall consult with NWG where the REC is able to provide a choice of tariffs.

- (b) The Local Authority, to obtain building permit and approval under the Town and Country Planning Act 1971.
 Note: The external appearance and features of an installation must blend satisfactorily with the rest of the development.
 - (c) NWG for information regarding the capacity of downstream sewer systems. Also the capacity of receiving Sewage Treatment Works and their compliance.
 - (d) NWG for telemetry requirements, as described in the Design Requirements section and the Electrical and Telemetry Specification.
 - (e) NWG for emergency overflow monitoring details, where pumps or power failure has occurred as detailed in the Electrical and Telemetry Specification.
 - (f) NWG for details of Hazardous Areas risk assessments “FLIDS”, as described in the Design Requirements section B11.
 - (g) Crown Commissioners, MAFF (Ministry of Agriculture, Fisheries and Farms) and RASWA (Roads and Street Works Act) to ensure that all other relevant permits/approvals/fees or legislation are in place before construction commences.
- 5.3 The Consultant will need to ensure that he/she complies with all other legislation which affects his proposal including, but not limited to, those covering conservation areas, SSSIs and ancient monuments.

6.0 PROGRAMME OF WORKS AND INFORMATION TO BE PROVIDED

- 6.1 The Consultant shall advise NWG of the intended construction and commissioning programme for the Pumping Station.
- 6.2 The programme shall contain the following information:
 - (a) Construction start date, in order that NWG can monitor progress.
 - (b) Date on which the station control equipment is to be installed, and when the telemetry is required.
 - (c) Dates of the Pumping Station commissioning period.
- 6.3 **Prior to Construction**
 - (a) All design data and the programme of work will be provided to NWG at least one month prior to work commencing on site.

6.4 Prior to Take-over by NWG

The following information must be given to NWG prior to Take-over:

- (a) The documentation detailed in sub-sections 2 and 3 of the Documentation section, excluding the evidence of land ownership.

7.0 TAKEOVER PROCEDURE

The following must be achieved before NWG will take-over any Pumping Station.

7.1 Documentation

- (a) The documentation specified in the Documentation Section shall be provided to NWG.

7.2 Take-over Inspection

- (a) Prior to adoption NWG, or its appointed representative, will conduct an inspection of the civil, mechanical, electrical and telemetry installations, and may request detailed testing to be carried out to ascertain satisfactory operation of the Pumping Station and conformity to the design specification.
- (b) Arrangement for the Take-over Inspection will be made by the Consultant with NWG, giving at least one month's written notice from the date the documentation is provided.
- (c) If the pumping station is more than 5 years old, NWG require the developer to replace the pumps for new models in accordance with correct pump selection procedures. This can be contested if the developer can demonstrate the required performance by means of a flow test and presentation of sufficient maintenance regimes. NWG reserve the right to accept/deny any objections based on the performance and maintenance content provided by the developer.

Inspections will not be made without the documentation being in NWG's possession.

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SECTION B: DESIGN REQUIREMENTS

1.0 GENERAL

- 1.1 No combined systems will be adopted by NWG, only separate systems are permitted.
- 1.2 Arrangement layout and details shall generally be in accordance with the drawings provided in Appendix A1, and incorporate, as appropriate, NWG Standard Details as provided in Appendix A2.
- 1.3 The Designer shall satisfy himself/herself as to the practicability of the pipework and proposed sump arrangements whenever these differ from the standard layout shown in Appendix A1.
- 1.4 Effects of the Pumping Station on nearby residents must be taken into account, and where necessary preventative measures put in place to avoid odour and noise problems.
- 1.5 Hedging and/or landscaping shall be agreed at the planning stage With the Local Authority to improve the appearance of the installation. Any such contribution shall have minimum maintenance requirements.
- 1.6 On completion, the installation is to be suitable for its intended use, within the environment in which it is to operate. The installation is to ensure safety, and shall operate in a reliable and efficient manner between equipment manufacturers' recommended maintenance intervals, without the need for attention or inspection.
- 1.7 The pumping station shall operate automatically as described in Appendix A8.2.

2.0 SPECIFICATIONS

- 2.1 General civil, mechanical and electrical specifications have been extracted from NWG's suite of standards and are provided herein. Particular Specifications will need to be drawn up by the Designer for each proposed Pumping Station.

3.0 LOCATION AND SITE ACCESS

- 3.1 The choice of site for a Pumping Station is very important, being influenced by the configuration of the development it serves, the type of sewerage system connected to it, and the requirement to minimise pumping head.
- 3.2 The Pumping Station design shall take into account the requirement for an emergency overflow, and adequate storage in the event of equipment failures.
- 3.3 The Pumping Station will need to be sited in a secure enclosure. NWG's preferred standard arrangement is 2.4m high palisade fencing with gates of sufficient size to allow vehicle access for maintenance and repair purposes. (See Appendix A2).
The gates shall have a locking facility allowing entry to both NWG and REC personnel. NWG should be consulted on the detail of this arrangement.
The enclosure shall be of a suitable size and layout to allow vehicles such as tankers and vehicle mounted cranes to manoeuvre. This will ensure that pumps

can be removed/installed at the wet well, and temporary mobile pumps and generators can be conveniently sited when required.

Protective and decorative finishes shall be agreed with the local planning authority and NWG.

- 3.4 All Pumping Station installations shall have an all-weather access road of 3.5m minimum width, and a turning circle suitable for a sludge tanker with an axle loading of up to 11.5 tonnes.
- 3.5 All pumping stations must have 24 hour vehicular access. Access should preferably be directly from the public highway but where this is not possible a private access route shared with other users must contain provisions to give NWG unobstructed access rights.
- 3.6 All areas within the pumping station operational site are to have a low maintenance finish. Any requirements to incorporate soft landscaping (e.g. hedging, tree planting) should be outside the security fence.

4.0 PUMPING STATION CAPACITIES AND SEPTICITY CONTROL

- 4.1 The capacity of the pumping units shall be consistent with the capacity of the rising main and capacity of any downstream gravity sewers.

The Designer cannot assume that downstream sewer capacity is adequate, this must be confirmed directly with NWG.

- 4.2 For stations with no Emergency Overflow, the following formula for storage is applied. Where stations have an Emergency Overflow, storage volume shall be agreed with the EA. To ensure that sewage flooding does not occur at, or upstream of, the pumping station during plant or power failure, additional storage shall be provided.

A storage volume of 4 hours at Dry Weather Flow (DWF) shall be provided with DWF being calculated as follows:

DWF (m3/day) = PG + E + I

Where:	P = Population in Catchment
	G = Domestic Consumption m3/hd/day)
	E = Industrial Flows (m3/d)
	I = Infiltration (m3/d)

* Infiltration is assumed as 50% of the populations daily consumption

* Domestic Consumption (G) = 0.18m3/hd/day shall be used

- 4.3 NWG require the storage volume to be contained within the wet well to avoid any risk of blockages in the upstream network. The base of the storage level shall start at the level of the standby trigger, and the top of the storage shall be below the invert level of the wet well inlet pipe.

Should this requirement result in the wet well depth exceeding 6m then NWG shall be consulted to decide upon alternative storage options (i.e. use of upstream network capacity).

- 4.4 If it is expected that further development will take place in the drainage area, the Pumping Station design shall allow for additional or different pumps to be added and increased storage capacity. This will be by provision of extra space in both the wet well and valve chamber and, if necessary, allowance for the duplication of the rising mains. Consideration should also be given to the electrical design. Detailed arrangements should be agreed with NWG.

Where provision is made for any future increase in flow, effects of initial low flows shall be considered. The system is required to maintain a self-cleansing velocity in the rising main and at the same time pump sewage often enough to avoid septicity occurring.

The holding of sewage in the wet well or rising main for periods of time exceeding 6 hours is to be avoided, as this may result in septic conditions.

5.0 EMERGENCY OVERFLOW

- 5.1 **This will require a permit from the EA.** In the unlikely event of a permit being given the overflow will be set as high as possible in the wet well in order to satisfy the conditions stated in the EA Permit and, at the same time, avoid excessive surcharging of the sewerage system upstream.
- 5.2 In most circumstances a discharge permit from the EA will not be authorised. If agreed, the typical allowance for storage is 4 hours at Dry Weather Flow. The actual volume would be agreed through the permit application process followed in guidance on the gov.uk website.
- 5.3 Should an overflow permit be given by the EA, then as far as possible, solids shall be retained in the flow. Normally a screen with a scum board shall be fitted as indicated in Appendix A1 Civil drawings schedule is adequate, unless more stringent requirements are imposed by the EA.

6.0 RISING MAINS

- 6.1 The consequences of hydraulic surge in the rising main shall be taken into account when designing the Pumping Station, and appropriate measures taken to ensure that surge effects are reduced to an acceptable tolerance level for the pipes and fittings subjected to such effects.
- 6.2 A copy of calculations on surge assessment shall be made available to NWG.
- 6.3 Where plastic pipes are used, the consequences of cyclic loading on fatigue life shall be considered.
- 6.4 Due regard for ease of maintenance shall be made when installing air valves.
- 6.5 The Designer will be responsible for demonstrating by site test, prior to adoption, that surge effects are not detrimental to the operation and maintenance of the system.
- 6.6 Further details may be found in the Civil Specification.

7.0 WET WELL DESIGN

- 7.1 The depth of the wet well should be kept to a minimum. The capacity should be designed for a maximum of seven pump starts per hour.
- 7.2 The preferred arrangement shall generally be in accordance with that shown on the drawings in Appendix A1. Circular construction wet wells are normally the most cost effective, but the designer may consider other options to suit the local ground conditions and make proposals to NWG.
- 7.3 Incoming sewers shall discharge into an inlet manhole adjacent to the wet well. From the manhole, the inlet into the wet well shall be at least 150 mm above the duty pump start level.
- 7.4 Benching shall be provided with a gradient of at least 45 degrees to prevent solids settling around the outer edges of the well. Benching should not be completed until the pump supports have been installed.
- 7.5 The walls of the wet well shall be fair faced to a smooth finish. Ledges and platforms that might collect solids shall be avoided.
- 7.6 Hinged, lockable access covers shall be selected with due regard for loading, security and manual handling limitations. For guidance on access covers please refer to Engineering Standard E0209 - 'Galvanised Mild Steel Access Covers for Wastewater Applications'.
- 7.7 Suitable provision for ventilation of the wet well shall be made. Generally this will be via the emergency overflow, but if no overflow exists then arrangements must be incorporated to suit local site conditions and to avoid causing odour problems.

8.0 PUMPS

- 8.1 Pump sets are to be selected in accordance with the Water Industry Mechanical and Electrical Specification (WIMES 1.02), included in Appendix A3. This document requires inputs from both the supplier and the purchaser.
- 8.2 Designers shall select Pump sets from suppliers that are on NWG's Pump Tender Framework.
- 8.3 Pumps must be fit for purpose, and NWG normally require raw sewage pumps to be capable of passing 70mm diameter spheres.

Where pumps with a lesser solids handling capability are offered, the Designer will be required to demonstrate, by design and satisfactory operation of the pumping station, that the pumps are capable of prolonged, reliable, and trouble free operation on raw unscreened sewage.
- 8.4 Pump rates shall be calculated at 6 times Dry Weather Flow.

Formula: $6PG + 3E + I$ (See Section E, Clause 1.1).
- 8.5 Where the rising main is less than 80mm, macerator pumps shall be used.
- 8.6 Further details may be found in the Mechanical Specification.

9.0 VALVE CHAMBER

- 9.1 A separate valve chamber is required. This will allow for the siting of the pump electrical junction boxes as well as the valves (see drawing in Appendix A1).

10.0 MATERIAL CORROSION

- 10.1 Materials used shall be selected to prevent galvanic corrosion. Special precautions shall be taken to prevent corrosion at joints, or points of intimate contact, between metals of differing electrochemical potential. Wherever possible electrochemically compatible materials shall be used. Contact between stainless steel fixings and galvanised fittings shall be prevented by plastic sleeves and washers.

11.0 HAZARDOUS AREAS

- 11.1 Potentially flammable atmospheres can arise in sewerage systems. It is essential that a risk assessment is undertaken to identify possible hazardous areas in order to allow proper design and selection of electrical equipment.
- 11.2 The Designer shall be responsible for ensuring that a risk assessment is carried out prior to commencing detailed design of the Pumping Station.
- 11.3 A risk assessment shall be carried out in accordance with NWG's DSEAR (Dangerous Substances and Explosive Atmosphere Regulations) guidelines.
- All calculations and any assumptions shall be forwarded to NWG Company Electrical Engineer for approval prior to the ordering of any electrical/Instrument equipment. Appropriate NWG Confined Space warning signs shall be fitted at all points of entry.
- 11.4 A standard electrical installation shall not be used unless the assessment concludes that the probability of a flammable atmosphere arising is negligible.

12.0 ELECTRICAL INSTALLATION

- 12.1 The Electrical and Telemetry Specification, which is to be read in conjunction with the accompanying drawings and schedules in Appendix A8.3, details the standard electrical installation for two pump submersible sewage pumping stations. These drawings can be provided on disk by NWG. The prescribed standard installation is to be provided for pumping stations which satisfy all of the criteria specified in the sub-section 'Application of Standard Installation' F 2.0.
- 12.2 The specified standard electrical installation provides levels of functionality, maintainability and safety acceptable to NWG, and replaces the general guidance provided in 'Sewers for Adoption' published by the Water Services Association (WSA).
- 12.3 The user of the specification is responsible for ensuring that the requirements of the specification are properly implemented, and that they are appropriate for the intended application.
- 12.4 The detailed electrical design of the Pumping Station, including all electrical drawings, shall be submitted to NWG for review, **prior to construction and manufacture.**
- 12.5 Application of the standard electrical installation specification will reduce, but not eliminate the need for, detailed design, construction and approvals. It is essential that the standard be properly and competently applied, and that on completion of construction, the installation be verified through inspection and testing for

compliance with relevant standards, including BS 7671 (IEE Wiring Regulations) and NWG Periodic Inspection and Testing (PIT).

- 12.6 There shall be no departures from the specified standard electrical installation except where formally agreed with NWG. All such departures shall be technically justified and normally confined to installations which do not meet the application criteria detailed in the sub-section 'Application of Standard Installation' F 2.0.
- 12.7 In **exceptional** circumstances NWG may, at their discretion, approve a proposal to employ a non-standard arrangement.
- 12.8 Full discrimination shall be provided between the overcurrent protection devices within the installation and, unless otherwise constrained by the REC, the REC service cut-out fuse shall fully discriminate with these devices.
- 12.9 The standard electrical installation provides for the use of either direct-on-line or star-delta starting method. The starting method employed shall be appropriate to the specific application, and selection criteria shall include the starting torque requirement of the pump, any starting restriction imposed by the REC and the need to ensure discrimination of the REC service fuse with other overcurrent protective devices in the installation.
- 12.10 For electrical services up to 20 kW, the REC will normally restrict the rating of the service fuse to 100A, or less. In certain cases the REC may uprate the service fuse to accommodate discrimination requirements. Where the REC proposes a 100A service fuse, full discrimination cannot be achieved where the pump set FLC exceeds 17A (approximately up to 5.9 kW) with DOL starting or exceeds 29A (approximately 5.9-15 kW) with star-delta starting. Unless the REC is prepared to increase the service fuse rating, star-delta starting should be employed where practicable for pump sets having a FLC exceeding 17A. Similar restrictions apply to lower service fuse ratings.
- 12.11 For electrical services between 20kW to 30kW, the Developer shall consult the REC for the service fuse size they will provide for the variable speed drives to be installed.
- If variable speed drives are supplied, there shall be an appropriate harmonics survey completed to ensure the station is compliant with G54-1. This decision shall also be made in consultation with NWG's MCC framework provider.
- 12.12 The control panel shall be sited in a weatherproof housing. NWG would prefer this to be of 'walk in' proportions (brick or GRP construction – see Section F, Clause 11.5). The minimum acceptable standard of housing is a GRP 'road-side' type. Further details can be found in the Electrical and Telemetry Specification.
- Housings with a volume not exceeding 29m³, based on external dimensions, will not normally require planning approval, though this must be confirmed with the local planning authority.
- 12.13 Cable ducts to the control panel shall terminate flush with the concrete plinth of the weatherproof housing at the positions shown on the drawings (see Appendix A8.3).
- 12.14 Where cable ducts pass under roads NWG shall be consulted.
- 12.15 Where an emergency overflow is to be installed, the Designer shall consult with NWG on the need to provide an additional monitoring facility to supplement the

standard arrangement. The additional facility will be required in cases where the emergency overflow discharges into sensitive receiving waters, and is detailed in the Electrical and Telemetry Specification.

13.0 ELECTRICITY SUPPLY

- 13.1 The Designer shall arrange for the provision of a suitable electricity supply from the Regional Electricity Company (REC). In particular the Designer shall ensure that:
- (a) The characteristics of the proposed supply meet all constraints detailed in the sub-section 'Application of Standard Installation' (F2) to permit the use of the standard electrical installation
 - (b) Any limitations imposed by the REC, including preferred motor starting method, are identified.
 - (c) The specific characteristics of the proposed supply are ascertained, in particular the prospective short circuit current (PSCC), type of earthing (TN-S or TN-C-S), earth fault loop impedance external to the installation (Z_e) and type and rating of the REC fuses.
- 13.2 Where the REC requires the installation to incorporate RCD protection, or is not able to provide an earth connection, the Designer shall not employ a standard electrical installation and the matter shall be referred to NWG.
- 13.3 The Designer shall liaise with the REC to ensure that where practicable the REC selects a service cut-out fuse rating which will provide full discrimination with the overcurrent protective devices incorporated in the installation.
- 13.4 Routing and protection arrangements for the supply cable shall be agreed with the REC, however where reasonably practicable the cable shall follow a route which is adjacent to the site perimeter rather than cross the site. The concrete plinth of the weatherproof housing shall incorporate a duct which shall terminate directly below the intended mounting position of the REC cut-out.
- 13.5 The Contractor/Designer shall record routing information and provide NWG with an as-installed record drawing.
- 13.6 The REC requires the Contractor/Designer to submit a Notice to Connect/Certificate of Compliance prior to connecting a supply to the installation. This declaration requires the electrical Contractor to certify that the installation complies with BS 7671 (IEE Wiring Regulations). The Designer should note that compliance cannot be confirmed unless the electrical Contractor has carried out certain inspection and testing activities required by BS 7671.
- 13.7 The Designer shall consult with NWG where the REC is able to provide a choice of tariff.
- 13.8 Further details may be found in the Electrical and Telemetry Specification.

14.0 TELEMETRY FACILITY

- 14.1 The Designer shall consult with NWG on the telemetry issues before commencement of detailed design.

- 14.2 NWG shall be consulted on equipment procurement issues, programme of works and equipment and service charges for the following:
- (a) Telemetry outstation and directly associated standard components, where it is intended to procure these items from NWG.
 - (b) Communications medium between the outstation and the NWG telemetry system. The communications medium is to comprise either a radio link or a PSTN (telephone) line, and NWG will determine on a site-specific basis which of these alternatives is to be provided. Where a radio link is applicable, requirements for a radio mast shall be included for. This determination will affect the site infrastructure provisions and the facilities to be afforded at the control panel.
 - (c) Mandatory inspection, acceptance testing and commissioning services provided by NWG.
 - (d) Other telemetry services available from NWG (Project Management, Installation and Supply of Hardware).
- 14.3 Further details may be found in the Electrical and Telemetry Specification.
- 14.4 NWG may accept a GPRS mobile communication with the station, but a survey from NWG and acceptance of this shall be agreed before its installation.

15.0 DESIGN DATA

- 15.1 The detailed design of the Pumping Station, including all mechanical, electrical and civil drawings shall be submitted to NWG New Development / Asset Investment prior to construction.
- 15.2 A suitably scaled plan showing all properties served by the Pumping Station and a copy of the calculations used to establish DWF and pumping rates shall be supplied to NWG.
- 15.3 A ground condition survey shall be carried out to confirm suitability and stability of the site.

16.0 TESTING AND INSPECTION

- 16.1 The Contractor shall be responsible for ensuring that all pumping station pipes and fittings, and the rising main, are hydraulically tested, in accordance with Appendix A12.
- 16.2 The Contractor will be responsible for provision of all properly calibrated and suitably scaled equipment required to carry out the above tests.
- 16.3 The electrical installation shall be tested in accordance with the 'Inspection and Testing' sub-section of the Electrical and Telemetry Specification.
- 16.4 Where the installation is over three years old (from the date of connection to the electricity supply) an additional BS 7671 Periodic Inspection and Test shall be undertaken by a NICEIC - approved contractor. Documentation in the form prescribed in BS 7671 including NWG Periodic Inspection and Testing (P.I.T.) shall be submitted to NWG. For P.I.T. test sheets see appendix A13.
- 16.5 After completion of the installation, and following receipt by NWG of satisfactory 'as-constructed' record documentation, NWG will formally inspect the installation

for adoption or take-over purposes. The electrical Contractor(s) shall be present during this inspection to satisfactorily demonstrate the operation of the complete system and to undertake such additional demonstrations and/or tests as directed by NWG.

- 16.6 The above tests and results thereof will be documented and shall form part of the Take-over Documentation.
- 16.7 The developer will provide NWG with a copy of the connection agreement with the PSTN supplier.

17.0 STANDBY POWER GENERATION

- 17.1 Permanently installed standby electrical power generation is not normally required provided adequate storage is given in the wet well, however this must be confirmed with NWG. A plug connection suitably rated for the station supply requirements to connect a temporary power generator is required and shall conform to BS EN 60309-2.

18.0 LIFTING PLANT

- 18.1 The preferred means of pump removal is with the aid of a crane, but davit sockets shall be provided for use in situations where a crane is not available. Only NWG standard davits are acceptable as per Appendix A4.

19.0 CONDITION & PERFORMANCE MONITORING

- 19.1 A flowmeter shall be installed on all pumping stations. The output values of a flowmeter shall be displayed on the control panel and the value linked back to SCADA. The flow monitoring device shall also have a low flow alarm which links into SCADA.
- 19.2 Pumps that are 50kW or above shall all have vibration monitoring protection. The vibration monitoring equipment shall be connected to the control panel, and the alarms linked back to SCADA.

SECTION C: DOCUMENTATION

1.0 PRIOR TO CONSTRUCTION

- 1.1 All design data and the programme of work shall be provided to NWG New Development / Asset Investment at least one month prior to work commencing on site.

2.0 PRIOR TO ADOPTION OR TAKEOVER BY NWG

The following information must be provided to NWG:

- 2.1 Information in accordance with the EnGarde Assets System (see Appendix A6 for sheet).
- 2.2 Copies on A3 paper and AutoCAD disk (AutoCAD release 14) of the following:
 - (a) Scale 1:200 site plan
 - (b) Scale 1:1250 and 1:500 Location Plans (see Appendix A7 for typical location plan)
- 2.3 The documentation required to satisfy all health and safety legislation including the Safety File as defined by the Construction (Design and Management) Regulations 1994 (CDM Regulations).
- 2.4 Load test certificates and inspection records for lifting plant.
- 2.5 Written schemes of examination and operating instructions for pressure systems.
- 2.6 Three copies of the Operation and Maintenance Manuals.
- 2.7 A copy of the connection agreement with the electricity supplier.
- 2.8 Evidence of planning permission and building control approval.
- 2.9 Evidence of land ownership.
- 2.10 A certificate signed by the relevant personnel to confirm that the rising main has been tested sufficiently for its operating loads.
- 2.11 If an overflow discharge permit has been obtained, the transfer of ownership document shall be provided.

3.0 OPERATION AND MAINTENANCE MANUALS

These manuals are to contain as a minimum the following:

- 3.1 Detailed description of the Pumping Station, with sufficient information to allow NWG personnel to locate the installation, and understand the operation.
- 3.2 Instructions for the operation, maintenance and overhaul of the plant
- 3.3 Specific details of manufacturers, plant types and capacities, serial numbers and model numbers, and the weight of all main plant items and pumps.
- 3.4 Detail of plant equipment performances, including pump curves and test sheets etc., shall be supplied to aid in fault diagnosis.

- 3.5 All relevant manufacturers' data. **Note: Generalised instructions are not acceptable.**
- 3.6 A list of all programmable and adjustable settings associated with the plant (e.g. level control settings, timer settings, overloads, trips, alarm points etc.). See Appendix A5 for specimen sheet of level control settings.
- 3.7 Recommendations for consumable items e.g. packings, lubricants etc. for the installed plant.
- 3.8 Parts lists and recommended operational spares lists.
- 3.9 A summary sheet of lubrication and maintenance requirements (preferably a one sheet schedule).
- 3.10 Fully completed WIMES 1.02 data sheets and certificates of factory and site tests, inspection, conformity and pump tests as detailed in WIMES 1.02.
- 3.11 Risk assessments and other documentation called for in the CDM Regulations.
- 3.12 A complete set of "as built" drawings for the Pumping Station and rising main.
The Drawings and associated documentation will:
 - (a) Show the internal construction of the major items, with parts lists and reference numbers for ordering spares.
 - (b) Include complete assembly drawings of machinery and ancillary plant showing all pipe connections and fittings.
 - (c) Include General Arrangement drawings showing all equipment, cabling, traywork, etc.
 - (d) Show cable routing information, including REC and PSTN (telephone) cables.
 - (e) Include all electrical schematics and schedules as detailed in the Electrical and Telemetry Specification.
- 3.13 A complete set of relevant design calculations relating to:
 - (f) Structural design
 - (g) Lifting beam, davit socket and davit lifting block
 - (h) Pump Station and rising main hydraulic calculations including surge suppression calculations and report, if undertaken.
 - (i) Wet well and pump design
 - (j) Storage calculation, to verify EA requirements.
 - (k) Electrical system design documentation, including calculations to verify compliance with the requirements of the IEE Regulations for Electrical Installations (BS 7671), control panel inspection and test certificate and NICEIC Completion and Inspection Certificate including Schedule of Test Results, as detailed in the Electrical and Telemetry Specification.
 - (l) Drainage plan, flow calculations and information used in the design of the Pumping Station.
- 3.14 Hydraulic testing results as required by the Civil and Mechanical Specifications (see Appendix A12).

- 3.15 The format for the manuals shall be that of loose leaves inserted into durable plastic covers and contained in suitable A4, 4 hole type ring binders. There shall be a title page and index and use will be made of file dividers and clear plastic wallets for holding drawings, schematics, manufacturer's booklets and leaflets as necessary. Drawings should be supplied in both paper version and electronically on C.D. disk in AutoCAD release 14 format.

SECTION D: CIVIL SPECIFICATION

1.0 GENERAL

- 1.1 The civil engineering specification for the Pumping Station and Wet Well shall be in accordance with the most recent versions of 'Sewers for Adoption' and 'CESWI'.

2.0 ACCESS ROADS

- 2.1 The minimum standard of construction for access roads to Pumping Stations will:
- (a) Incorporate a granular compacted sub-base laid on a geotextile such as Terram, the depth of the sub base will depend on the exist ground conditions. The depth of the sub base shall be approved by a Structural/Civil Engineer.
 - (b) The geotextile bottom sheet shall be laid with a 1000mm minimum overlap between sheets.
 - (c) The sub base shall be covered with a 1000 gauge impermeable plastic sheeting with a minimum 500mm overlap between sheets.
 - (d) The concrete slab shall have two layers of mesh reinforcement the design of the slab and reinforcement shall be carried out by an approved Structural/Civil Engineer.
 - (e) The depth of cover from the road surface to the mesh reinforcement shall be 50mm+/- 10mm.
 - (f) Road surface shall be laid to ensure satisfactory draining, with no retention of standing water.
 - (g) The road surface shall have a wood float finish.
 - (h) The mesh reinforcement shall terminate 60mm+/- 20mm from the edge of the slab.

3.0 PIPES, VALVES AND FITTINGS

- 3.1 The Pumping Station pipes, valves and fittings shall be in accordance with Appendix A10.

4.0 RISING MAINS

- 4.1 The diameter of rising mains shall be such that the velocity of flow is sufficient for self-cleansing, with the rate of discharge being in the range of 0.75 m/s to 1.8 m/s.
- 4.2 Rising mains of less than 80mm internal diameter will not normally be acceptable unless macerating pumps are employed. NWG must be consulted at the Design Stage if Rising Mains less than 80mm are proposed.
- 4.3 The pipes used must be capable of withstanding the maximum pressure developed within the system, including any additional allowance for the effects of surge.
- 4.4 A rising main should normally achieve a steady rise from the valve chamber up to the discharge manhole. Where this is not possible, washouts are required at low

points, and air valves at high points. The nominal depth will be 1.2 m in highways, or 0.9 m on Greenfield sites.

- 4.5 Rising mains shall, where necessary, be provided with access for cleaning, and washout facilities at any low points. Washout should be taken from a “T” junction and valve; the main discharging to a nearby foul gravity sewer or to a specially constructed sump if this is not possible. Washout chamber details are given in Appendix A2.

- 4.6 A means for marking changes of direction in the pumping main will be required either by marker posts, or manholes with sealed hatch boxes. Access points should be fitted to the rising main at a nominal 100 m apart.

Warning tape coloured green should be provided (“Caution Pressure Main Below”) set not less than 300 mm above the crown of the pipe.

For non-metallic mains the marker tape should incorporate a tracer wire which should be brought to the surface at access points and connected to terminals on the marker post (continuity must be maintained in the wire as reels are usually only 100 m long). At the pumping station the tape should be terminated with a one metre coil inside the valve chamber, entry being through a sealed duct 300mm below the finished paved area. At the discharge end of the main the wire should be terminated in a similar manner, and in a suitable chamber to enable a signal to be induced for tracing. The rising main should be kept within a public open space or a highway.

- 4.7 The permissible range of materials for construction of rising mains is as defined in Sewers for Adoption.
- 4.8 The calculation of head loss and values of pipe roughness shall be as defined in Sewers for Adoption.

5.0 ANCHORAGES AND THRUST BLOCKS

- 5.1 Where anchors are required to resist thrusts produced on mains and pipework at changes of direction, tapers, tees and valves, these shall be designed in accordance with CIRIA Report 128 - Guide to the Design of Thrust Blocks for Buried Pressure Pipelines.

6.0 AIR VALVES

- 6.1 All air valves, which are required either as a surge alleviation device or to vent high points on the rising main, shall be suitable for a sewage application and designed so that liquid contained in the lower chamber cannot contact the sealing face(s). Clean water type valves are not acceptable.
- 6.2 The valves must be capable of being isolated to enable removal for cleaning or replacement.
- 6.3 Valve chamber details shall be in accordance with those given in Appendix A2.
- 6.4 Valve materials shall be in accordance with details given in Appendix A10.

7.0 PENSTOCKS

- 7.1 All penstocks shall be in accordance with the details given in Appendix A10.

8.0 FASTENERS AND FIXINGS

8.1 All fasteners and fixings shall be in accordance with Appendix A11.

9.0 CABLE DUCTS

9.1 Separate continuous underground ducts shall be installed for the services listed below. Ducts shall be laid a minimum of 450 mm below ground level. Typical minimum diameters are given below but these should be checked against the size of the cable which is to be installed into the duct for ease of pulling, bending radius etc.

	Service	Dia (mm)	From	To
(a)	REC Supply Cable	100	Service Connection	Control Panel
(b)	PTSN (Telephone) Cable	65	Service Connection	Control Panel
	Service	Dia (mm)	From	To
(c)	Earth Electrode	65	Electrode Chamber	Control Panel
(d)	Pump Supplies, Level Control	100	Control Panel	Valve Chamber
(e)	Pumps, Supplies Level Control	100	Valve Chamber	Wet Well

9.2 Long radius bends shall be employed for vertical terminations and changes in direction. The duct route shall eliminate acute changes in direction wherever possible. Where this cannot be avoided, a pull-in chamber shall be installed at the change in direction.

9.3 At a position approximately 150 mm below final ground level, a yellow 'Electricity Services' marker tape shall be installed along the whole length of the duct run.

9.4 A draw cord shall be installed in each duct.

10.0 ACCESS COVERS

10.1 For guidance on access covers please refer to Engineering Standard E0209 - 'Galvanised Mild Steel Access Covers for Wastewater Applications'.

11.0 STEEL PALISADE FENCE AND GATES

11.1 Where provided these shall be in accordance with NWG standard details in Appendix A2.

11.2 Consideration of the access road camber and slope shall be given to allow 50mm clearance under the gates.

SECTION E: MECHANICAL SPECIFICATION

1.0 PUMP SPECIFICATION

The capacity of the pumping units shall be consistent with the duty required of the Pumping Station, the capacity of the rising main and the capacity of any downstream gravity sewers.

Submersible sewage pumps shall be specified in accordance with the Water Industry Mechanical and Electrical Specification - WIMES 1.02 using the Data sheet therein (see Appendix A3) and with due regard for the requirements of this document. The pump purchaser and the pump supplier shall fully complete the relevant sections of the Data Sheet.

1.1 Pumps

The Pumping Station will incorporate two identical pumps, with one duty pump and one standby pump.

Pumps and control gear installed at the Pumping Station shall be rated for a minimum 15 starts per hour.

Pumps shall be selected to meet the highest best efficiency point based on the design pump rate for the station. Pump rates shall be calculated as follows:

PUMP RATE (m³/day) = 6PG + 3E + I	
Where:	P = Population in Catchment
	G = Domestic Consumption m ³ /hd/day)
	E = Industrial Flows (m ³ /d)
	I = Infiltration (m ³ /d)
* Infiltration is assumed as 50% of the populations daily consumption	
* Domestic Consumption (G) = 0.18m ³ /hd/day shall be used	

1.2 Pump Data Plate (WIMES 1.02, Clause 1.4.4)

The Pump shall have a securely fixed data plate containing, as a minimum, the following information:

- Serial Number
- Pump Type
- Rated Flow
- Rated Voltage
- Frequency
- Number of Phases
- Full Load Current
- Speed of Rotation
- Weight of Pump

Note: An additional plate shall be supplied for attachment to the Control Panel.

1.3 Guide Rail System (WIMES 1.02, Clause 1.5.1)

The guide system shall be of the rigid tube type and will be located by spigots at the bottom. The spigots shall have a minimum engagement of at least the internal diameter of the tubes.

The guide rails shall not have an unsupported span greater than 3 m and shall be of the galvanised steel tube type. The top of the guide rails shall locate into a suitably designed bracket, having a minimum engagement into the tube equivalent to the inside diameter of the tubes used.

Hooks shall be provided at the top of the guide system for securing the cable support sleeves and parking the suspension chain.

The hooks shall be manufactured from appropriately sized galvanised steel, and shall have sufficient upstand to adequately retain the chain and cable support.

1.4 Lifting System (WIMES 1.02, Clause 1.5.2)

(a) Lifting chains shall be made from heavily galvanised low carbon steel (grade 30 or 40) having 50 mm, or larger, diameter rings every metre. The chains shall be securely fixed to the pump using galvanised fittings. The length of the lifting chain shall be such that when the pump is in position the chain extends at least one metre above the top of the well.

The chain shall be rated to lift twice the weight of the pump.

(b) The NWG preferred method for the removal of pumps from the wet well is by vehicle mounted crane. A davit socket will be provided in accordance with the NWG standard detail for use in emergency situations. (See Appendix A4). The davit socket must be rated to lift twice the weight of the pump.

1.5 Flushing System (WIMES 1.02, Clause 1.6)

This will not normally be required unless significant scum and fat problems are anticipated. Where there is a problem the device shall be specified by the Designer.

1.6 Impeller Speed and Solids Handling (WIMES 1.02, Clause 2.1)

The maximum speed of rotation shall not exceed 1450 rpm for pumps with discharge branch diameter up to 150 mm, 960 rpm for pumps having discharge diameters greater than 150 mm and up to 200 mm, or 750 rpm for larger discharge diameters.

Pumps must be fit for purpose, and NWG normally require raw sewage pumps to be capable of passing 100mm diameter spheres.

Where pumps of a lesser solids handling capability are offered, the Designer shall be required to demonstrate, by design and satisfactory operation of the Pumping Station, that the pumps are capable of prolonged, reliable and trouble free operation on raw unscreened sewage.

1.7 Seal Arrangements (WIMES 1.02, Clause 6.13)

Leakage detection is required for specific pump units, refer to WIMES 1.02, Clause 6.13 (Point 2) for guidance. .

1.8 Cables and Connectors (WIMES 1.02, Clause 3.9)

NWG require junction boxes in the valve chamber. Connectors are not acceptable.

1.9 Tests (WIMES 1.02, Clause 5)

Pump tests should be carried out prior to the units leaving the factory, in accordance with the requirements of BS 5316 Part 1, to show that the pumps are capable of achieving the specified operating conditions.

Test Certificates shall be provided to NWG.

Note: NWG has additional testing requirements for the Pumping Station prior to adoption or take-over.

2.0 PIPES, VALVES AND FITTINGS

2.1 The pipes, valves and fittings shall be in accordance with Appendix A10, the layout shall generally be in accordance with that shown in Appendix A1

3.0 FASTENERS AND FIXINGS

3.1 All fasteners and fixings shall be in accordance with Appendix A11.

4.0 HYDRAULIC TESTING

4.1 The Contractor shall be responsible for ensuring that all pipework is hydraulically tested, in accordance with Appendix A12.

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SECTION F: ELECTRICAL AND TELEMETRY SPECIFICATION

1.0 GENERAL

- 1.1 This specification, which is to be read in conjunction with the accompanying drawing and schedules (Appendix A8.3), details the standard electrical installation for two pump submersible sewage pumping stations. The prescribed standard installation is to be provided for pumping stations which satisfy all of the criteria specified in the sub-section 'Application of Standard Installation' below.
- 1.2 The installation shall comply with all applicable statutory requirements including the Electricity at Work Regulations. The installation is to be designed, constructed, inspected and tested in accordance with BS 7671, and shall comply with the requirements of all other relevant British Standards.
- 1.3 All on-site electrical installation work, including inspection and testing to BS 7671, shall be carried out by a contractor registered with the National Inspection Council for Electrical Installation Contracting (NICEIC).
- 1.4 Nothing in this specification shall imply any obligation on the part of NWG to ensure that the installation, or any part of the installation, is properly designed, constructed, inspected or tested, or that the installation conforms to statutory requirements.

2.0 APPLICATION OF STANDARD INSTALLATION

Application of this standard electrical installation is restricted to pumping stations:

- (a) Having two submersible pump sets, one duty and one standby each of the same capacity, arranged for automatic operation where the starting arrangements for such pump sets will be either DOL or Star/Delta arrangements to a maximum of 20kW and where the REC supply is adequate for such an arrangement.

The maximum size of pump set to be used in this application is 30kW, where pump set are between 20kW and 30kW a frequency inverter starting method shall be adopted. **NWG should be consulted if larger stations are necessary.**
- (b) Which the Designer has confirmed through a risk assessment using NWG methodology that a potentially explosive atmosphere is unlikely to arise, and as a consequence no part of the installation will require classification as a Hazardous Area within the meaning of BS 5345.
- (c) Where the installation is to be supplied by a Regional Electricity Company (REC) from a low voltage network at 400 volts \pm 10%, 3-phase and neutral via a fusible cut-out having fuses to BS 1361 Type II or BS 88 Part 2 or Part 6 and a maximum prospective short circuit current (PSCC) of 16 kA at the supply terminals.
- (d) Where the REC is able to provide an earth connection to the installation, and the value of the earth fault loop impedance external to the installation (Z_e) is 0.4 ohms maximum for a TN-S system, or 0.35 ohms maximum for TN-C-S (PME) system.
- (e) Where the pump sets are to be started by direct-on-line or star-delta method up to 20kW and variable-speed -drive between 20kW to a 30Kw maximum, and the

chosen starting method is acceptable to the REC and appropriate for the pump set.

- (f) Where the REC does not require the installation to be equipped with power factor correction equipment, or penalise the consumer for poor power factor by way of applied tariff.
- (g) Where the installation does not require provision of electrical services to equipment other than the two pump sets, associated control and level monitoring system, telemetry and minor lighting and heating services within the weatherproof housing provided for the control panel.
- (h)

3.0 TELEMETRY FACILITY

The installation shall incorporate a Standard NWG telemetry outstation and communications system, these systems will require acceptance testing and commissioning by NWG.

Details of the telemetry signal requirements are provided within this specification.

4.0 EXTENT OF INSTALLATION

The electrical installation shall include:

- (a) REC mains supply service, fusible cut-out and metering equipment
- (b) Floor standing control panel incorporating incoming mains and standby supply arrangements, starters, distribution, control and telemetry system.
- (c) Weatherproof housing for (a) and (b) 'walk in' proportions see drawing in Appendix A8.3.
- (d) Lighting and heating to (c).
- (e) Earthing and bonding system, including the establishment of an equipotential zone within the weatherproof housing, and the valve and wet well chambers, and the installation of a consumer's earth electrode system with connecting duct.
- (f) Ultrasonic level monitoring system and, where required, float switch for monitoring the emergency overflow.
- (g) Cabling and ancillaries including ducts etc.
- (h) Telemetry outstation and communications system, PSTN (telephone) line or radio system, as directed by NWG.

5.0 CONFIGURATION OF STANDARD INSTALLATION

The specified standard electrical installation, as detailed in Appendix A8.3, is to be configured by the Designer to suit the particular application. Such configuration shall take account of pump motor full load current and starting method, and will include the following:

5.1 Mains Supply - BS 88 Fuse Rating

This section of the supply changeover switch shall be equipped with BS 88 fuses selected to provide satisfactory discrimination with the upstream REC fuses and downstream motor circuit fuses.

5.2 Standby Supply - BS 88 Fuse Rating

This section of the supply changeover switch is to be equipped with BS 88 fuses selected to provide satisfactory discrimination with the downstream motor circuit fuses

5.3 Pump Motor Starters

5.3.1 Up to 20kW

- (a) Selection of the fuses, contactor(s) and overload for motor short circuit protection is to be appropriate to motor full load current and method of starting, and afford Type 2 co-ordination to BS EN 60947-4.
- (b) Selection of direct-on-line or star-delta starting method, according to REC starting current limitations, service cut-out fuse rating and suitability for the pump.
- (c) Selection of current transformer for digital load monitor.
- (d) Selection of other components, as provided for in the schedule, including fuse switch assembly rating and wiring size.

5.3.2 Between 20kW and 30kW

- (a) Selection of the fuses, contactor(s) for motor short circuit protection is to be appropriate to motor full load current and method of starting, and afford Type 2 co-ordination to BS EN 60947-4.
- (b) Selection of variable speed drive, according to REC starting current limitations, service cut-out fuse rating and suitability for the pump.
- (c) Selection of ammeter scale for 4-20mA input.
- (d) Selection of other components, as provided for in the schedule, including fuse switch assembly rating and wiring size.

5.4 Pump Motor Cables

Selection of motor cables to suit motor full load current and starting method.

The selection of suitable components is to be based on the pump motor full load current as confirmed by the pump manufacturer, and not the quoted kW or HP rating.

5.5 Telemetry Outstation and Communications System

As directed by NWG the Designer will provide for a PSTN line or radio system.

6.0 STANDARD ELECTRICAL COMPONENTS

- 6.1 Except where detailed below, the Designer may use components of different manufacture to those indicated in the schedules or drawings. However, where an alternative is proposed, the component shall be equivalent in all respects to that specified and the performance requirements of the relevant British Standard. Additionally, the Designer shall ensure that all alternatives meet any physical constraints as to layout and accommodation. In respect of motor starter

components the Designer shall demonstrate that any proposed alternative is properly selected to achieve Type 2 co-ordination to BS EN 60947-4.

6.2 The installation shall incorporate the following standard components.

- (a) Wet Well Level Monitoring System based on Ultrasonics: including a transducer head IP66 rated for mounting in the wet well. It shall be installed vertically, an isolation adaptor shall also be used. The head shall be mounted at a suitable distance from the wet well wall to take into account the beam angle. A ratio of 10 to 1 for depth of well to wet well wall distance shall apply for a 12 degree beam angle, 20 to 1 for 5 degree beam angle.
- (b) Phase Failure Relay: suitable for the incoming REC supply + Neutral.
- (c) Telemetry Outstation: to be specified by the NWG IS Telemetry Engineer This equipment can be obtained from NWG.
- (d) Radio System: Radio and aerial to be specified by the NWG IS Telemetry Engineer.
- (e) Telemetry Ancillaries:

	Yuasa NP2.1Ahr - 12V
Mains Filter	MTL Telematic MA03
Lighting Protection Unit or similar	MTL Telematic MTL 376 (Where PSTN line is applicable)
Disconnect Terminals	Klippon SAKD 2.5/35 or Phoenix Polyamide UK3

The components in (c) and (d) may be purchased from NWG as part of the telemetry outstation.

7.0 ELECTRICITY SUPPLY

- 7.1 Where the REC intends to install an earth electrode, it shall be separated from the consumer's earth electrode by a distance not less than the effective length of the longest electrode.
- 7.2 The REC cut-out, metering equipment and earth terminal are to be mounted on a timber board located to the left hand side of the control panel. This equipment shall be located within the weatherproof housing.
- 7.3 Unless otherwise directed by the REC, the Contractor/Designer shall provide 25mm² phase and neutral conductor double insulated 'tails' to BS 6004. The earthing conductor shall be not less than 16mm². All conductors shall be adequately supported; where trunking is employed it shall not be metallic. Tail length shall not exceed 1.5m unless approved by the REC.
- 7.4 The Contractor/Designer shall record routing information and provide NWG with an as-installed record drawing.

8.0 EARTHING AND BONDING

8.1 Main Equipotential Bonding

An earthed equipotential zone is to be established which shall extend from the control panel weatherproof housing into the valve chamber and wet well. PVC

insulated, main bonding copper conductors of minimum size 16 mm² shall connect the following metallic parts to the Main Earth Terminal (MET) of the installation:

- (a) Any exposed metallic structural parts of the weatherproof housing.
- (b) Metallic sheath of the telecommunication cable, where provided, subject to consent by the PSTN service provider.
- (c) Radio mast, where provided as directed by NWG.
- (d) Pipework, guard-rails, and other metallic parts within the valve chamber and wet well.

8.2 Bonding within Valve Chamber and Wet Well

One main bonding conductor is to be installed into the valve chamber and wet well, and looped to the bonding points shown in the drawing in Appendix A8.3. The bonding conductor shall be continuous and not cut at each connection. All earth bonding in the valve chamber shall be terminated on to earth bar inside a GRP IP54 rated enclosure. All earth cables entering this junction box shall do so via suitable rated stuffing glands.

The surfaces of all bonding points are to be cleaned free from paint and other non-conducting material, and the surfaces coated with petroleum jelly. All connections shall be made using tinned compression lugs, Denso taped on completion to prevent corrosion and labelled as required by BS 7671.

8.3 Earth Electrode

An earth electrode shall be installed. Where the REC also installs an electrode, physical separation shall be as previously specified.

The electrode shall be of the rod type and shall be driven into the ground external to the weatherproof housing. Rods shall be copper skinned, 15 mm diameter, installed in 1.25 m lengths and fitted with hardened steel tips and driving caps.

The resistance of the electrode system shall not exceed 20 ohms. Additional electrodes are to be installed where this resistance cannot be achieved with a single electrode.

Earthing lead connection(s) shall be PVC copper conductor 16 mm² minimum routed in a 65 mm diameter duct. Each rod is to be provided with an inspection pit with removable cover.

The earth lead/rod connection is to be protected against corrosion and labelled as detailed above.

The electrode earthing conductor shall be connected to the earthing arrangement via a disconnectable test link.

8.4 Circuit Protective Conductors

The circuit protective conductor (CPC) arrangement shall be as detailed on the drawings. XLPE or PVC/SWA/PVC cables for pump motors shall incorporate an integral CPC core of identical size to the live cores; cable armour and braid is to be connected to the CPC.

8.5 Control Panel Earthing Arrangement

An earth bar shall be installed in the central cable way of the control panel. All circuit protective conductors, equipotential bonding conductors, gland plates and control panel bonds shall be connected to this earth bar. This earth bar shall be the MET for the installation and a 16 mm² main earthing conductor shall connect the MET to the earth terminal provided by the REC.

All connections to the earth bar shall employ compression lugs and be bolted.

9.0 CONTROL PANEL

General

- 9.1 The control panel shall conform to the arrangements specified in the accompanying drawings and schedules (Appendix A8.3), it shall also be in consultation with NWG's MCC Framework Supplier.
- 9.2 The control panel shall be a factory built assembly of bolted and welded construction, providing IP54 degree of protection to BS EN 60529. The specified assembly shall comply with BS EN 60439 and, except where otherwise provided for in the drawings, be of Form 4 construction, suitable for use with an electricity supply having the characteristics specified above, including a PSCC of up to 16 kA. Electrical components of the assembly shall comply with their relevant British Standard, including BS EN 60947.

Location and Construction

- 9.3 The control panel shall be a self-supporting, multi-section, floor fixed assembly providing front access. The assembly construction, floor fixings and component and wiring fixing arrangements shall not require access from the rear of the assembly.
- 9.4 Bottom cable entry into the cableway shall be provided for valve chamber/wet well cabling and a vermin board fitted on completion. Entry arrangements for other circuit cables shall be as detailed on the drawings.
- 9.5 The assembly shall be bolted to the concrete floor of the weatherproof housing, using a minimum of four fixings. The control panel shall be located to the right hand side of the timber board provided for the REC equipment. Clearance between the rear face of the control panel and the wall of the housing shall be a minimum of 50 mm.
- 9.6 Assembly frame, doors and panels are to be constructed from 2 mm zintec sheet steel. Doors and panels are to be single folded with welded corners. Component mounting plates and metallic gland plates are to be 3 mm sheet steel. The plinth, which is to be a minimum height of 100 mm, shall be constructed from 'C' channel and shall be hot dip galvanised to BS729.
- 9.7 The protective coating is to provide a minimum 20 year life expectancy. Exterior finish colour shall be BS 4800 reference 18 E 51, blue, semi-gloss. Internal component mounting plates shall be finished OO E 55, white, semi-gloss. The plinth shall be finished OO E 53, black, semi-gloss.
- 9.8 The gland plate within the central cableway for valve chamber/wet well cabling is to be located a minimum of 300 mm above floor level.

- 9.9 The central cableway shall be provided with two separate trunking arrangements, one for busbar cabling and one for other intercubicle wiring. All inter-section wiring is to be via insulated, grommetted holes.
- 9.10 The central cableway is to incorporate the earth bar and a support system for outgoing cables.

Additional Safety Requirements for Operation and Maintenance

- 9.11 Incoming supply and starter compartment fuse switches shall be suitable for acting as isolators for mechanical maintenance, and shall be capable of being padlocked in the OFF position.

A full spare set of fuses shall be provided by the developer on handover to NWG.
- 9.12 The OFF, ON and TEST positions of all isolating switches shall be clearly, permanently and unambiguously marked.
- 9.13 Except for the common controls/telemetry section, enclosure doors shall be mechanically interlocked by their functional unit isolating fuse switch. Interlock mechanisms which permit entry into a functional unit with the switch handle in the padlocked OFF state are not acceptable.
- 9.14 Isolating fuse switch assemblies for incoming supplies and starters are to employ a double contact action such that the fuses are fully isolated from live parts when the switch is OFF. The live terminals of fuse switches are to be shrouded to IP3X minimum.
- 9.15 The fixed assembly of a functional unit fuse switch shall provide clear, unambiguous indication of switch position.
- 9.16 In addition to handle padlocking, fuse switch assemblies for motor starters shall provide for a padlock to be attached directly to the fixed part of the fuse switch when in the OFF position.
- 9.17 Isolating devices mounted within the common controls/telemetry section are to be fully enclosed assemblies padlockable in the OFF position. The radio communications isolator, when required, is to be similarly equipped.
- 9.18 Except as required by 9.14, all terminals and fuses of fuse switch assemblies are to be equipped with insulating shrouds and terminal covers which provide, as a minimum, IP2X degree of protection. Live terminal shrouds shall be equipped with a warning label.
- 9.19 All parts of a functional unit which operate above 50 V shall provide IP2X protection as a minimum. Any component which provides IP2X protection from live parts by virtue of its construction is not required to be provided with an additional shroud. The requirement for IP2X shrouding shall also apply to functional units provided with a door interlocked isolating arrangement.
- 9.20 Terminals for 230/400 V conductors shall be segregated from terminals provided for extra low voltage conductors. Low voltage terminals shall be labelled and shrouded in accordance with the above.
- 9.21 One of the tee type handles for each functional unit door is to incorporate a barrel lock, keyed LF 92369. Doors shall be restrained in a minimum 90 degree open position with stays.

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- 9.22 Screw fixed Traffolyte or Reverse Screen Printed labels, incorporating black lettering on a white background, shall identify each internal and external component by reference and/or function, as appropriate, as detailed in the drawings. Labels shall not be fixed to removable components, e.g. removable junction box covers.
- 9.23 Danger and warning labels shall conform to the Safety Signs Regulations. Self-adhesive safety signs may be used.

Components

- 9.24 The 'Mains/Off/Generator' incoming supply fuse switch shall provide a positive mechanically interlocked 4-pole switching arrangement for each supply source. The operating handle, which shall be door interlocked, shall be coloured red and yellow. Electrical isolation of the complete installation shall be provided in the 'OFF' position. The assembly shall comply with BS EN 60947-3.
- 9.25 The standby generator intake arrangement shall incorporate a BS EN 60309-2, 5 pin appliance socket inlet providing IP 54 or greater degree of protection. The RCD for the standby supply circuit shall have a rated operating current of 300 mA with 100 mS time delay.
- 9.26 Individual radial circuits shall be employed between the busbar section and the functional units.
- 9.27 Starter fuse, contactor and overload combination shall be selected to provide Type 2 co-ordination to BS EN 60947-4. The selected thermal overload shall provide single phasing protection, hand/auto reset option (set to auto) and manual test facility. Starter RCD rated operating current shall be 30 mA instantaneous. The RCD shall be of a type suitable for 3-phase 3-wire use which does not require a neutral connection or an external resistor to permit testing of the assembly using its integral test push-button. Starters shall be rated for a minimum 15 starts per hour.
- 9.28 Where the pump or its motor incorporates additional protection or monitoring devices such as thermostat, moisture detection (seal failure) etc., these shall be incorporated into the standard installation of the station.
- 9.29 Indicating lamps, push-buttons and selector switches shall be of the 22mm diameter standard, colours shall be as detailed on the drawings. Indicating lamps shall be multicluster LED type.
- 9.30 Digital load monitoring unit shall measure the shaft power of the pump motor. This unit shall be mounted in such a way that it can be interrogated via the control panel compartment door while the pump is running.
- 9.31 An analogue Ammeter shall be installed on the control panel for each pump unit. Where Variable Speed Drives are installed, this removes the requirement for an Ammeter.

Internal Wiring

- 9.32 Wiring shall comply with BS7671. Conductors shall be copper and of not less than 1.0 mm² c.s.a. Details of power wiring are given in the drawings and schedules in Appendix A8.3.
- 9.33 Wiring shall be identified by colour code as follows:

- (a) Phase - Brown, Black, Grey according to phase
- (b) Neutral - Blue
- (c) Protective conductors – Green and Yellow
- (d) Power and control circuit conductors (excluding neutrals): 50V to 150V AC and DC - Red
- (e) ELV control and signal circuit conductors (excluding neutrals): < 50V AC and DC - Yellow
- (f) Telemetry - Pink
- (g) Intrinsically Safe Circuits - Light blue
- (h) Supply voltage independent circuits [see clause 9.34 below] - White

9.34 Supply voltage independent circuits are those not directly connected to a control circuit supply, and shall include the following:

- current transformer circuits
- instrument sensor to transmitter circuits (e.g. 3 or 4 wire RTDs) where screened cabling is not necessary
- motor thermistor circuits
- motor thermostat and seal leak circuits connected to multifunctional relays
- conductivity probe circuits

9.354 All wiring shall be ferruled, and each end numbered to correspond with the schematics. Cable numbers may be colour coded or black on white.

9.365 Wiring at terminal rails shall be fitted with compression connectors or terminal lugs according to terminal type.

9.376 Wiring shall be protected from sharp edges or abrasion, and shall be located clear of moving parts.

Telemetry Facility

9.387 The telemetry outstation and communications medium shall be defined by the NWG IS Telemetry Engineer.

9.38 Telemetry signals shall conform with (as a minimum) those specified in 'Telemetry Compile Sheet' (supporting document to E0702 in NWG SharePoint). Deviation from this signal set will require agreement with the NWG IS Telemetry Engineer.

9.39 The 'Wet Well Overflow Operating' alarm shall only be provided when directed by NWG.

9.40 The 'intruder' alarm shall be derived from proximity switches mounted on the doors of the weatherproof housing. The circuit shall be directly connected to the telemetry outstation.

10.0 LEVEL MONITORING SYSTEM

- 10.1 For wet well level monitoring and pump control purposes the installation shall incorporate an ultrasonic system, including transducer head IP66 rated, with potted cable RG 62 A/U (93ohm), and head mounting system and fixings. The length of potted cable shall be sufficient to allow direct connection into the common controls section of the control panel, without the need for an intermediate junction box within the valve chamber or wet well. The depth of the well shall determine the beam angle to be used. The Ultrasonics system shall be configured as follows:

Relay 1& 3: Set at Duty Level

Relay 2 : Set at Standby Level

Relay 1 & 2 : Programmed for Sequential Loop control (DE9)

Relay 3 : Programmed for pump control (DE8)

Relay 4 : Programmed for Wet Well High Level to Telemetry

Relay 5 : Programmed for Ultrasonics System Healthy

10.2 Monitoring of Emergency Overflow

Where directed by NWG a float switch, shall be installed in the wet well to provide a 'Wet Well Overflow Operating' alarm condition to the telemetry system. The float switch shall be arranged to operate at a water level indicative of the emergency overflow being in use.

- 10.3 Control philosophy for the pumping station requires; when the duty pump fails, the standby pump shall automatically activate as the duty pump.

11.0 CONTROL PANEL HOUSING

- 11.1 The control panel and REC equipment shall be located in a vandal resistant, weatherproof, ventilated housing of either brick or GRP construction. Where necessary under consultation with NWG a suitable steel kiosk may be used (kiosk construction details must be approved by NWG before manufacture may commence) a 'walk-in' type housing is preferred. The minimum acceptable standard of housing is shown in the drawings in Appendix A8.3
- 11.2 The housing shall not be located where it might be susceptible to flooding. The housing shall be suitably positioned in relation to the wet well, valve chamber and the vehicular access, the drawings in Appendix A1 show a typical site layout. The location shall take account of the need to offload and position a standby generator adjacent to the housing. Additionally, the access doors to the housing are to be positioned a minimum of two metres from any manhole provided with handrails and a minimum of three metres from any manhole not provided with handrails.
- 11.3 The housing shall be erected on a concrete plinth which is to extend 150 mm above the surrounding ground level. Where a GRP housing is used, its base shall be sealed with mastic to prevent the entry of water and vermin.

- 11.4 Cross ventilation of the housing is to be afforded by one high and one low level vermin and weatherproof grill, on opposite sides of the housing.
- 11.5 GRP housings, unless otherwise agreed by NWG, shall be constructed from high density chipboard, sandwiched between glass fibre laminate using fire-retardant resin class 1. The nominal thickness shall be 25 mm. The housing shall have a cast-iron finish and the colour shall be Spruce Green, reference 12-B-25 to BS 4800.
- 11.6 GRP housing doors shall be provided with stainless steel hinges. One door shall have stainless steel shot bolts at both the top and the bottom. The doors shall be fitted with two Abloy hasp and staple locks. Each door shall be provided with a stay to restrain it in the 90 degree position when open.
- 11.7 GRP housings shall provide IP55 degree of protection to the control panel and REC equipment.
- 11.8 In the case of a GRP housing, other facilities including a REC meter reading hatch and a standby generator cable access hatch shall be as detailed on the drawing in Appendix A8.3. The meter reading hatch shall open outwards and be secured by a rim latch equipped with a lock barrel provided by the REC.
- 11.9 Walk-in housings shall provide a minimum clear working distance of 750 mm between the front of the control panel and its facing wall.
- 11.10 Where a housing of brick construction is to be provided, a wall mounted REC meter cabinet shall be incorporated. The position of the cabinet shall be equivalent to the position shown occupied by the REC meters on the drawings in Appendix A8.3. The timber board arrangement shall be altered accordingly.
- 11.11 Brick housings shall incorporate outward opening door(s) generally to NWG standard detail SDD7/01 or approved equivalent manufacture, equipped with one Abloy lock and other furniture including mortise dog bolts, all as directed by NWG.
- 11.12 Walk-in housings shall be equipped with a BS EN 61111:2009 rubber insulating mat of 750mm minimum width extending the full length of the control panel and REC equipment.
- 11.13 A first-aid electric shock resuscitation notice shall be fixed within the housing interior.
- 11.14 One or more IP65 fluorescent light fittings shall be installed within the housing at roof level. In the case of a walk-in housing the switch shall be located adjacent to the housing door.
- 11.15 Suitable tubular heating shall be provided for the housing. One 60W heater is sufficient for road-side kiosks, however high rated heaters will be required for larger housings. Heaters shall be controlled via an adjustable thermostat allowing settings between 5°C and 25°C. The heater shall be set at 5°C unless otherwise specified.

12.0 CABLE DUCTS AND SEALING SYSTEM

- 12.1 Separate continuous underground ducts shall be installed for the services listed below. Ducts shall be laid a minimum of 450 mm below ground level. Typical minimum diameters are given below but these should be checked against the size

of the cable which is to be installed into the duct for ease of pulling, bending radius etc.

	Service	Dia (mm)	From	To
(a)	REC Supply Cable	100	Service Connection	Control Panel
(b)	PTSN (Telephone) Cable	65	Service Connection	Control Panel
(c)	Earth Electrode	65	Electrode Chamber	Control Panel
(d)	Pump Supplies, Level Control	100	Control Panel	Valve Chamber
(e)	Pump Supplies, Level Control	100	Valve Chamber	Wet Well

12.2 Directly buried cables are not permitted.

12.3 A draw cord shall be installed in each duct. In the case of the duct to the valve chamber an additional draw cord shall be pulled in during cable installation for future use. Draw cords shall not pass through duct sealing arrangements.

12.4 On completion of cable installation work, every duct end shall be sealed to provide a barrier against vermin, and to prevent the transmission of any gas or vapour which may arise.

The duct between the control panel and the valve chamber shall enter the chamber at right angles, and shall be sealed at the valve chamber using a Hawke, or equivalent, cable transit mechanical compression seal.

Effective sealing of all other ducts shall be carried out using Denso Mastic or other approved method. Polyurethane foam is not acceptable.

All ducts shall have joints which are of a water tight construction.

13.0 CABLING AND ANCILLARIES

13.1 Pump motor cables, for installation between the control panel and valve chamber junction boxes (JBs) shall be selected from the Schedule in Appendix A8.3, according to motor full load current and method of starting. However, the Schedule shall only be used where the maximum length of cable from the panel to each pump motor does not exceed 25 m.

13.2 The earthing conductor, for equipotential bonding purposes within the valve chamber and wet well, shall be 16 mm², installed and terminated in accordance with the 'Earthing and Bonding' sub-section.

13.3 The Ultrasonics level monitoring system transducer head cable shall be RG 62 A/U (93ohm), and of sufficient length to allow direct connection into the common controls section of the control panel.

13.4 Where required, the emergency overflow float switch cable shall be terminated at a JB in the valve chamber. A PVC/SWA/PVC cable shall be installed between this JB

and the control panel. Where necessary, to prevent mechanical damage within the wet well, the float switch cable shall be run in plastic conduit to a position adjacent to its mounting bracket. This conduit must not pass through the duct seal.

- 13.5 Cables within the valve chamber shall be installed on medium duty GRP or heavy duty PVC tray plate throughout the whole of their length. Pump motor flexible cables shall be suitably supported and protected from mechanical damage; these cables shall be cut to remove excessive spare length prior to termination at their JB.
- 13.6 Two all-insulated JBs shall be installed within the valve chamber for pump motor cable connection purposes. The size and arrangement of the JB shall permit bottom cable entry for all cables; top entry arrangements are not acceptable. JBs shall provide ingress protection to IP65 and shall be mounted in an accessible position, where they will not be exposed to mechanical damage or used as a foothold.
- 13.7 Each pump motor JB shall incorporate four or seven power terminals, as appropriate to starting method, for phase and earth connections. Additionally, four terminals, segregated from the power terminals, are to be provided for the termination of any unused connections in the motor flexible cable (e.g. thermostat, seal fail). Power terminals shall be shrouded to IP2X minimum.
- 13.8 the removable cover of each motor JB shall be equipped with a '400 V' self-adhesive warning label. Each JB shall be identified with a screw fixed white on black on white flexible 1.5mm thick label fixed to the wall directly above the JB.
- 13.9 All connections within a JB shall be identified according to the drawings using cable numbers, and shall be fitted with suitable compression connectors or terminal lugs.
- 13.10 Cable glands shall be of the brass connection pattern, incorporate seals to IP65 and shall be protected by an overall plastic sleeve. This sleeve shall not be of heat-shrink type. For armoured cables, earth continuity shall be afforded through the use of an armour clamp, brass earthing tag and connector. Within pump motor JBs, cable armour and, where appropriate, cable braid shall be interconnected and connected to the CPC cores of the cable.

14.0 INSPECTION AND TESTING

- 14.1 The Contractor/Designer shall give one month's written notice to NWG of the commencement date, and anticipated duration, of each of the activities listed below:
 - (a) Commencement of electrical installation work on site.
 - (b) Inspection and testing of the control panel at the manufacturer's works.
 - (c) Installation of telemetry/communications equipment, where this equipment is to be installed or commissioned at site by NWG.
 - (d) Acceptance testing and setting to work of the telemetry and communications system by NWG.
 - (e) Inspection and testing of the completed electrical installation.

- (f) Commissioning of the installation
- 14.2 NWG will confirm with the Contractor/Designer their intention or otherwise to attend, inspect or witness any or all of the activities listed above. Non-attendance by NWG shall not relieve the Contractor/Designer of any obligation to satisfactorily carry out that inspection, test or commissioning activity.
- 14.3 The Contractor/Designer shall allow NWG access to the site at all reasonable times for the purpose of ensuring compliance with the specifications.
- 14.4 Methods and procedures adopted for inspection and testing shall be appropriate for the particular activity and prevailing environmental conditions.
- Inspecting and testing shall be carried out by persons having the necessary skills and experience to avoid danger to themselves and others, and to prevent damage to equipment and property.
- Test equipment shall be suitable for the particular test activity, have current calibration status, and be maintained in a safe condition.
- Inspection, testing and the preparation and issue of the Completion Certificate including Schedule of Test Results, shall conform with the requirements of Part 6 of BS 7671 (IEE Wiring Regulations) and IEE Guidance Note No 3 (as amended) 'Inspection and Testing'.
- 14.5 The control panel shall be inspected and tested before despatch from the manufacturer's works. Inspection and testing shall include:
- (a) Inspection of all wiring, connections and security of component mounting arrangements
 - (b) Effectiveness of mechanical actuating elements, interlocks and locking arrangements
 - (c) Visual inspection to ensure the prescribed degree of protection, shrouding arrangements and clearance distances etc.
 - (d) Marking and conformity of the assembly to the drawings and schedules
 - (e) Dielectric test(s) between live parts and the assembly frame
 - (f) Protective measures with regard to protection against direct and indirect contact
 - (g) Effectiveness of protective conductors, including continuity
 - (h) RCD testing, trip current and time
 - (i) Tests to satisfactorily demonstrate the full and correct operation of all components, systems and sequences. Tests shall be performed with the level monitoring system(s) temporarily connected to the system; the relays of the Ultrasonic system shall be configured as specified in the 'Level Monitoring' section. Interfacing with the telemetry facility shall be proved up to the telemetry system terminal rail.
- The control panel manufacturer shall provide a certificate of inspection and test which shall detail the activities undertaken and the test results.
- 14.6 During construction and/or on completion, the complete installation shall be verified through inspection and testing to Part 6 of BS 7671. The relevant sections

of the NICEIC Completion and Inspection Certificate including the Schedule of Test Results, plus the P.I.T. test sheets shall all be completed at the time of inspection and test.

Testing activities shall include:

- (a) Detailed inspection as required by BS 7671. The inspection shall determine that the equipment complies with Section 511 of BS 7671, that the equipment has been correctly selected and installed, and that any equipment which is damaged or otherwise defective is identified and replaced.
- (b) Testing of the installation including:
 - (i) Continuity of Conductors
 - earthing conductors
 - main bonding conductors
 - supplementary bonding conductors
 - radial circuit protective conductors
 - (ii) Insulation Resistance
 - (iii) Polarity
 - (iv) Earth Electrode Resistance
 - (v) Earth Fault Loop Impedance
 - (vi) Operation of RCDs trip current and time
 - (vii) Testing of pump motor circuits including earthing shall not necessitate the opening of the cable entry/motor terminal box at the pumpset. Earth fault loop impedance (EFLI) testing of a pump motor circuit shall comprise an EFLI test of the pumpset cable circuit up to the JB within the valve chamber, and an assessment of the $R1 + R2$ resistance of the integral pumpset cable, based on information provided by the pump supplier. Continuity of the pumpset CPC between the valve chamber JB and the exposed conductive parts of the pumpset shall be confirmed by test; this test shall also be used to validate the assessed $R2$ value.

14.7 Details of each circuit, its composition and relevant test results shall be entered on the Schedule of Test Results section of the Completion Certificate. The schedule shall include the following circuits:

230/400V ac circuits:

- (a) REC supply 'tails'
- (b) Incoming supply circuit to control panel Distribution Block 1
- (c) Standby generator circuit to control panel Distribution Block 1 including RCD
- (d) Pump 1 circuit including RCD and size and composition of integral pumpset cable.
- (e) Pump 2, as (d) above
- (f) Heating circuit

- (g) Lighting circuit
- (h) Telemetry section internal socket outlet and RCD
- (i) Common controls supply circuit including RCD
- (j) Telemetry outstation and communications supply circuit including RCD

110V ac (55V-C-55V) circuit:

- (k) BS EN 60309-2 socket outlet including RCD

14.8 Following the configuration of the level monitoring system(s) the complete installation shall be tested to prove the satisfactory operation of all components, systems and sequences. The telemetry signals detailed in F9.37 shall be tested up to the outstation for continuity and functionality.

14.9 Conclusive tests shall be undertaken to prove that:

- (a) Starter Pump 1 is connected to Junction Box 'Pump 1' within the valve chamber, and
- (b) Pump 1 is connected to Junction Box 'Pump 1'

Tests shall be repeated for the Pump 2 configuration. Labelling and cable numbering etc. shall be checked for correctness.

14.10 The direction of rotation of pump impellers shall be checked in conjunction with the pump supplier.

14.11 After completion of the installation, and following receipt by NWG of satisfactory 'as-constructed' record documentation, NWG will formally inspect the installation for adoption or take-over purposes. The electrical Contractor(s) shall be present during this inspection to satisfactorily demonstrate the operation of the complete system and to undertake such additional demonstrations and/or tests as directed by NWG.

Where NWG determines that the BS 7671 Completion and Inspection Certificate or other record documentation is incomplete or incorrect, or where a non-conformance with BS 7671 is identified, the Designer and Contractor will be informed accordingly. Thereafter, a formal inspection will not be undertaken until:

- (a) Matters are resolved to the satisfaction of NWG who shall be informed of the remedial action(s) taken to resolve those matters, and
- (b) Correct record documentation has been submitted to NWG

Remedial work to the installation, as determined and directed by NWG, shall be carried out.

14.12 Where the installation is over three years old (from the date of connection to the electricity supply) an additional BS 7671 Periodic Inspection and Test shall be undertaken by a NICEIC - approved contractor. Documentation in the form prescribed in BS 7671 plus NWG P.I.T. test sheets shall be completed and submitted to NWG.

15.0 DRAWINGS AND SCHEDULES

Appendix A8.3 contains the detailed electrical design, including schematics, parts lists, schedules, GA's and panel construction details.

The design shall be only used when all the criteria in the sub-section 'Application of Standard Installation' are satisfied.

a) **Site Specific Designs**

Modifications must be made to the supplied design to make it site specific. There are a number of variations which must be considered and the appropriate drawings selected as detailed in Appendix A.8.3.

15.2 **Drawing Amendment**

The schematics, schedules and parts lists will require amending by the Designer, so as to be site specific.

In particular, for **schematic** drawings, the following require detailing:

- Fuse Sizes
- MCB Values
- RCD Values
- Overload Setting (Range)
- Motor Full Load Current and kW Ratings
- Timer Settings
- Cable Sizes
- Emergency Overflow Float switch (if fitted)

For **Parts Lists and Cable Schedules** all site specific components and cables must be detailed. Items or cables that are not used shall be deleted. A site specific drawing register must also be created.

15.3 **Drawings to be returned to NWG**

The following "as built" drawings are to be included with the O & M Manuals along with an AutoCAD release 14 disk copy:

- All schematic drawings, with the exception of those that are not applicable, as detailed above
- All constant and variable parts lists
- Site specific drawing register
- Control panel General Arrangement
- Cable block diagram
- Site specific kiosk details
- Cable schedule

15.4 **Format**

Each drawing must detail the following:

- Site name
- Contractor name
- Amendment record
- Title
- Approvals box
- Drawing number -**the three figure suffix (e.g. 305) must be retained.** The Contractor may alter the prefix.
- A reference to note that the design is based on Northumbrian Water standard E0702 drawings.

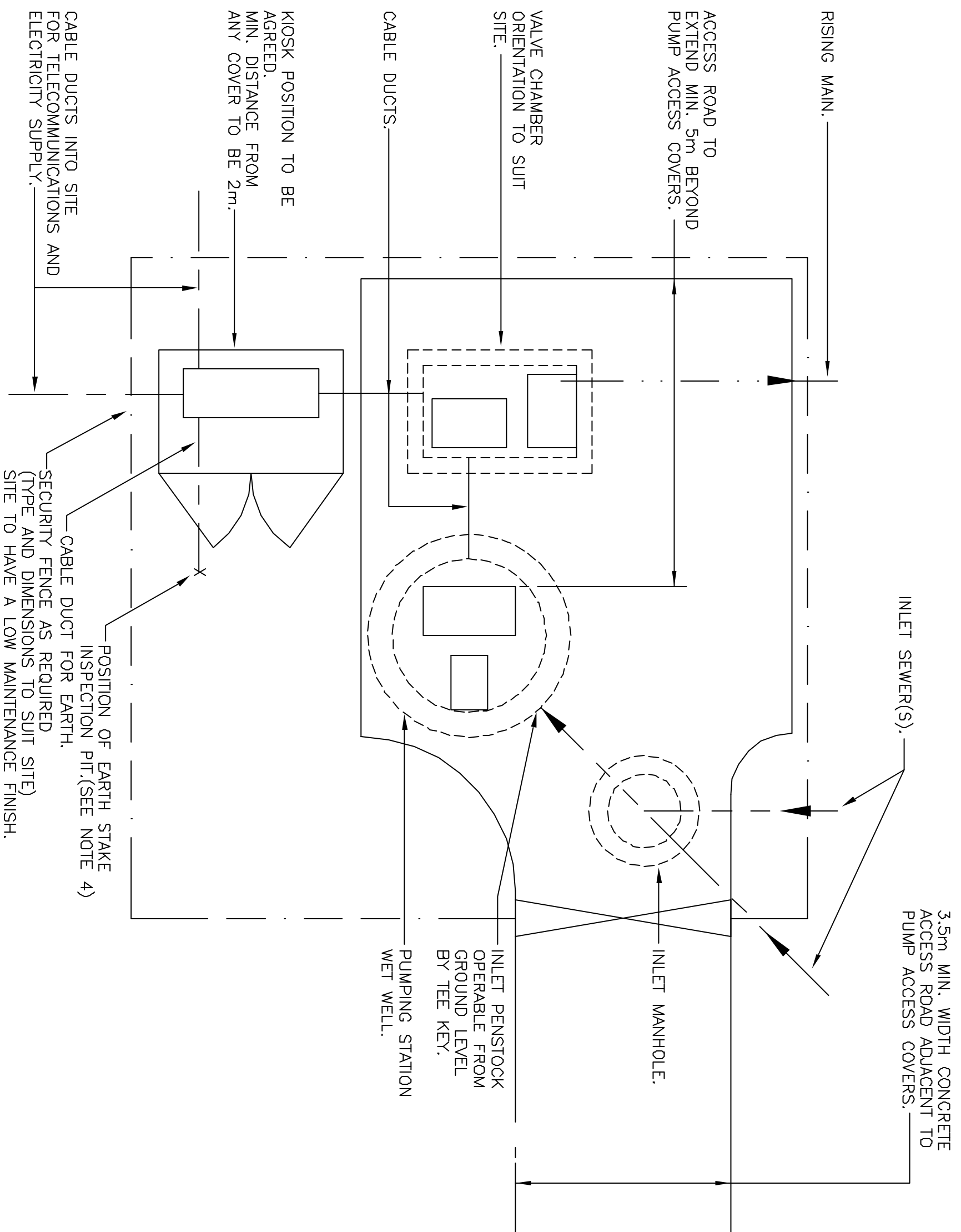
The box to the left of the Amendment box on the drawings may be used for the above purposes. It is not necessary to retain the 'Northumbrian Water' title.

UNCONTROLLED UNLESS VIEWED ON NWG SHAREPOINT

APPENDICES

A1 TWO PUMP SUBMERSIBLE PUMPING STATION DRAWINGS

Drawing Number	Title	Issue
E0702/501	Diagrammatic Site Layout	P3 7/6/95
E0702/503	Plan of Valve Chamber and Wet Well	P1 5/5/95
E0702/504	Elevation of Valve Chamber and Wet Well	P1 5/5/95
E0702/505	Valve Chamber Alternative Arrangement	P1 5/5/95
E0702/506	Inlet Baffle and Emergency Overflow Details	P1 5/5/95
E0702/507	Ultrasonic Sensor Mounting Arrangement	P2 17/5/95



NOTES

GUIDANCE NOTES:

1. THE ARRANGEMENTS SHOWN ARE SUITABLE FOR RISING MAINS NOT EXCEEDING 150mm DIA.
2. THIS DRAWING SHOWS THE PREFERRED LAYOUT. ACTUAL ARRANGEMENTS SHALL BE DISCUSSED WITH N.W.L. SUITABLE VEHICULAR ACCESS MUST BE PROVIDED TO THE SITE.
3. 1m PAVED WORKING SPACE IS TO BE PROVIDED AT THE FRONT OF THE KIOSK. THE KIOSK IS TO BE A MINIMUM OF 1m FROM THE SECURITY FENCE.
4. EARTH STAKE TO BE INTO UNDISTURBED GROUND.

PREVIOUS ISSUE P3 7/6/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08 2000	OVERFLOW PIPEWORK AND CHAMBER REMOVED.	DO	EP	DG

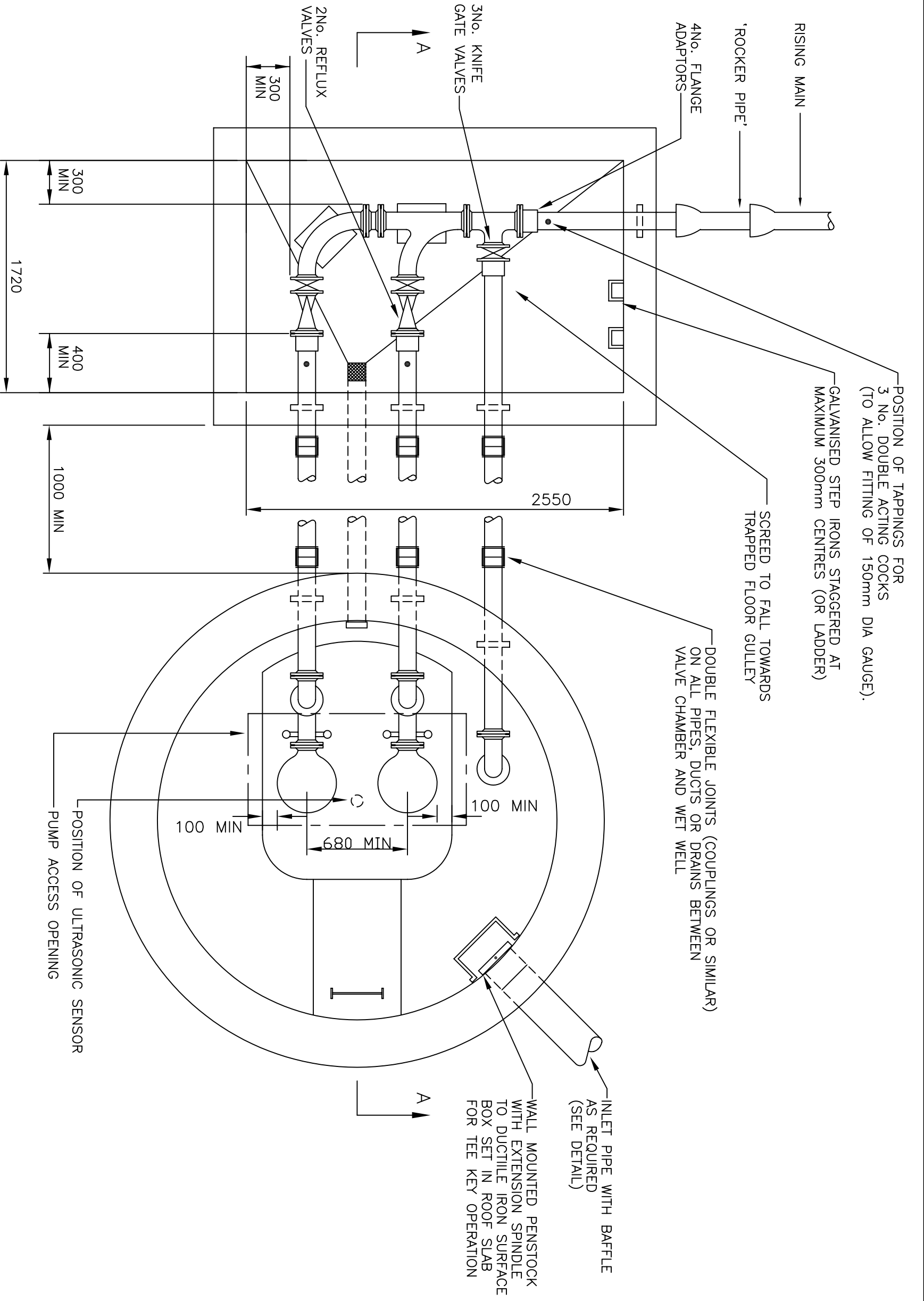
TITLE:
TWO PUMP SUBMERSIBLE PUMPING STATION. DIAGRAMMATIC SITE LAYOUT.

DATE: MAY '95 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD
Serving the North East

STANDARD DETAIL No.: E0702/501



PLAN - VALVE CHAMBER AND WET WELL

NOTES

GUIDANCE NOTES:

1. THE ARRANGEMENTS SHOWN ARE SUITABLE FOR RISING MAINS NOT EXCEEDING 150mm DIA.
2. FOR VALVE CHAMBER ALTERNATIVE ARRANGEMENT REFER TO DWG.

SPECIFICATION NOTES:

1. ELECTRICAL AND MECHANICAL INSTALLATION TO BE TO N.W.L. SPECIFICATION AND SHALL BE DISCUSSED WITH N.W.L.
2. HAZARDOUS AREA CLASSIFICATION TO BE DISCUSSED AT DESIGN STAGE WITH N.W.L.
3. BOX OUTS SHALL BE PROVIDED THROUGH WALLS FOR PUMP STATION PIPEWORK AND SHALL BE DESIGNED FOR THE THRUSTS INVOLVED.

PREVIOUS ISSUE P1 5/5/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08 2000	OVERFLOW PIPEWORK REMOVED.	DO	EP	DG

TITLE:
TWO PUMP SUBMERSIBLE PUMPING STATION.
PLAN OF VALVE CHAMBER AND WET WELL.

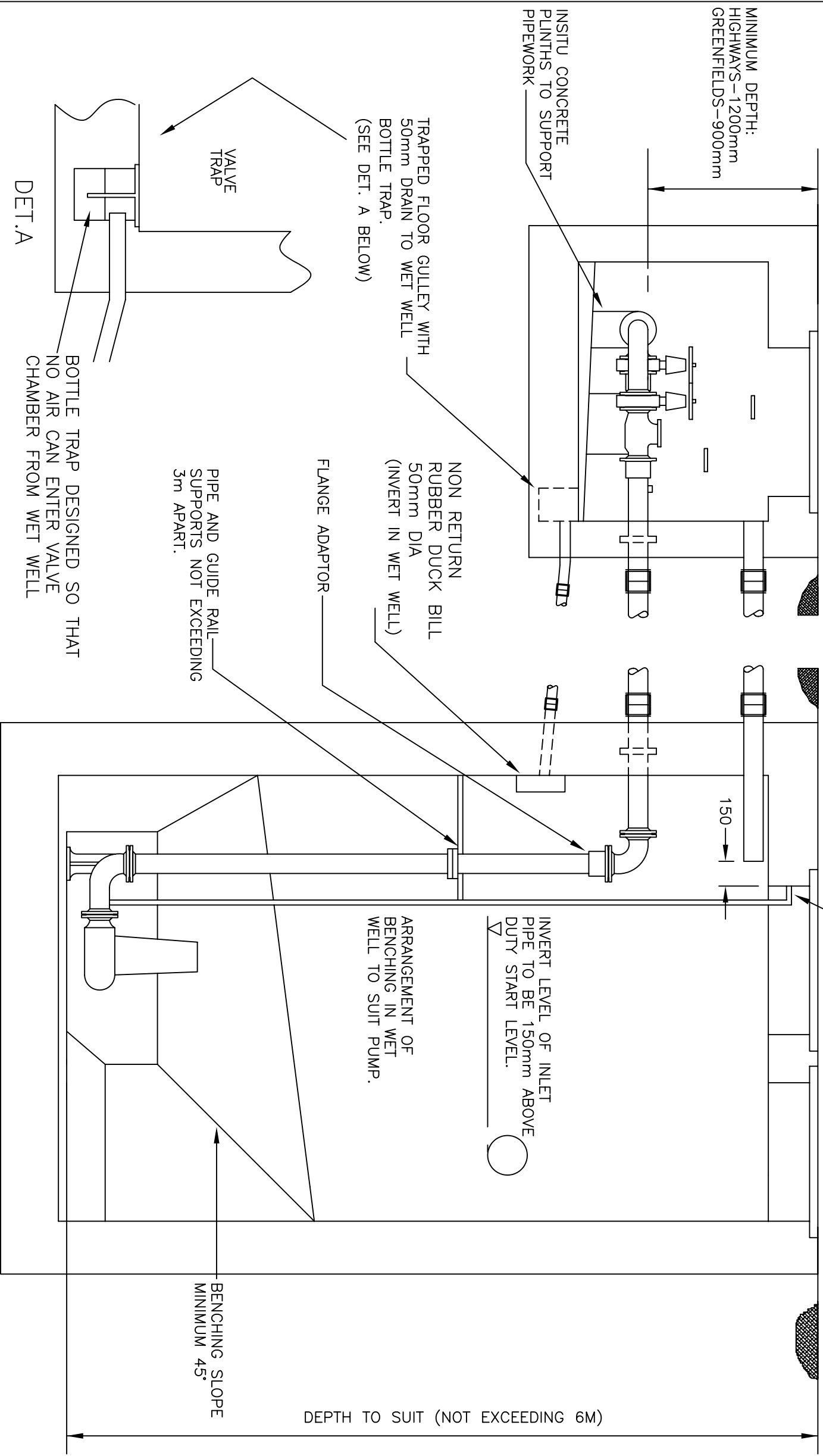
DATE: MAY '95 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD

Serving the North East

STANDARD DETAIL No.: E0702/503



SECTION 'A-A' ELEVATION - VALVE CHAMBER AND WET WELL

NOTES

GUIDANCE NOTES:

1. THE ARRANGEMENTS SHOWN ARE SUITABLE FOR RISING MAINS NOT EXCEEDING 150mm DIA.
2. VALVE CHAMBERS 2m OR MORE DEEP REQUIRE SECURE FENCING AROUND PLANT ACCESS OPENINGS (e.g. PERMANENTLY FIXED HAND-RAIL AND TOE PLATE).

SPECIFICATION NOTES:

1. ELECTRICAL AND MECHANICAL INSTALLATION TO BE TO N.W.L. SPECIFICATION AND SHALL BE DISCUSSED WITH N.W.L.
2. HAZARDOUS AREA CLASSIFICATION TO BE DISCUSSED AT DESIGN STAGE WITH N.W.L.
3. BOX OUTS SHALL BE PROVIDED THROUGH WALLS FOR PUMP STATION PIPEWORK AND SHALL BE DESIGNED FOR THE THRUSTS INVOLVED.
4. BENCHING IN WET WELL TO BE FORMED AFTER INSTALLATION OF PUMPS AND PIPEWORK.

PREVIOUS ISSUE P1 5/5/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08	LADDER REMOVED.	DO	EP	DG
	2000	100NB DRAIN MODIFIED TO 50NB.			

TITLE:
TWO PUMP SUBMERSIBLE PUMPING STATION. ELEVATION VALVE CHAMBER AND WET WELL.

DATE: MAY '95 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD
Serving the North East

STANDARD DETAIL No.: E0702/504

NOTES

GUIDANCE NOTES:

1. THE ARRANGEMENTS SHOWN ARE SUITABLE FOR RISING MAINS NOT EXCEEDING 150mm DIA.
2. VALVE CHAMBERS 2m OR MORE DEEP REQUIRE SECURE FENCING AROUND PLANT ACCESS OPENING (e.g. PERMANENTLY FIXED HAND-RAIL AND TOE PLATE).

SPECIFICATION NOTES:

1. ELECTRICAL AND MECHANICAL INSTALLATION TO BE TO N.W.L. SPECIFICATION AND SHALL BE DISCUSSED WITH N.W.L.
2. HAZARDOUS AREA CLASSIFICATION TO BE DISCUSSED AT DESIGN STAGE WITH N.W.L.
3. BOX OUTS SHALL BE PROVIDED THROUGH WALLS FOR PUMP STATION PIPEWORK AND SHALL BE DESIGNED FOR THE THRUSTS INVOLVED.

PREVIOUS ISSUE P1 5/5/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08	2000	DO	EP	DG

TITLE:
TWO PUMP SUBMERSIBLE
PUMPING STATION.
VALVE CHAMBER
ALTERNATIVE ARRANGEMENT

DATE: MAY '95

SCALE: N.T.S.

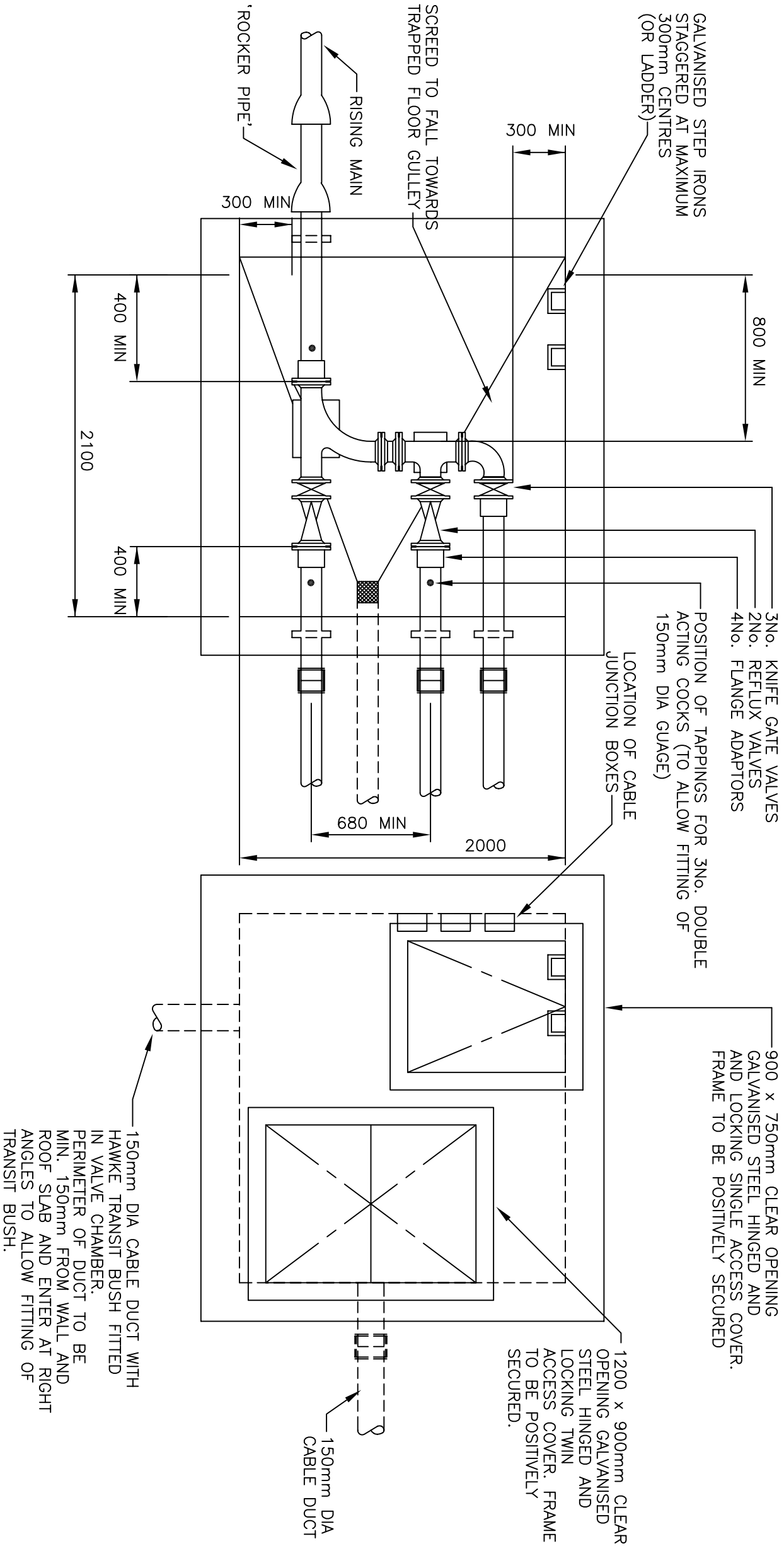


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STANDARD DETAIL No.: E0702/505

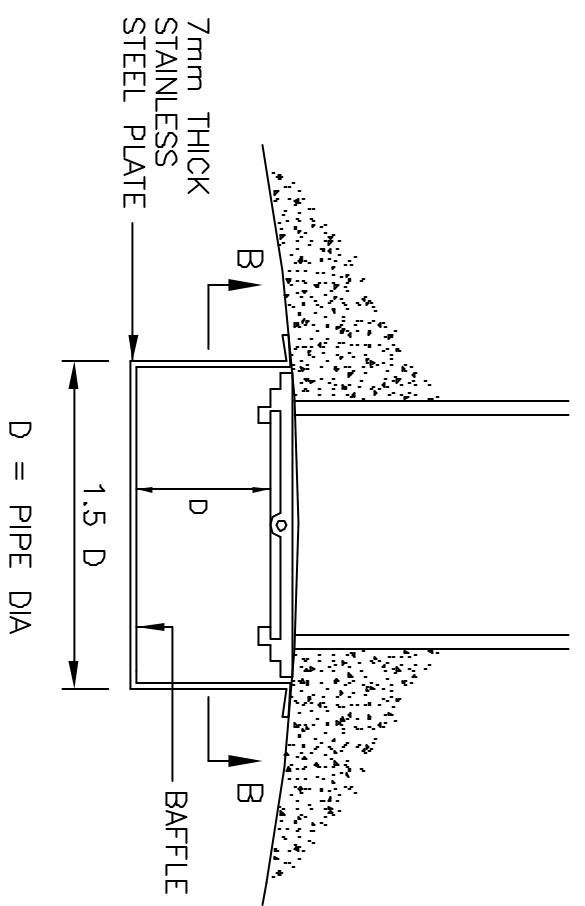
PLAN - VALVE CHAMBER

PLAN - ROOF SLAB

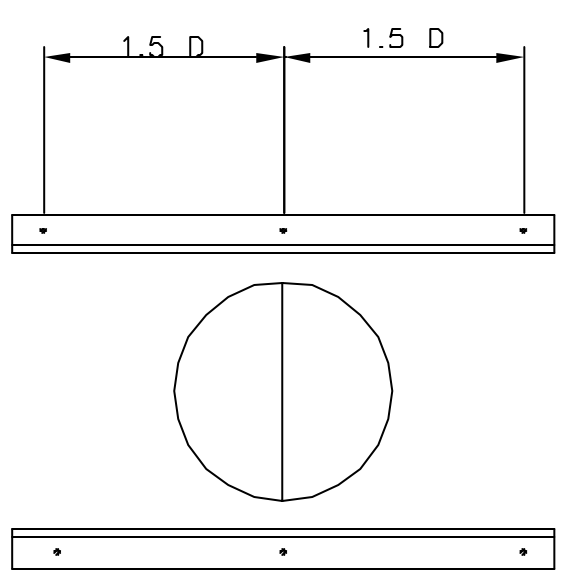


PLAN - VALVE CHAMBER

PLAN - ROOF SLAB

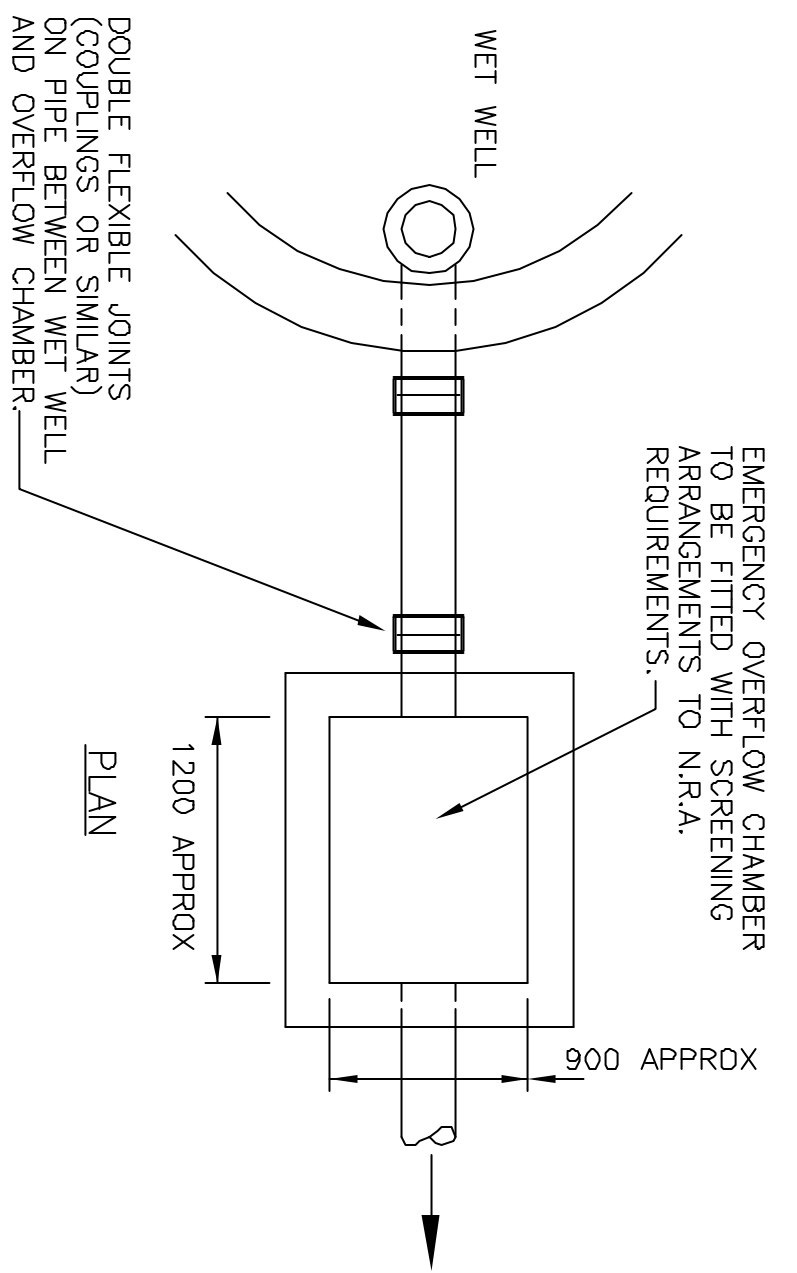


PLAN

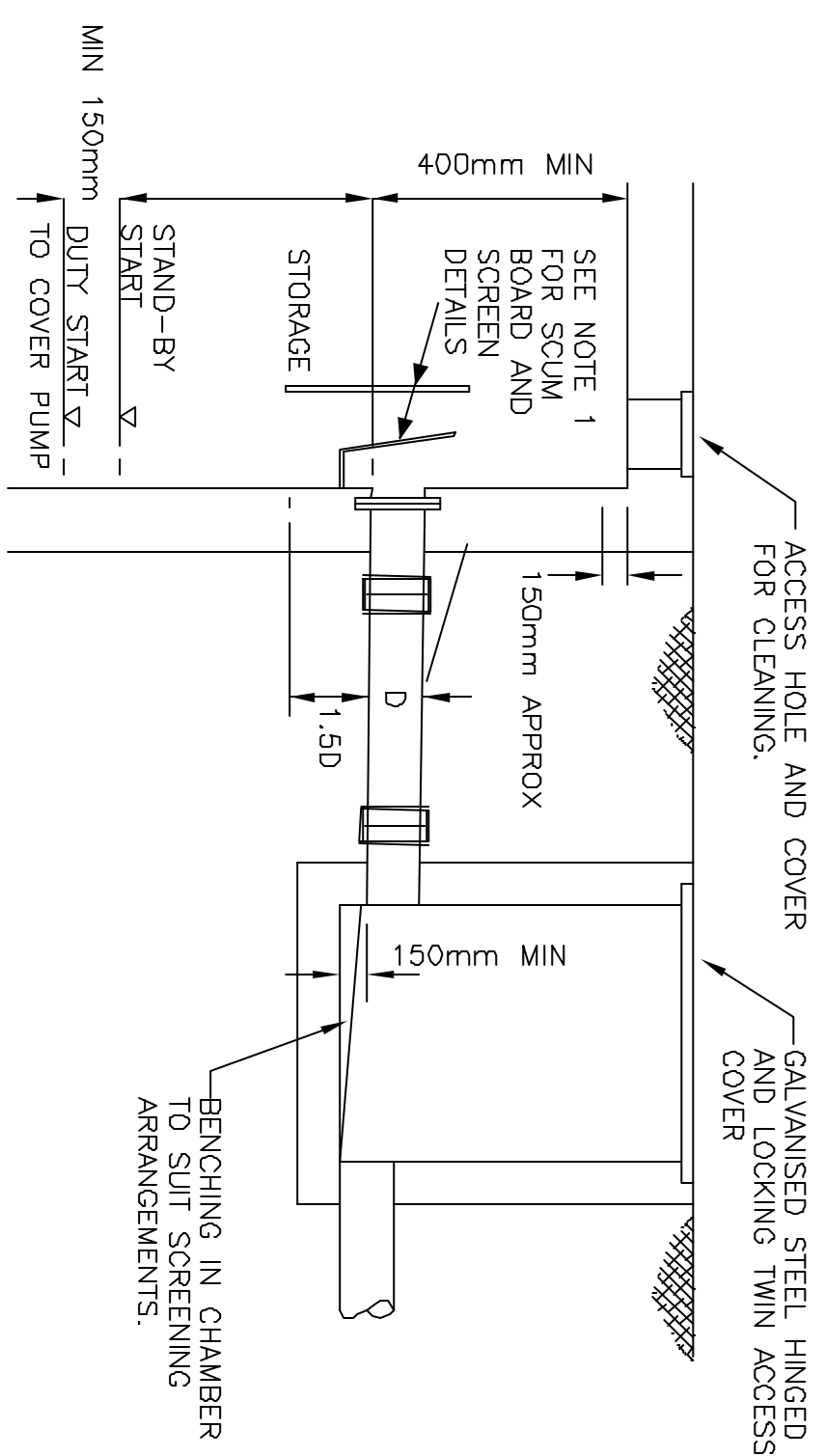


ELEVATION B-B

INLET BAFFLE DETAIL



PLAN



SECTION

EMERGENCY OVERFLOW DETAIL SHOULD CONSENT BE GIVEN

NOTES

GUIDANCE NOTES:

SHOULD CONSENT BE GIVEN A SCUM BOARD AND SCREEN SHALL BE FITTED TO THE OVERFLOW. THE SCUM BOARD SHALL BE SIMILAR IN CONSTRUCTION TO THE BAFFLE PLATE. THE SCREEN SHALL BE MADE OF HOT DIP GALVANISED STEEL BARS TO BS729 HAVING A 5mm GAP BETWEEN THE BARS TO ALLOW EFFLUENT NOT SOLIDS TO OVERFLOW.

SPECIFICATION NOTES:

1. STAINLESS STEEL SHALL BE GRADE 316S31.

PREVIOUS ISSUE P1 5/5/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08	OVERFLOW	DD		
	2000	DETAIL No. REVISED.			

TITLE:
TWO PUMP SUBMERSIBLE PUMPING STATION.
INLET BAFFLE AND EMERGENCY OVERFLOW DETAILS

DATE: MAY '95 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD
Serving the North East

STANDARD DETAIL No.: E0702/506

NOTES

GUIDANCE NOTES:

1. ULTRASONIC SENSOR MOUNTING ARRANGEMENT IS TO BE DESIGNED SO THAT SENSOR CAN BE ACCESSED AND REMOVED FROM GROUND LEVEL.
2. MOUNTING BRACKET TO BE GALVANISED STEEL. HANGER TO BE PLASTIC CONDUIT.

PREVIOUS ISSUE P2 17/5/95

REV	DATE	REVISIONS	DWN	CHK	APP
1	01-08 2000	MOUNTING OF SENSOR NOTE ADDED AND DRAWING NO CHANGED	DO	EP	DG

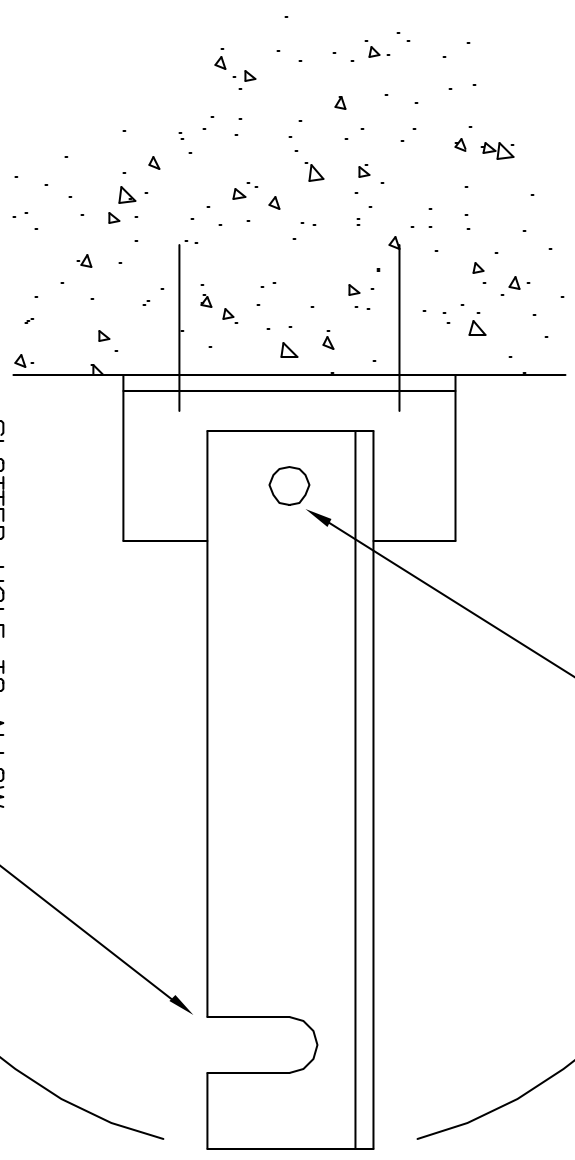
THE ULTRASONICS SENSOR HEAD SHALL BE MOUNTED AT A SUITABLE DISTANCE FROM THE WET WELL WALL TO TAKE INTO ACCOUNT THE BEAM ANGLE OF THE SENSOR. A RATIO OF 10 TO 1 OF DEPTH TO DISTANCE FROM THE WET WELL WALL SHALL BE USED FOR A 12 DEGREE BEAM, AND 20 TO 1 FOR A 5 DEGREE BEAM.

IN ADDITION A PLUMB-LINE SHALL BE USED TO DETERMINE THE FINAL FIXING POSITION TO ENSURE THE SENSOR DOES NOT PICK UP ANY INTERFERENCE FROM PIPEWORK, AND PUMPS ETC LOCATED INSIDE THE WET WELL.

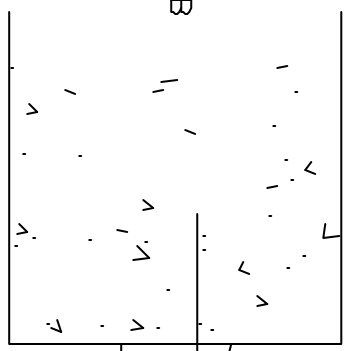
PIVOT PIN TO ALLOW SENSOR TO BE SWUNG BACK TO EDGE OF OPENING SO AS TO ALLOW ACCESS AND REMOVAL FROM GROUND LEVEL.

SLOTTED HOLE TO ALLOW REMOVAL OF ULTRASONIC SENSOR AND HANGER

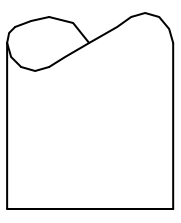
PLAN



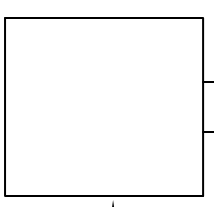
ROOF SLAB



CABLE DUCT



ELEVATION



HANGER

ULTRASONIC SENSOR

TITLE:
TWO PUMP SUBMERSIBLE
PUMPING STATION.
ULTRASONIC SENSOR
MOUNTING ARRANGEMENTS
DATE: MAY '95 SCALE: N.T.S.



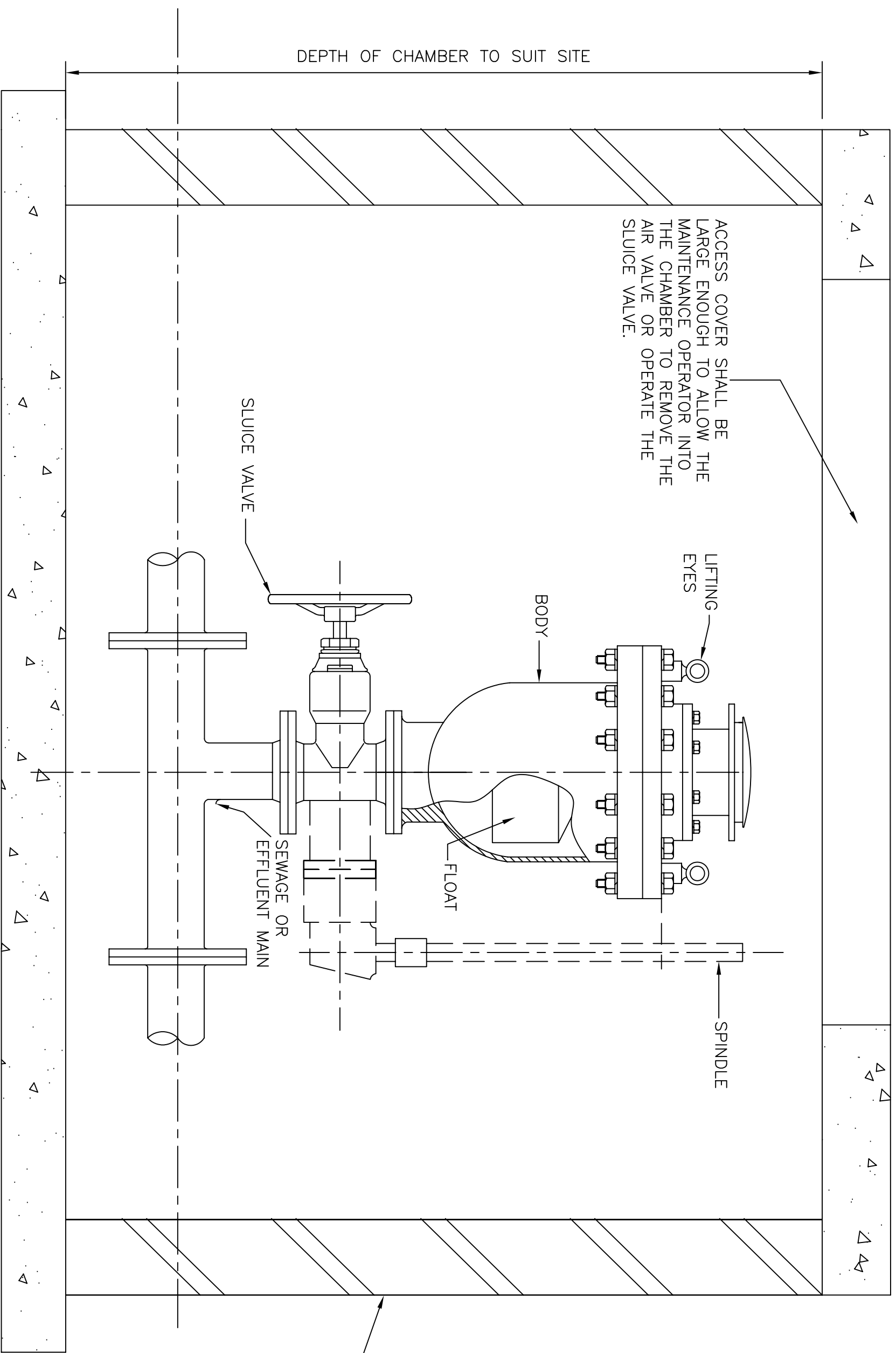
**NORTHUMBRIAN
WATER LTD**
Serving the North East

STANDARD DETAIL No.: E0702/507

A2 NWG STANDARD DETAIL DRAWINGS

Drawing Number	Title	Issue
E0702/600	Air Valve Chamber Type A	April 1995
E0702/601	Washout Chamber Type C	April 1995
E0702/602	Fencing Type F	April 1995
E0702/603	Gate Type 2	April 1995
E0702/604	Typical Submersible Pumping Station Access Cover	April 1995

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Note

- 1) DRAWING IS NOT TO SCALE.
- 2) THE ILLUSTRATION SHOWS THE AIR VALVE WITH AN ISOLATING SLUDGE VALVE WITH HANDWHEEL.
- 3) ALTERNATIVELY THE ISOLATING SLUDGE VALVE CAN BE PROVIDED WITH MITRE GEARS AND AN EXTENSION SPINDLE AS SHOW DOTTED.
- 4) THERE SHOULD BE ENOUGH WORKING SPACE AROUND THE AIR VALVE TO CARRY OUT MAINTENANCE AND REMOVAL OF THE VALVE.

CLASS B ENGINEERING BRICKWORK 215mm THICK IN ENGLISH BOND BEDDED ON CLASS M1 MOTAR.

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE: 01/08/00

DIMENSIONS REMOVED AND STANDARD EQUAL TEE ADDED

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

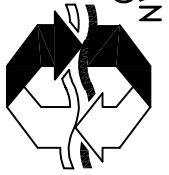
Project: SEWAGE PUMPING STATIONS

DRAWING TITLE: TYPICAL AIR VALVE DETAIL (DEPENDS ON TYPE OF VALVE)

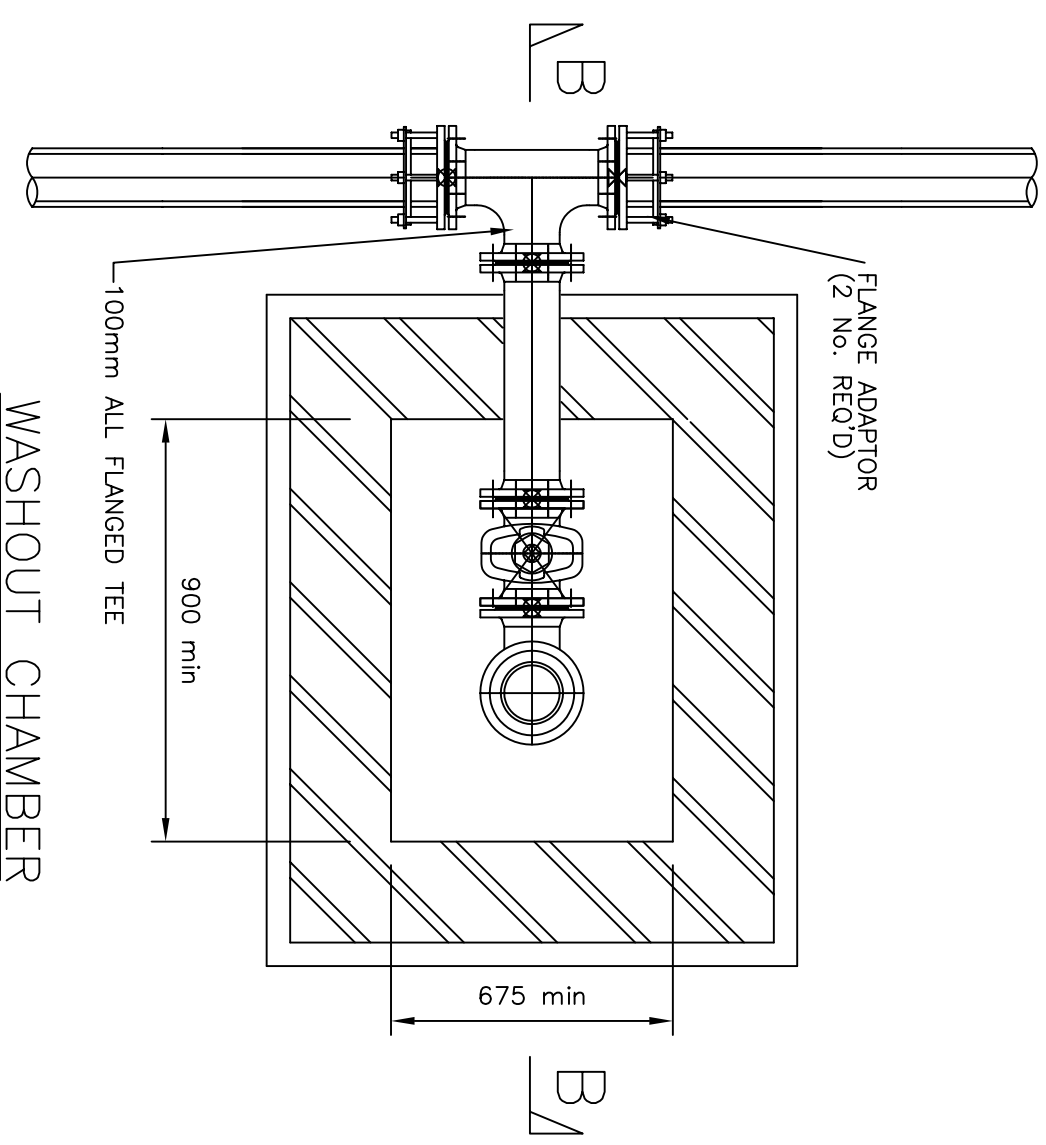
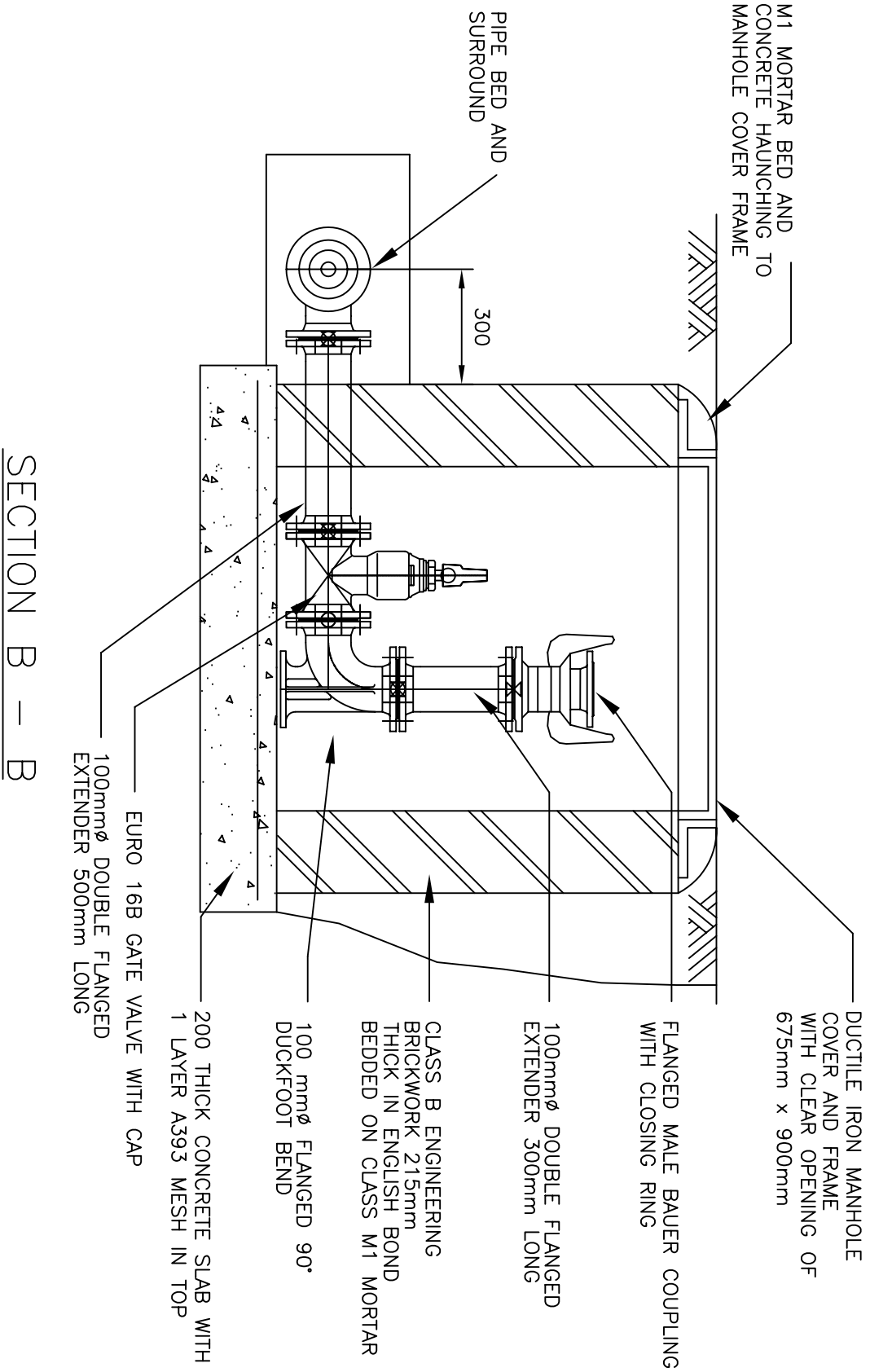
DRAWING No: E0702/ 600

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
ELEVATIONS REMOVED AND MIN DIMENSIONS ADDED.							

PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: WASHOUT CHAMBER GENERAL ARRANGMENT

DRAWING No: E0702 / 601

SHEET: 1 OF 1

DATE: 01/08/00

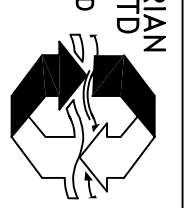
REV: 01

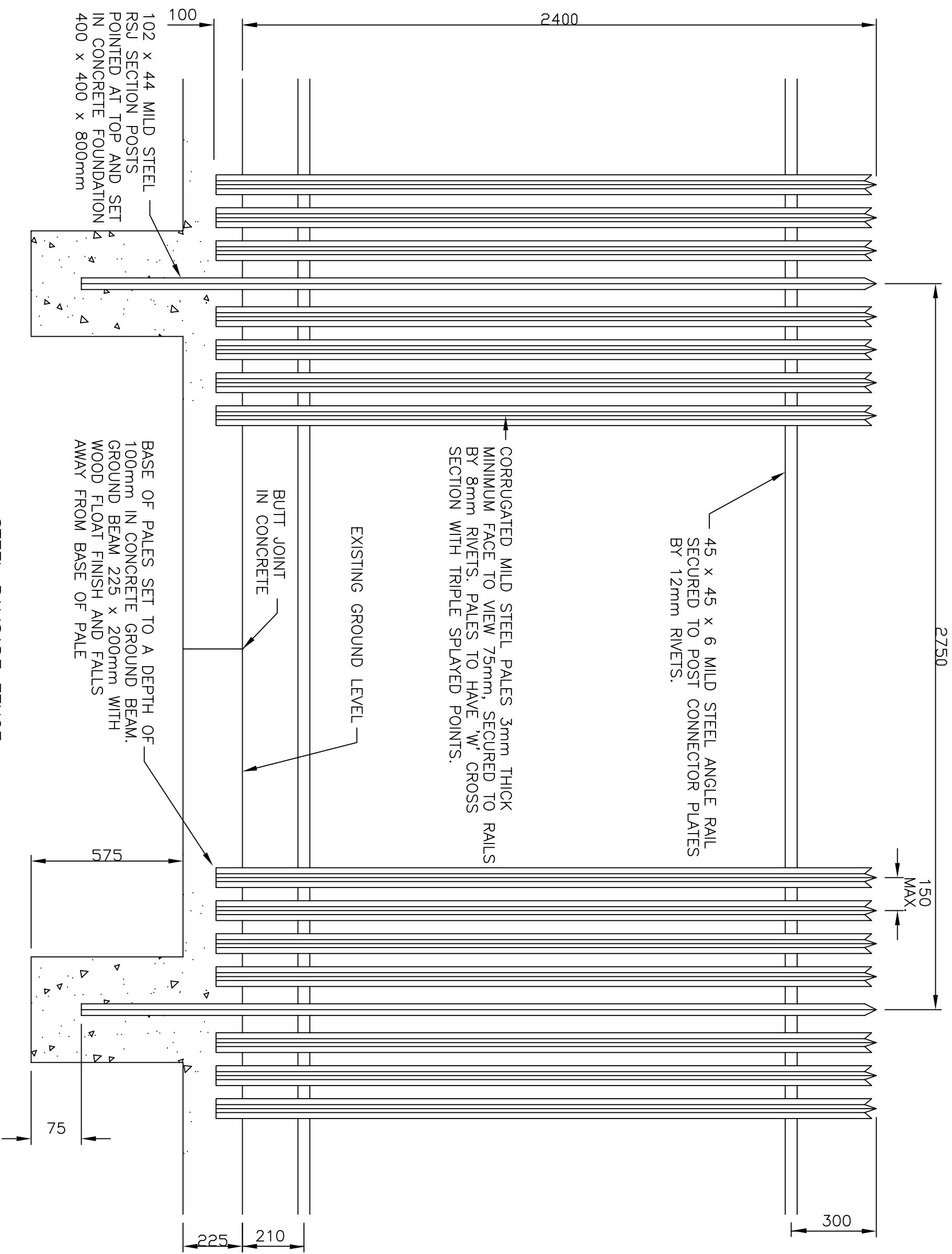
DRN: DO

CHD: DG

APP: DG

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ





NOTES

1. ALL RIVETS TO BE HOT DIP SPUN GALVANISED TO B.S. 729.
2. STEEL MEMBERS TO BE STRUCTURAL STEEL AND TO COMPLY WITH THE RELEVANT CESWI CLAUSE.
3. CONCRETE GROUND BEAM SHALL INCORPORATE A BUTT JOINT BETWEEN POSTS AND AT MAXIMUM 2.75mm CENTRES. BUTT JOINT SHALL CONSIST OF 25mm THICK PERFORMED JOINT FILLER WITH JOINT SEALANT TO 30mm WIDE x 25mm DEEP REBATE IN TOP AND SIDE CONCRETE SURFACES.
4. JOINT SEALANT SHALL BE A TWO-PART POLYSULPHIDE COMPLYING WITH THE REVELANT PROVISIONS OF B.S. 4254.

TITLE:
FENCING TYPE F

DATE: APRIL 1995 SCALE: N.T.S.



**NORTHUMBRIAN
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Serving the North East

STANDARD DETAIL No.: E0702/602

STEEL PALISADE FENCE

SIZES OF RHS FRAME

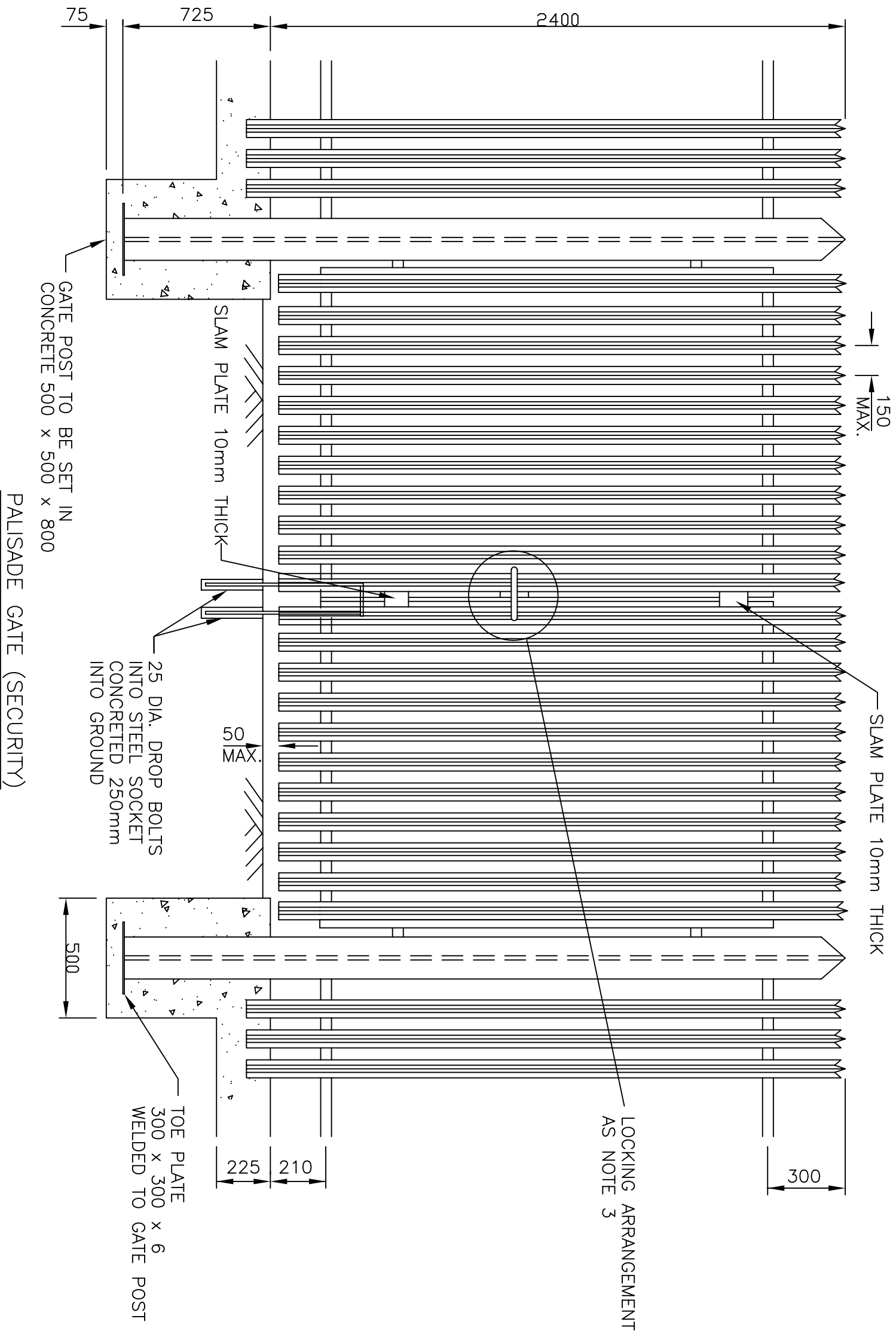
FOR SINGLE GATES TO 1.5m WIDE	80 x 40 x 4.0
FOR PAIRS OF GATES	
2.4m TO 3.5m WIDE	80 x 40 x 4.0
3.5m TO 4.8m WIDE	90 x 50 x 3.6
4.8m TO 6.7m WIDE	90 x 50 x 3.6 *

SIZES OF RSJ OR UC GATE POSTS

	SECTION	Kg / m
FOR SINGLE GATES TO 1.5m WIDE	178 x 102	21.5
FOR PAIRS OF GATES		
2.4m TO 3.0m WIDE	178 x 102	21.5
3.0m TO 5.4m WIDE	203 x 203	60.0
5.4m TO 6.7m WIDE	203 x 203	86.0

* - TRIANGULAR CORNER GUSSETS TO BE BETWEEN RAILS AND HANGING STILES

WIDTH MEASURED CENTRE TO CENTRE OF THE GATE POSTS



PALISADE GATE (SECURITY)

NOTES

- NOTES
- CORRUGATED MILD STEEL PALES 3mm THICK MINIMUM FACE TO VIEW 75mm FULLY WELDED TO RAILS. PALES HAVE 'W' CROSS SECTION WITH TRIPLE SPLOYED POINTS.
 - 50 x 50 x 8 MILD STEEL PLATE TO BE WELDED TO GATE POST TO CONNECT FENCING RAIL.
 - SLIDING HORIZONTAL LOCKING BAR TO BE 75 x 10 FLAT SECURED TO A LOCKING PLATE 10mm THICK WELDED TO GATE FRAME AT 1050 ABOVE GROUND. LOCKING BAR TO BE HOLED TO RECEIVE PADLOCK. PADLOCK TO BE HOUSED IN 10 THICK MILD STEEL BOX WITH ACCESS FROM OUTSIDE FACE ONLY.
 - STEEL MEMBERS TO BE STRUCTURAL STEEL AND TO COMPLY WITH THE RELEVANT CESWI CLAUSE.
 - HINGES TO BE EITHER AN INTEGRAL PART OF THE GATE AND HANGING POST OR OF THE HEEL AND SOCKET TYPE.

TITLE:

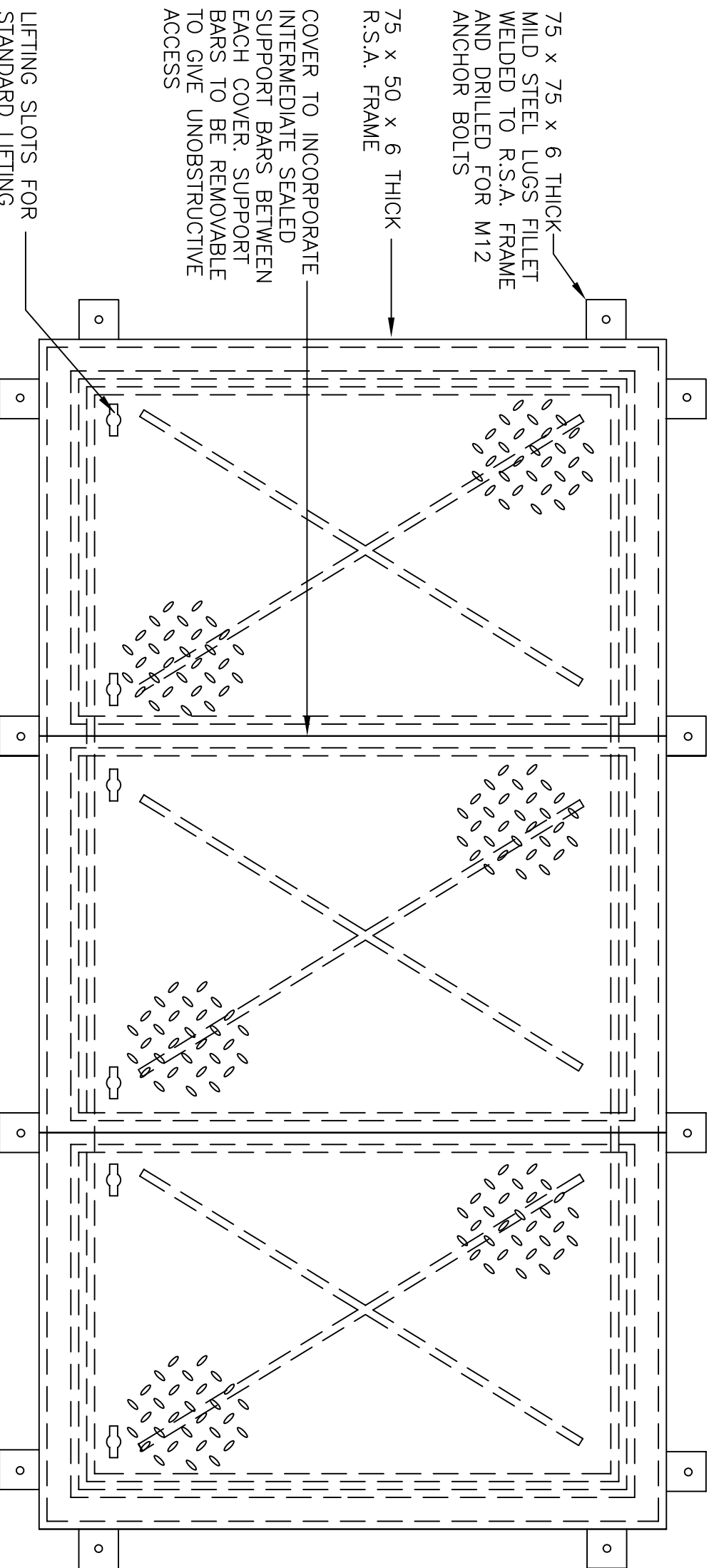
GATE TYPE 2

DATE: APRIL 1995 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD
Serving the North East

STANDARD DETAIL No.: E0702/603



75 x 75 x 6 THICK MILD STEEL LUGS FILLET WELDED TO R.S.A. FRAME AND DRILLED FOR M12 ANCHOR BOLTS

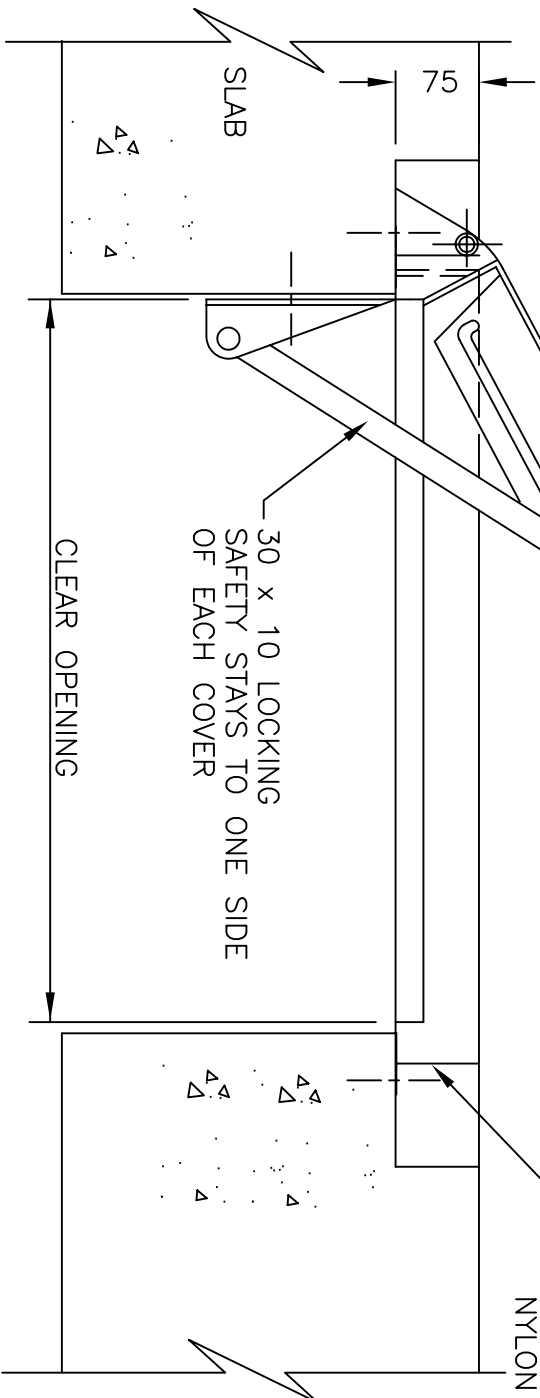
75 x 50 x 6 THICK R.S.A. FRAME

COVER TO INCORPORATE INTERMEDIATE SEALED SUPPORT BARS BETWEEN EACH COVER. SUPPORT BARS TO BE REMOVABLE TO GIVE UNOBSTRUCTIVE ACCESS

LIFTING SLOTS FOR STANDARD LIFTING KEYS AND LOCKING ARRANGEMENT

6 THICK 'DURBAR' PATTERN MILD STEEL CHEQUER PLATE COVERS

8 THICK MILD STEEL CROSS-BRACING TO UNDERSIDE OF COVERS
 FRAME FIXED TO SLAB WITH M12 STAINLESS STEEL ANCHOR BOLTS COMPLETE WITH NYLON OR PVC SLEEVE WASHER



30 x 10 LOCKING SAFETY STAYS TO ONE SIDE OF EACH COVER

CLEAR OPENING

SLAB

75

NOTES

- NOTES
1. COVER SHALL BE DESIGNED FOR 5 TONNE LOAD RATING.
 2. ALL COVER LEAVES SHALL HAVE CLOSED KEYWAYS AND SPECIAL LOCKING ARRANGEMENTS.
 3. ALL METALWORK SHALL BE PROTECTED AT THE WORKS BY HOT DIP GALVANISING TO B.S.729 AFTER FABRICATION.

TITLE:
 TYPICAL SUBMERSIBLE PUMPING STATION ACCESS COVER

DATE: APRIL 1995 SCALE: N.T.S.



NORTHUMBRIAN WATER LTD
Serving the North East

STANDARD DETAIL No.:E0702/604

A3 WATER INDUSTRY MECHANICAL AND ELECTRICAL SPECIFICATION WIMES 1.02

- (a) Copies of WIMES 1.02 are available from:

THE PUMP CENTRE
BUILDING RD1
AEA TECHNOLOGY
BIRCHWOOD SCIENCE PARK
WARRINGTON
WA3 6AT

TELEPHONE: (01925) 252 185
FAX: (01925) 253 576

- (b) This document is the industry standard and shall be used to specify all Submersible Sewage Pumps.
- (c) The data sheet must be **fully** completed, as indicated therein, by the pump purchaser and the pump supplier.

A4 LIFTING DAVITS AND SOCKETS

The preferred method of lifting submersible pumps is to use a lorry mounted jib crane. Suitable provision must be made to allow vehicular access.

Standard davit sockets must be provided to guard against the non-availability of a crane. These can be obtained from NWG Stores at Pity Me. They must be installed at a radius such as to allow the lifting equipment a vertical pull on the pump lifting attachment.

Details of NWG's standard davits and sockets are given on the following drawings:

500 kg SWL Portable Lifting Davit and Socket	Drawing No: HSP 100/CE0002
--	----------------------------

1000 kg SWL Portable Lifting Davit and Socket	Drawing No: HSP 100/CE0003
---	----------------------------

Brass Marker Plate for Lifting Davit Sockets	Drawing No: HSP 100/CE0004
--	----------------------------

NWG will provide an identification number for the socket on request. This number shall be used on the lifting plant test certificates and inspection records, and shall be indicated on the brass marker plate to be installed adjacent to the davit socket.

All lifting plant must be designed and tested in accordance with prevailing legislation, including the Factories Act and the Construction (Design and Management) Regulations 1994 [CDM Regulations].

The Designer must ensure that the supporting structure is designed to support the davit and any loads transmitted.

When selecting davit sockets, the SWL must be greater than twice the mass of the pump unit.

NWG use chain blocks suspended from the davits to lift pumps. Proprietary, lightweight, winches are not acceptable.

Non standard davit sockets are not acceptable to NWG.

A5 ULTRASONICS PARAMETER SETTINGS

P1	
P2	
P3	
P4	
P5	
P6	

P7	
P8	
P9	
P10	
P11	
P12	

P13	
P14	
P15	
P16	
P17	
P18	

P19	
P20	
P21	
P22	
P23	
P24	
P25	
P26	
P27	
P28	
P29	
P30	
P99	Reset All

Relay 1& 3: Set at Duty Level

Relay 2 : Set at Standby Level

Relay 1 & 2 : Programmed for Sequential Loop control (DE9)

Relay 3 : Programmed for pump control (DE8)

Relay 4 : Programmed for Wet Well High Level to Telemetry

Relay 5 : Programmed for Ultrasonics System Healthy

HRS RUN 1
HRS RUN 2
HRS RUN 3
HRS RUN 4
HRS RUN 5
SECS

HEAD Metres

FLOW l/sec

HEAD Metres

FLOW l/sec

H1	
H2	
H3	
H4	
H5	
H6	

F1	
F2	
F3	
F4	
F5	
F6	

H7	
H8	
H9	
H10	
H11	
H12	

F7	
F8	
F9	
F10	
F11	
F12	

COMPLETED BY:

DATE:

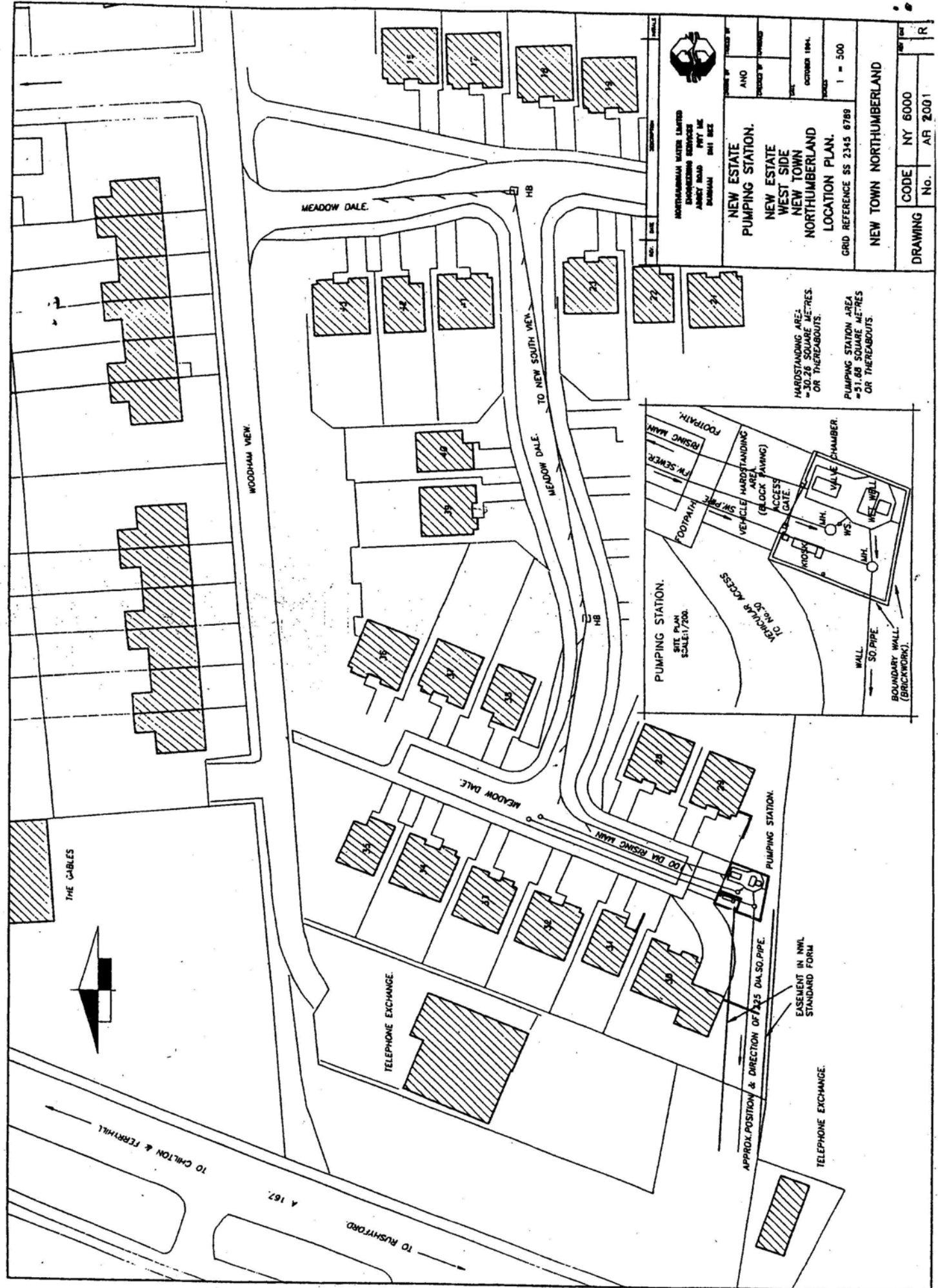
A6 SEWAGE TREATMENT ASSETS SYSTEM

Number	*	
Description		
Parent Number	*	
Location Lvl 1		
Lvl 2		
Lvl 3		
Commissioned	*	
Classification		
Category		
GENERAL		
Terrier Reference	*	
Site Address 1		
Site Address 2		
Post Code		
Telephone Number		
OS Grid Reference		
AOD Level		
Adoption Date		
Station Type		
Council Area		
Sewage Work Supplied		
Type of Macerator		
Total Capacity		
Flow Measurement (Y/N)		
Discharge Type		
PSTN Supply		
Level Controller Type		
PLC Type		
Radio		
Telemetry System Equipment		
Building / Kiosk		
Water Supply on Site (Y/N)		
Access Type		
Abloy Key Type	*	
PUMPING SYSTEM		
Population Served		
Number of Properties		
Factory Area		
Industry light / Medium / Heavy		
Sewage System Type		
Overflow Type		
Overflow Details (Size)		
Capacity (l/s)-Des/Ms/Calc		
On Line Store Availability		
Capacity Pump Well		
Pump Bypass		
Dry Weather Flow (l/s)		
Store Time Before Overflow		
Trade Effluent (l/s)		
Dry Weather Flow (l/s)		
Store Time Before Overflow		
Trade Effluent (l/s)		
Type of Solid Separation		
Wet Well Size (m dia)		

RISING MAIN		
Rising Main Discharge Grid Ref		
Rising Main Length (m)		
Rising Main Diameter (mm)		
Rising Main Material		
Total Head (m)		
Average Pumping Head (m)		
Static Head (m)		
Maximum Surge		
Minimum Surge		
Velocity m/s		
Air Valve Type		
PUMPS		
Number of Pumps		
Duty		
Running Current		
Starter Arrangement (DOL etc)		
Type / Make of Pump		
Max Pump Motor Rating (kW)		
Suction / Delivery Size (mm)		
Speed (rpm)		
Impeller Type Number		
Year of Manufacture		
Serial Numbers		
Power		
Panel Manufacture		
Elec Supply O/hd, U/gd, Vlt		
Service Capacity		
Earth Definition/Type		
Test Cert.		
Test Cert. Date		
Phases		
Dual Power Supply (Y/N)		
Plug in Socket for Generator (Y/N)		
Size of Mobile Generator Req'd (kVA)		
Maximum Demand (kW)		
REC Owned HV Equipment (Y/N)		
NWG Owned HV Equipment (Y/N)		
EA Permit Date		
Permit Population		
Storage Capacity		
Sample point Grid Reference		
MISCELLANEOUS		
EA Permit Number		
Discharge Grid Reference		
Water Course		
Hazardous Zone Classification		
Station Manuals		
Telephone Account Number		
Electricity Account Number		
REC Elec Supplier		
Electricity Tariff		
Legal Reference Number	*	

* INFORMATION TO BE PROVIDED BY NWG

A7 LOCATION PLAN EXAMPLE

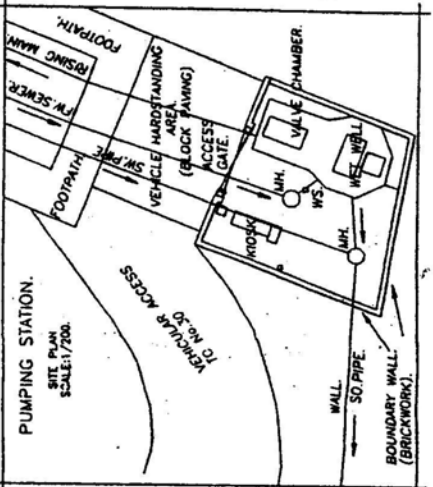


NORTHUMBRIA WATER LIMITED
 ENGINEERING SERVICES
 ARMY ROAD
 NEWCASTLE
 NORTHUMBRIA

PROJECT NO.	NEW ESTATE PUMPING STATION
DATE	OCTOBER 1984
SCALE	1 = 500
GRID REFERENCE	SS 2345 8788
PROJECT NAME	NEW ESTATE PUMPING STATION NEW ESTATE WEST SIDE WEST TOWN NORTHUMBRIA LOCATION PLAN.
PROJECT ADDRESS	NEW TOWN NORTHUMBRIA
DRAWING No.	AR 2001
CODE	NY 6000
	R

HARDSTANDING AREA
 -30.28 SQUARE METRES
 OR THEREABOUTS.

PUMPING STATION AREA
 -51.68 SQUARE METRES
 OR THEREABOUTS.



PUMPING STATION.
 SITE PLAN
 SCALE: 1/200.

APPROX. POSITION & DIRECTION OF 225 DIA. SO. PIPE.

EASEMENT IN NHW
 STANDARD FORM

THE CABLES



TO CHILTON & FERRINHILL

A 167

TO RUSHFORD

A8.1 STANDARD ELECTRICAL DESIGN FOR TWO PUMP SUBMERSIBLE PUMPING STATIONS

**THE SERCK PROTEUS PS1 "TERMINATION & COMPILE SHEET" SHALL SUPERSEDE ANY
REFERENCE TO TELEMETRY INPUT SIGNALS ON DRAWINGS E0702/315-1A & 315-1B**

**NORTHUMBRIAN WATER LTD
SERCK PROTEUS PS1 OUTSTATION
TERMINATION & COMPILE LIST**

These lists will be sent to you electronically, along with a guidance note, by the relevant Engineer in NWG's Asset Investment Department, at Pity Me.

A8.2 OPERATION PHILOSOPHY (SEPARATE SYSTEM)

1.0 All levels in the pumping station wet well are monitored by an Ultrasonic detector head and control unit. The controlling actions and operation levels are commissioning set by programming the control unit.

The sequence of operation is as follows:

- (a) Flow enters the pumping station and accumulates in the wet well. At a pre-set level of liquid, the *Duty Pump Start Level*, the Duty pump will start.
- (b) Under normal, healthy, pump operation the Duty pump will pump down the wet well level, and will stop at the *Duty Pump Stop Level*.
- (c) If however the level continues to rise after the *Duty Pump Start Level* has been reached, (this may be due to a blockage or other reason whereby the pump is running but is not removing the sewage from the wet well) the level will eventually reach the *Standby Pump Start Level*. At this point the control system will stop and then lock out the Duty pump, which is assumed to be faulty because although rated at 6 x DWF (Dry Weather Flow) it could not cope with the flow into the pumping station. The Standby pump will then be started, a message is then sent "*Pump condition (Failed)*" alarm signal to the NWG Control Room via the telemetry system for the duty pump.

Provided that the Standby pump is healthy, the pump will pump down the wet well and will stop at the *Duty Pump Stop Level*. The Standby pump will then assume the role of Duty pump.

- (d) If the level still continues to rise the *Wet Well High Level* will be reached and a further telemetry alarm signal sent to the NWG Control Room. The Standby pump will continue to run, but should be assumed to be faulty or the rising main to be blocked etc.

The *Wet Well High Level* alarm level should be set just above the *Standby Pump Start Level* and as far below the emergency overflow level as possible, so as to give as much notice as possible of an impending overflow operation.

2.0 Notes to the above:

- (a) When a pump is locked out it will not be able to be restarted until it is manually reset. This can be done either locally, at the control panel, or remotely via the telemetry system from the NWG Control Room.
- (b) When the Duty pump is locked out by the control system, the Standby pump lock out circuit is inhibited, i.e. it is not possible for both pumps to be locked out at the same time.
- (c) If the Standby pump is not in the *Auto Available* condition, due to pump failure or the pump Run/Off/Auto selector switch being switched in the OFF or RUN positions or the starter section being switched in the OFF position, the Duty pump lock out circuit is inhibited.

A8.3 ELECTRICAL DRAWING LIST

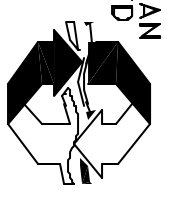
Drawing Title	Drawing No	Rev	TN-S	TN-C-S	TT	Low Panel	Std Panel
Document Register	E0702/300-1	01					
General Arrangement Control Panel	E0702/301-1A	01	YES	YES			YES
General Arrangement Control Panel	E0702/301-1B	01	YES	YES		YES	
General Arrangement Control Panel	E0702/301-1C	01			YES		YES
General Arrangement Control Panel	E0702/301-1D	01			YES	YES	
General Arrangement Main Incomer & distribution Section	E0702/302-1A	01	YES	YES			YES
General Arrangement Main Incomer & distribution Section	E0702/302-1B	01			YES		YES
General Arrangement Main Incomer & distribution Section	E0702/302-1C	01	YES	YES		YES	
General Arrangement Main Incomer & distribution Section	E0702/302-1D	01			YES	YES	
General Arrangement Pump No1 (A1) Starter Section	E0702/303-1A	01	YES	YES		YES	YES
General Arrangement Pump No1 (A1) Starter Section	E0702/303-1B	01			YES	YES	YES
General Arrangement Pump No1 (B1) Starter Section	E0702/304-1A	01	YES	YES		YES	YES
General Arrangement Pump No1 (B1) Starter Section	E0702/304-1B	01			YES	YES	YES
General Arrangement common controls & Telemetry Section	E0702/305-1A	01	YES	YES			YES
General Arrangement common controls & Telemetry Section	E0702/305-1B	01		YES	YES	YES	
General Arrangement common controls & Telemetry Section	E0702/305-1C	01			YES		YES
Back Plate Arrangement Main Incomer & Distribution Section	E0702/306-1A	01	YES	YES		YES	YES
Back Plate Arrangement Main Incomer & Distribution Section	E0702/306-1B	01			YES	YES	YES
Back Plate Arrangement Pump No1 (A1) Starter Section	E0702/307-1	01	YES	YES	YES	YES	YES
Back Plate Arrangement Pump No1 (B1) Starter Section	E0702/308-1	01	YES	YES	YES	YES	YES
Back Plate Arrangement Common Controls Section PSTN	E0702/309-1A	01	YES	YES	YES	YES	YES
Back Plate Arrangement Common Controls Section RADIO	E0702/309-1B	01	YES	YES	YES	YES	YES
Main Incomer & Distribution Schematic	E0702/310-1A	01		YES		YES	YES
Main Incomer & Distribution Schematic	E0702/310-1B	01	YES			YES	YES
Main Incomer & Distribution Schematic	E0702/310-1C	01			YES	YES	YES
Main Incomer & Distribution Section Wiring Schematic	E0702/310-2	01	YES	YES	YES	YES	YES
Distribution Section Wiring Schematic (A2)	E0702/311-1A	01	YES	YES		YES	YES
Distribution Section Wiring Schematic (A2)	E0702/311-1B	01			YES	YES	YES
Pump 1 & 2 Starter DOL Circuit	E0702/312-1A	01			YES	YES	YES
Pump 1 & 2 Starter Star / Delta Circuit	E0702/312-1B	01			YES	YES	YES
Pump 1 & 2 Starter DOL Circuit	E0702/312-1C	01	YES	YES		YES	YES
Pump 1 & 2 Starter Star / Delta Circuit	E0702/312-1D	01	YES	YES		YES	YES
Pump 1 (A1) Starter DOL Schematic	E0702/312-2A	01	YES	YES	YES	YES	YES
Pump 2 (B1) Starter DOL Schematic	E0702/312-2B	01	YES	YES	YES	YES	YES
Pump 1 (A1) Starter Star / Delta Schematic	E0702/312-2C	01	YES	YES	YES	YES	YES
Pump 2 (B1) Starter Star / Delta Schematic	E0702/312-2D	01	YES	YES	YES	YES	YES
Pump 1 (A1) Starter Control Indication Schematic	E0702/312-3A	01	YES	YES	YES	YES	YES
Pump 2 (B1) Starter Control Indication Schematic	E0702/312-3B	01	YES	YES	YES	YES	YES
Common Controls Wiring Schematic	E0702/314-1	01	YES	YES	YES	YES	YES
Telemetry Section Wiring Schematic PSTN	E0702/315-1A	01	YES	YES	YES	YES	YES
Telemetry Section Wiring Schematic RADIO	E0702/315-1B	01	YES	YES	YES	YES	YES
Cable Schedule	E0702/320-1	01	YES	YES	YES	YES	YES
Cable Block Diagram (PSTN)	E0702/321-1	01	YES	YES	YES	YES	YES
Cable Block Diagram (RADIO)	E0702/322-1	01	YES	YES	YES	YES	YES
Earthing Arrangement	E0702/323-1	01	YES	YES	YES	YES	YES
Kiosk and Panel Layout Details STD Height	E0702/324-1A	01	YES	YES	YES	YES	YES
Kiosk and Panel Layout Details LOW Height	E0702/324-1B	01	YES	YES	YES	YES	
Main Incomer and Distribution Section Label Schedule	E0702/325-1	01	YES	YES	YES	YES	YES
Pump Starter Cubical A1 and B1 Label Schedule	E0702/325-2	01	YES	YES	YES	YES	YES
Pump Starter Cubical A1 and B1 Label Schedule	E0702/325-3	01	YES	YES	YES	YES	YES
Common Controls and Telemetry Section Label Schedule	E0702/325-4	01	YES	YES	YES	YES	YES
REC Board and Cable Chamber Label Schedule	E0702/325-5	01	YES	YES	YES	YES	YES
Wet Well and Valve Chamber Label Schedule	E0702/325-6	01	YES	YES	YES	YES	YES

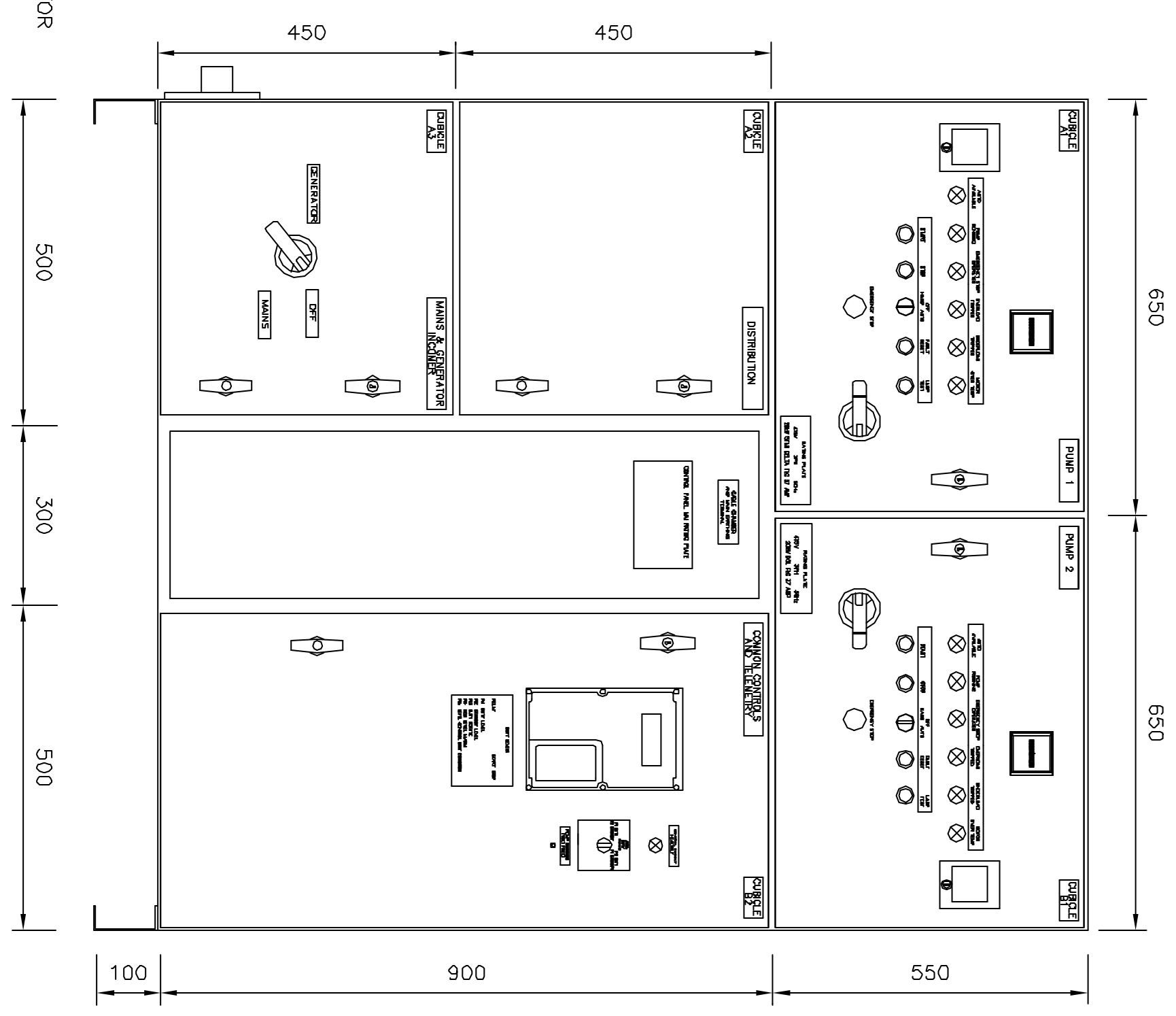
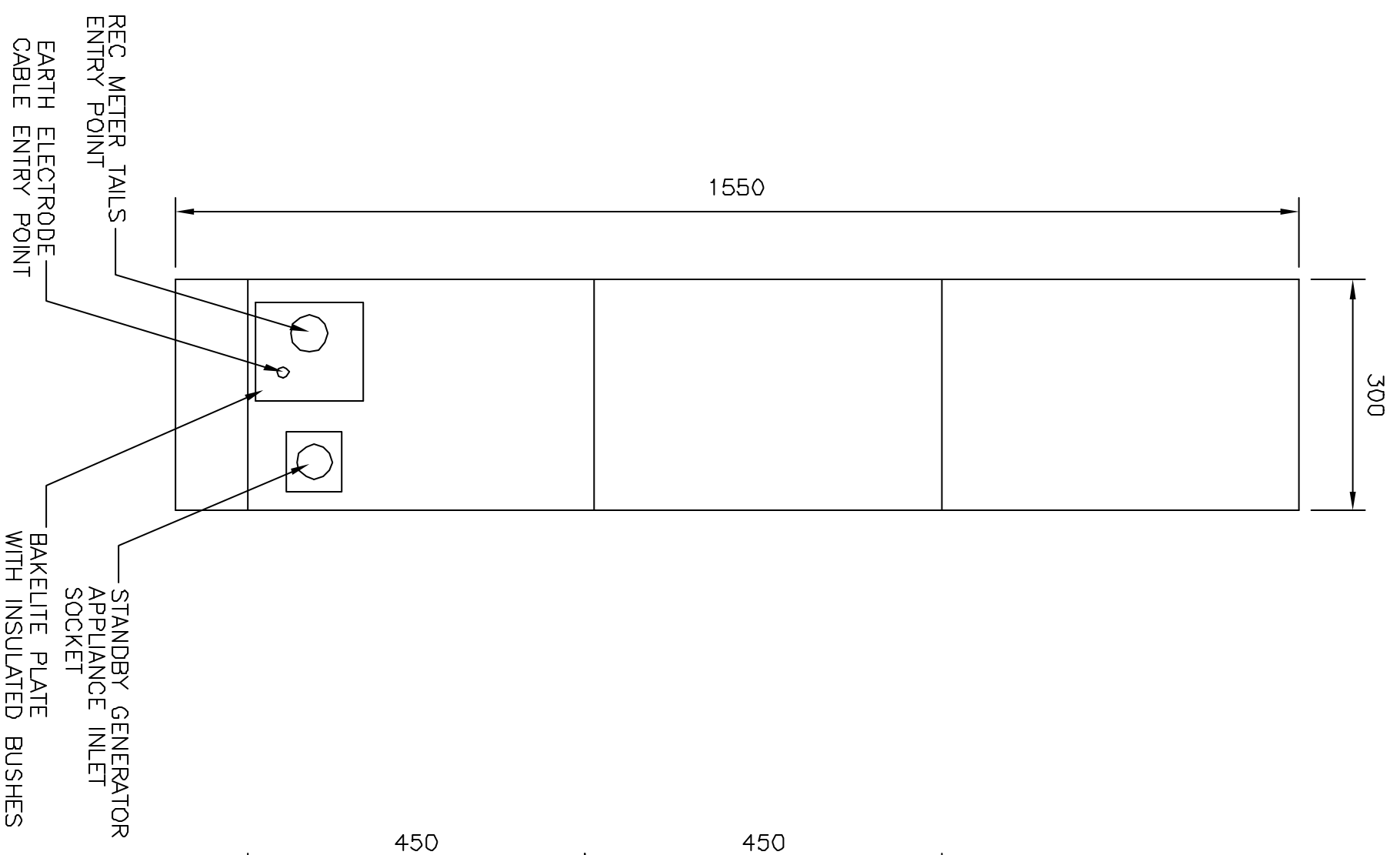
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E0702/300-1A	DOCUMENT REGISTER	E0702/311-1B	DIST SECTION WIRING SCHEMATIC (A2) (TT)
E0702/301-1A	GENERAL ARRANG'MT OF CONTROL PANEL (STD HEIGHT) (TN-S & TN-C-S)	E0702/312-1A	PUMP No 1 & No 2 STARTER DOL CIRCUIT (TT)
E0702/301-1B	GENERAL ARRANG'MT OF CONTROL PANEL (LOW LEVEL TYPE) (TN-S & TN-C-S)	E0702/312-1B	PUMP No 1 & No 2 STARTER STAR/DELTA CIRCUIT (TT)
E0702/301-1C	GENERAL ARRANG'MT OF CONTROL PANEL (TT)	E0702/312-1C	PUMP No 1 & No 2 STARTER DOL CIRCUIT (TN-S & TN-C-S)
E0702/301-1D	GENERAL ARRANG'MT OF CONTROL PANEL (TT)	E0702/312-1D	PUMP No 1 & No 2 STARTER STAR/DELTA CIRCUIT (TN-S & TN-C-S)
E0702/302-1A	GENERAL ARRANG'MT OF MAIN INCOMER & DIST' SECTION(TN-S & TN-C-S)	E0702/312-2A	PUMP No 1 (A1) STARTER SECTION DOL CONTROL SCHEMATIC
E0702/302-1B	GENERAL ARRANG'MT OF MAIN INCOMER & DIST' SECTION(TT)	E0702/312-2B	PUMP No 2 (B1) STARTER SECTION DOL CONTROL SCHEMATIC
E0702/302-1C	GENERAL ARRANG'MT OF MAIN INCOMER & DIST' SECTION(TN-S & TN-C-S)	E0702/312-2C	PUMP No 1 (A1) STARTER SECTION STAR/DELTA CONTROL SCHEMATIC
E0702/302-1D	GENERAL ARRANG'MT OF MAIN INCOMER & DIST' SECTION(TT)	E0702/312-2D	PUMP No 2 (B1) STARTER SECTION STAR/DELTA CONTROL SCHEMATIC
E0702/303-1A	GENERAL ARRANG'MT OF PUMP No 1(A1) STARTER SECTION	E0702/312-3A	PUMP No 1 (A1) STARTER SECTION CONTROL INDICATION SCHEMATIC
E0702/303-1B	GENERAL ARRANG'MT OF PUMP No 1(A1) STARTER SECTION(TT)	E0702/312-3B	PUMP No 2 (B1) STARTER SECTION CONTROL INDICATION SCHEMATIC
E0702/304-1A	GENERAL ARRANG'MT OF PUMP No 2 (B1) STARTER SECTION	E0702/314-1A	COMMON CONTROLS WIRING SCHEMATIC
E0702/304-1B	GENERAL ARRANG'MT OF PUMP No 2 (B1) STARTER SECTION(TT)	E0702/315-1A	TELEMETRY SECTION WIRING SCHEMATIC (PSTN)
E0702/305-1A	GENERAL ARRANG'MT OF COMMON CONTROL & TELEMETRY SECTION	E0702/315-1B	TELEMETRY SECTION WIRING SCHEMATIC (RADIO)
E0702/305-1B	GENERAL ARRANG'MT OF COMMON CONTROL & TELEMETRY SECTION	E0702/320-1A	CABLE SCHEDULE
E0702/305-1C	GENERAL ARRANG'MT OF COMMON CONTROL & TELEMETRY SECTION(TT)	E0702/321-1A	CABLE BLOCK DIAGRAM (PSTN)
E0702/306-1A	BACKPLATE ARRANG'MT MAIN INCOMER & DIST SECTION (TN-S & TN-C-S)	E0702/322-1A	CABLE BLOCK DIAGRAM (RADIO)
E0702/306-1B	BACKPLATE ARRANG'MT MAIN INCOMER & DIST SECTION (TT)	E0702/323-1A	EARTHING ARRANG'MT
E0702/307-1A	BACKPLATE ARRANG'MT OF PUMP No 1 (A1) STARTER SECTION	E0702/324-1A	KIOSK AND PANEL LAYOUT DETAILS (STD HEIGHT)
E0702/308-1A	BACKPLATE ARRANG'MT OF PUMP No 2 (B1) STARTER SECTION	E0702/324-1B	KIOSK AND PANEL LAYOUT DETAILS (LOW LEVEL)
E0702/309-1A	BACKPLATE ARRANG'MT OF COMMON CONTROL & TEL'M SECTION (PSTN)	E0702/325-1A	MAIN INCOMER AND DIST SECTION LABEL SCHEDULE
E0702/309-1B	BACKPLATE ARRANG'MT OF COMMON CONTROL & TEL'M SECTION (RADIO)	E0702/325-2A	PUMP STARTER CUBICALS A1 AND B1 LABEL SCHEDULE
E0702/310-1A	MAIN INCOMER & DIST SECTION (TN-C-S)	E0702/325-3A	PUMP STARTER CUBICALS A1 AND B1 LABEL SCHEDULE
E0702/310-1B	MAIN INCOMER & DIST SECTION (TN-S)	E0702/325-4A	COMMON CONTROLS AND TELEMETRY LABEL SCHEDULE
E0702/310-1C	MAIN INCOMER & DIST SECTION (TT)	E0702/325-5A	REC BOARD AND CABLE CHAMBER LABEL SCHEDULE
E0702/310-2A	MAIN INCOMER & DISTRIBUTION SECTION WIRING SCHEMATIC	E0702/325-6A	WET WELL AND VALVE CHAMBER LABEL SCHEDULE
E0702/311-1A	DIST SECTION WIRING SCHEMATIC (A2) (TN-S & TN-C-S)		

NWL STANDARD E0702/3 DOCUMENT REGISTER PROJECT: SEWAGE PUMPING STATIONS

NORTHUMBRIAN WATER LTD ABBEY ROAD PITY ME DURHAM DH1 5FJ	REV	DRN	CHD	APP	REV	DRN	CHD	APP	REV	DRN	CHD	APP	REV	DRN	CHD	APP	DRAWING TITLE: DOCUMENT REGISTER DRAWING No: E0702/300-1A SHEET: 1 OF 1
	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	
																	01/08/00 REV 01 DRN 00 CHD DG APP DG





FOR TN-S & TN-C-S
EARTHING SYSTEM

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	D0	DG	DG

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

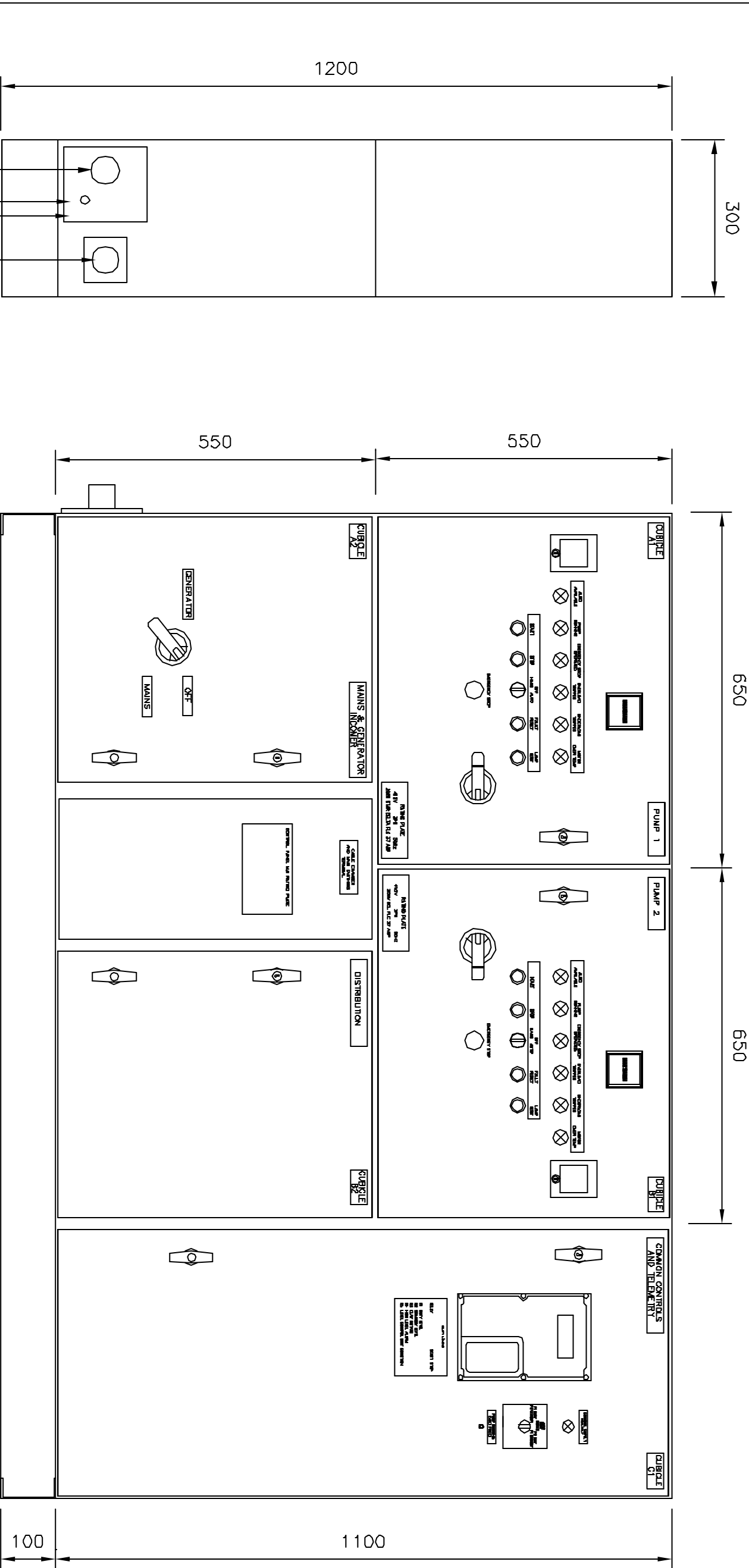
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT CONTROL PANEL

DRAWING No: E0702 / 301-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	D0	DG	DG




LOW ARRANGEMENT
FOR TN-S & TN-C-S
EARTHING SYSTEMS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	D0	DG	DG

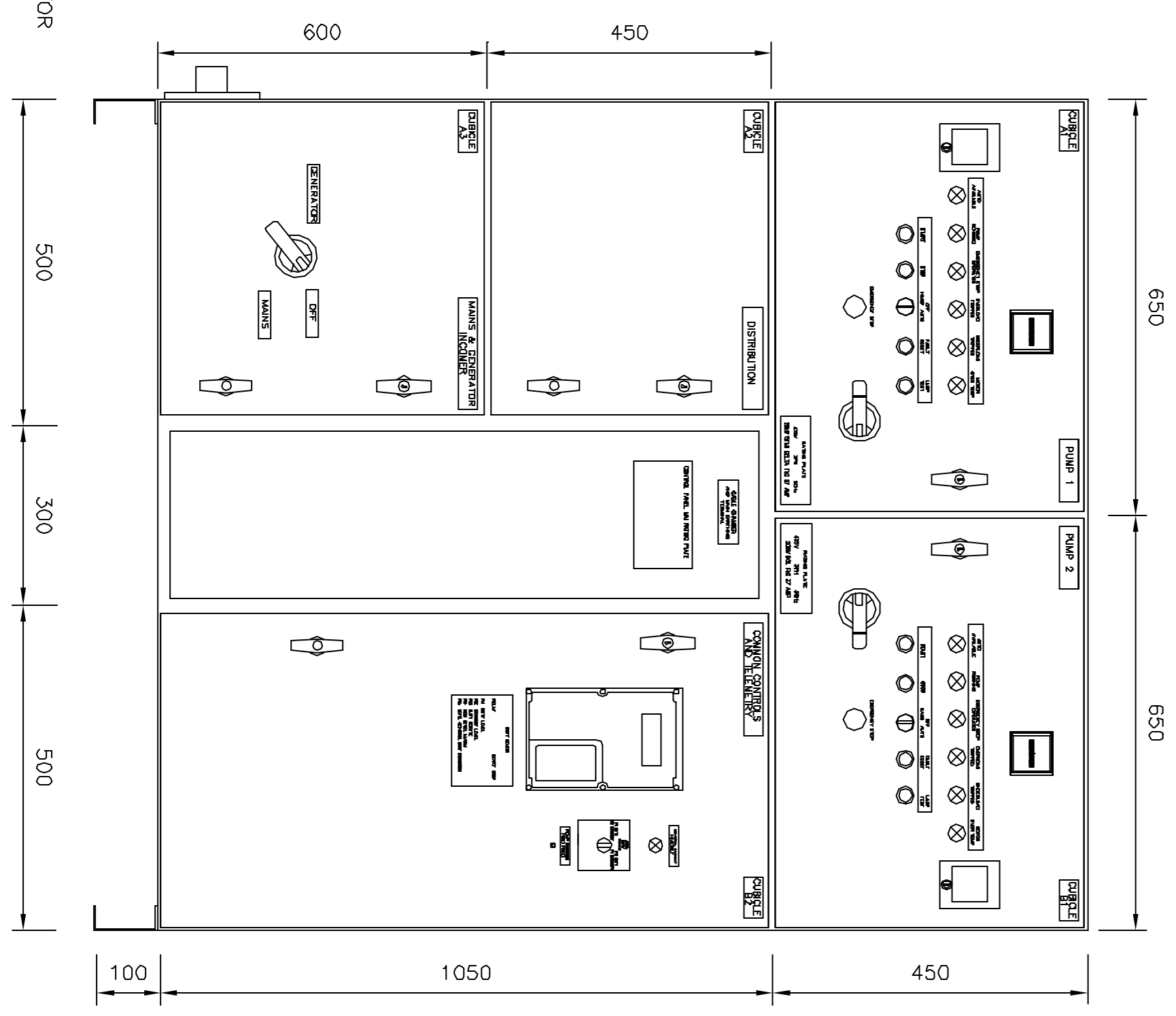
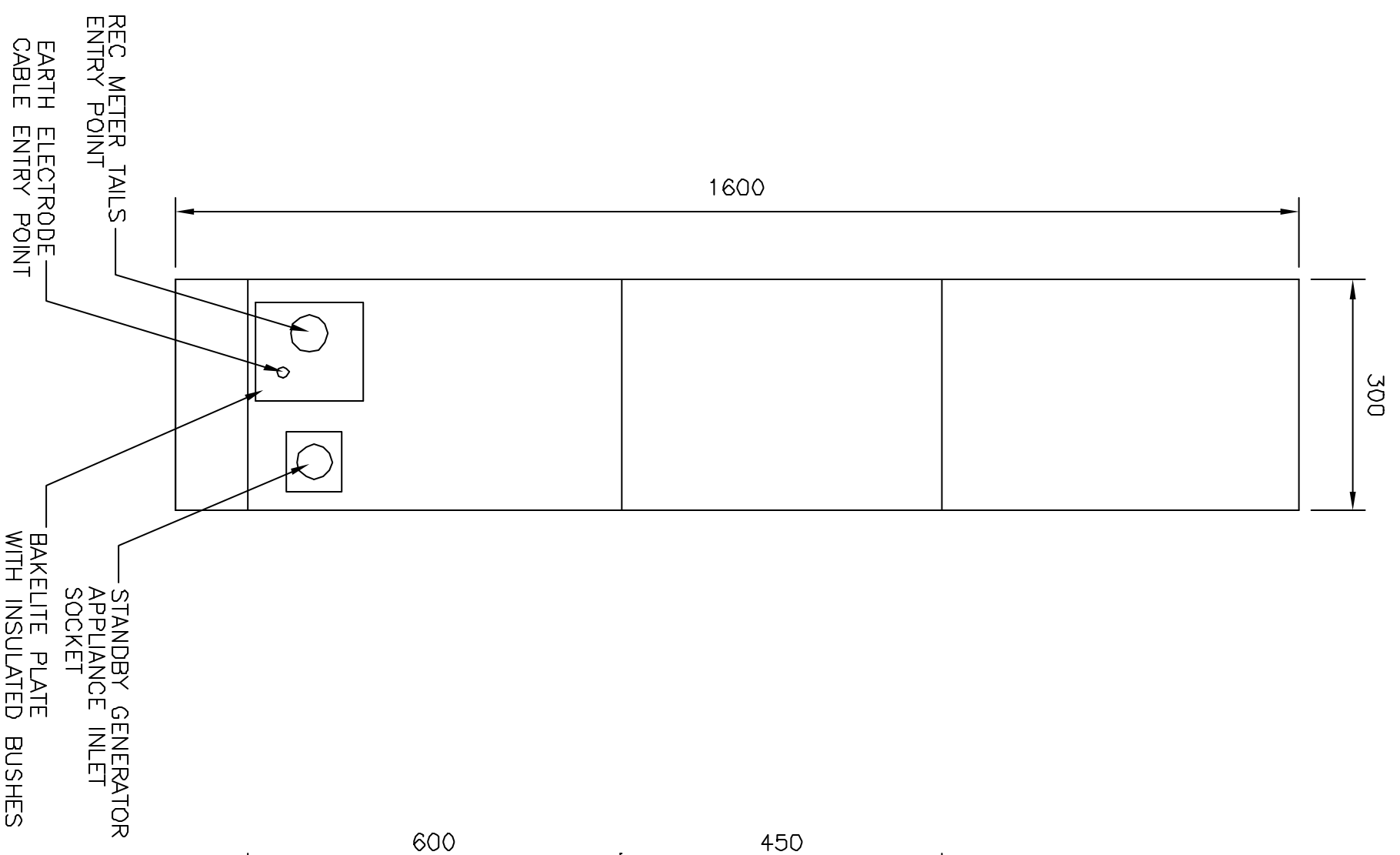
DATE 01/08/00
LOW ARRANGEMENT
MODIFIED

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ



PROJECT: SEWAGE PUMPING STATIONS
 DRAWING TITLE: GENERAL ARRANGEMENT CONTROL PANEL (LOW ARRANGEMENT)
 DRAWING No: E0702/301-1B
 SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	D0	DG	DG



FOR TT
EARTHING SYSTEM

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	00	DG	DG	01	00	DG	DG

DATE: 01/08/00

PANEL ARRANGEMENT CHANGED FOR A TT STANDARD HEIGHT PANEL

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

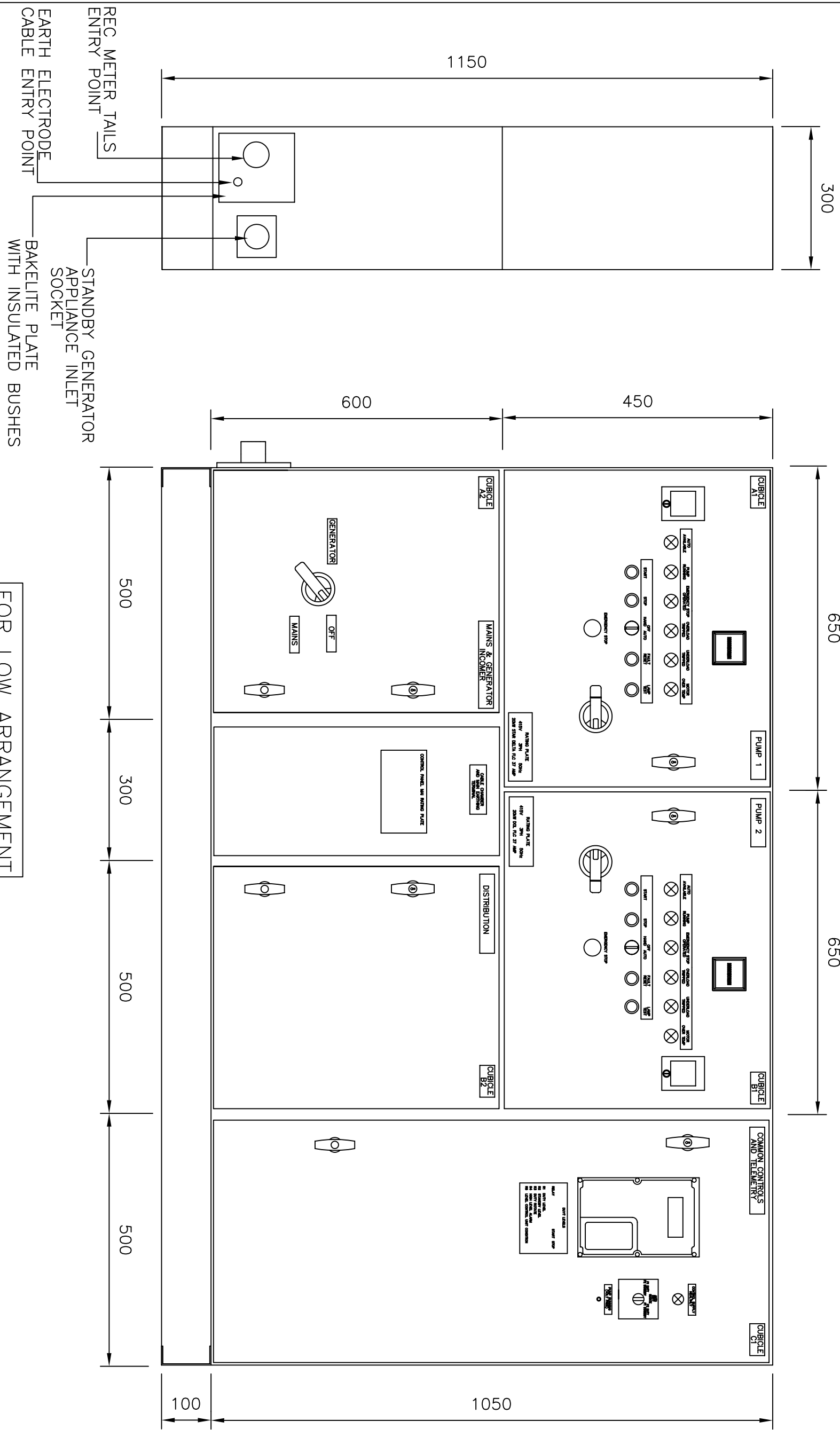
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT CONTROL PANEL

DRAWING No: E0702 / 301-1C

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	00	DG	DG



FOR LOW ARRANGEMENT
TT EARTHING SYSTEMS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG
DATE 01/08/00				DATE 01/08/00			

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITTY ME
 DURHAM
 DH1 5FJ

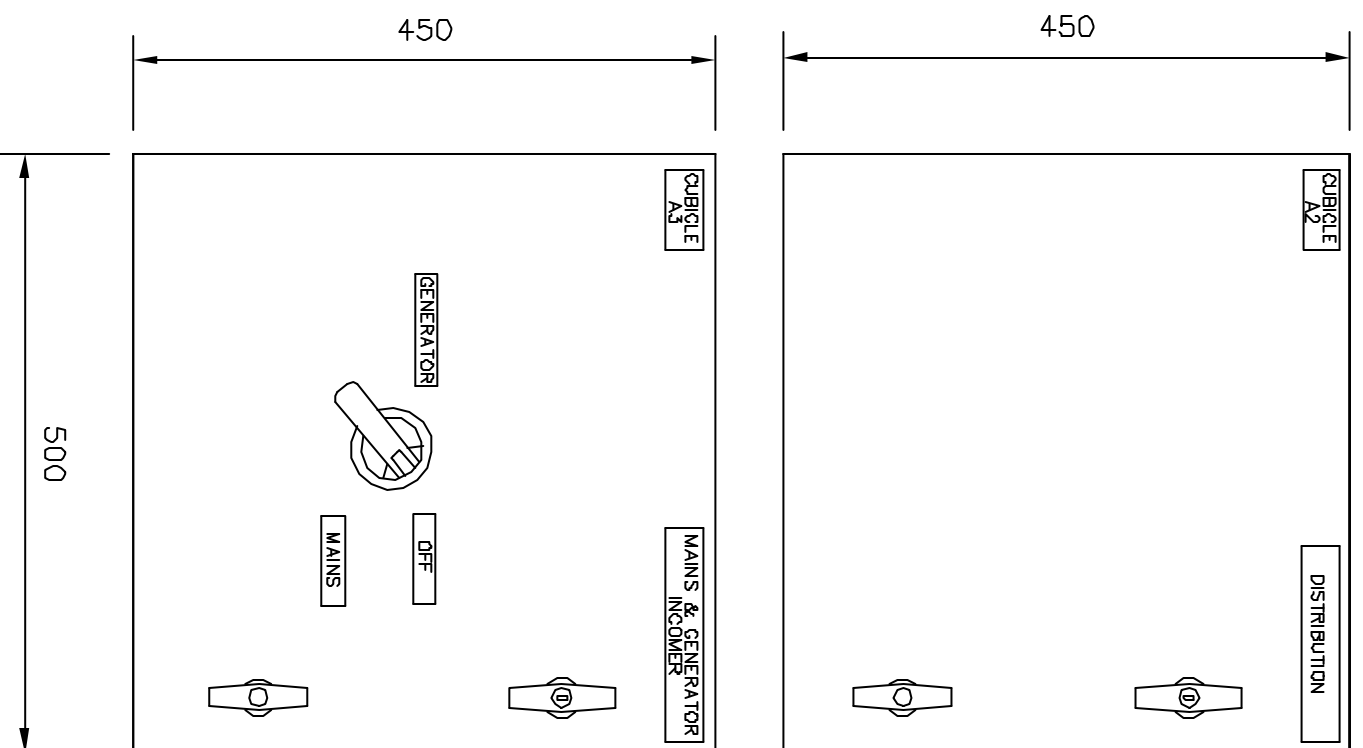
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT CONTROL PANEL (LOW ARRANGEMENT)

DRAWING No: E0702/301-1D

SHEET: 1 OF 1

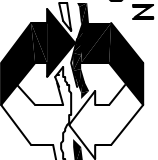
DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



FOR STANDARD HEIGHT CONTROL PANEL
TN-S & TN-C-S EARTHING SYSTEMS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DD	DG	DG
DATE				DATE			
				01/08/00			

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 DURHAM
 DH1 5FJ



PROJECT: SEWAGE PUMPING STATIONS

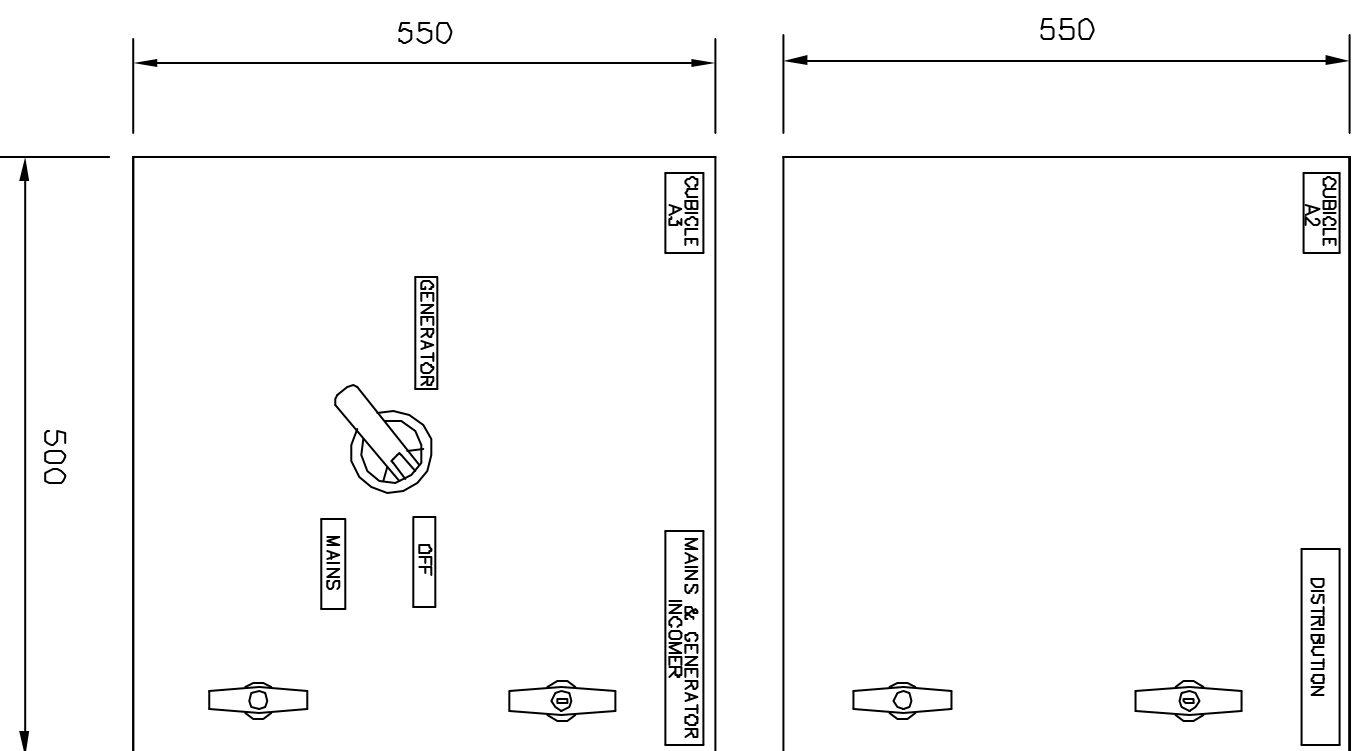
DRAWING TITLE: GENERAL ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS

DRAWING No: E0702 / 302-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DD	DG	DG

DOORS MODIFIED FOR STANDARD HEIGHT PANEL FOR USE WITH DRAWING 301-1A

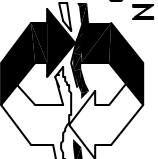


FOR LOW ARRANGEMENT CONTROL PANEL
TN-S & TN-C-S EARTHING SYSTEM

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			

DOORS MODIFIED FOR LOW
PANEL TNS / TNC-S
SYSTEM FOR USE WITH
DRAWING 301-1B.

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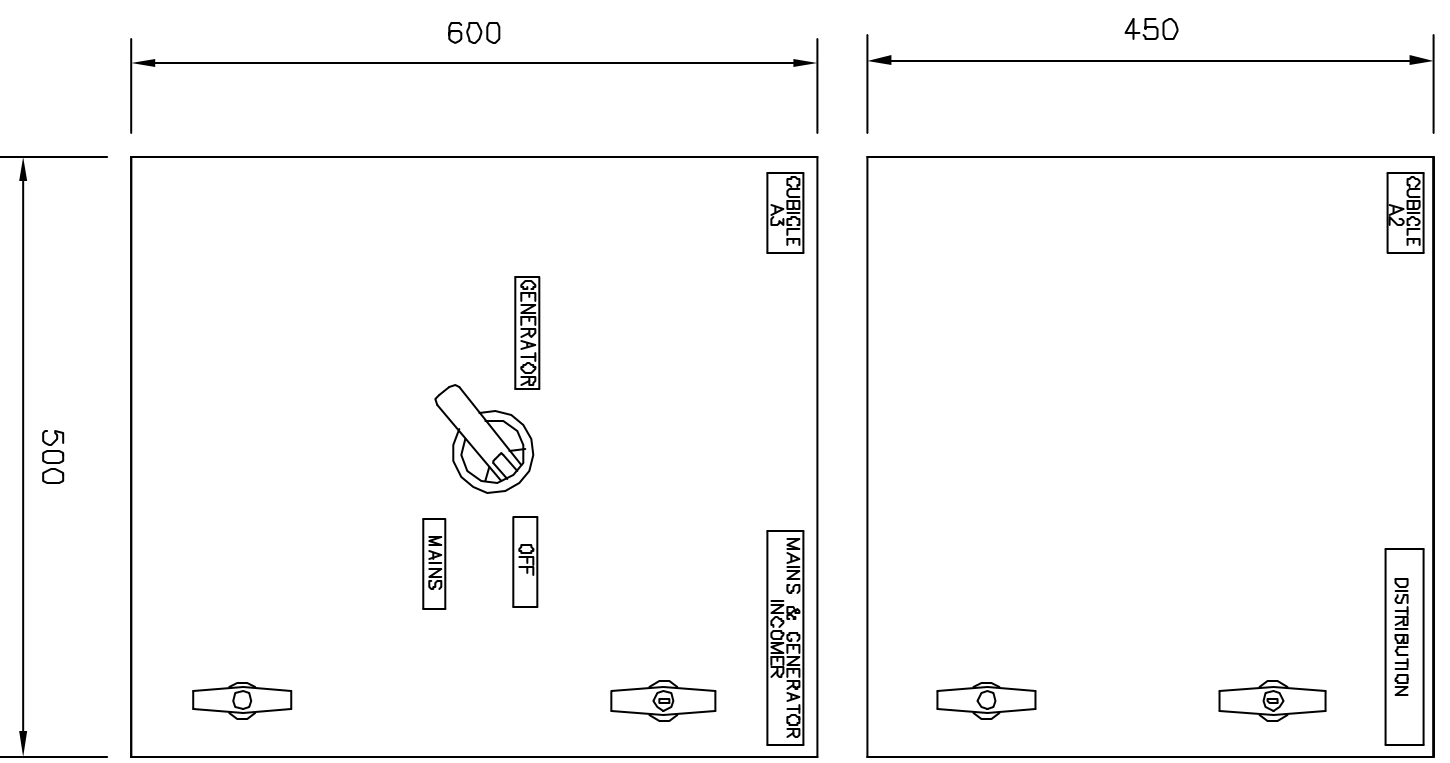
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS

DRAWING No: E0702 / 302-1B

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



FOR 1500mm HIGH ARRANGEMENT
FOR TT EARTHING SYSTEM

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				DOORS MODIFIED FOR 1500mm HIGH PANEL TT SYSTEM FOR USE WITH DRAWING 301-1C			

NORTHUMBRIAN WATER LTD
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 DURHAM
 DH1 5FJ

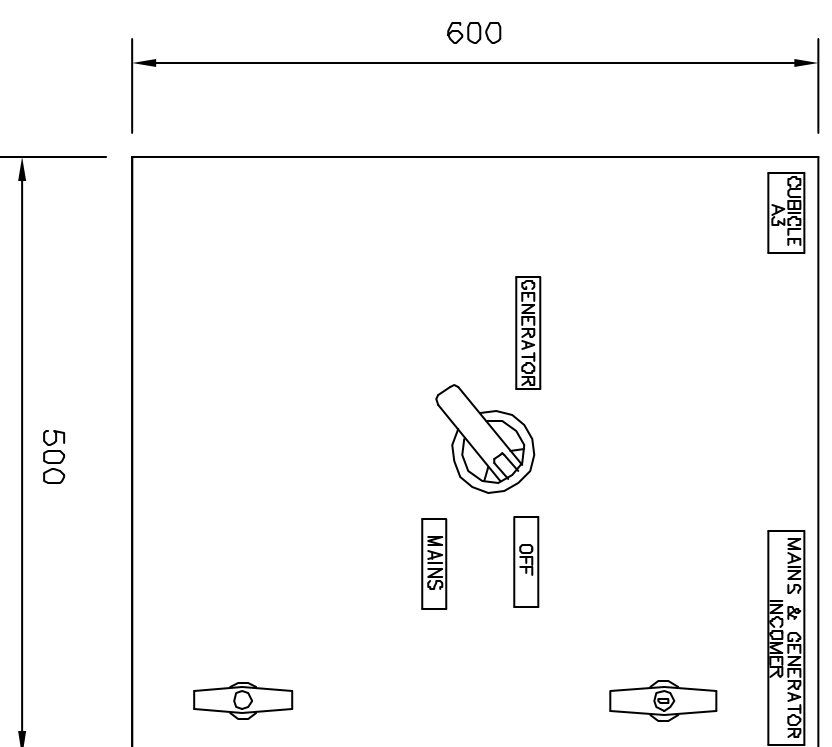
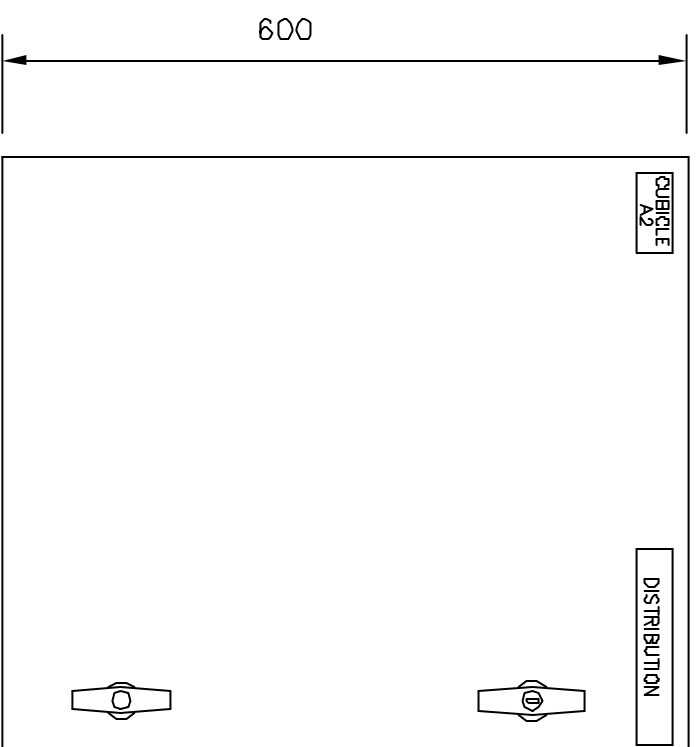
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS

DRAWING No: E0702/302-1C

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG




FOR LOW ARRANGEMENT
FOR TT EARTHING SYSTEM

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE: 01/08/00

DOORS MODIFIED FOR
LOW PANEL TT SYSTEM
FOR USE WITH DRAWING
301-1D

NORTHUMBRIAN WATER LTD
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 DURHAM
 DH1 5FJ



PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: GENERAL ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS

DRAWING No: E0702 / 302-1D

SHEET: 1 OF 1

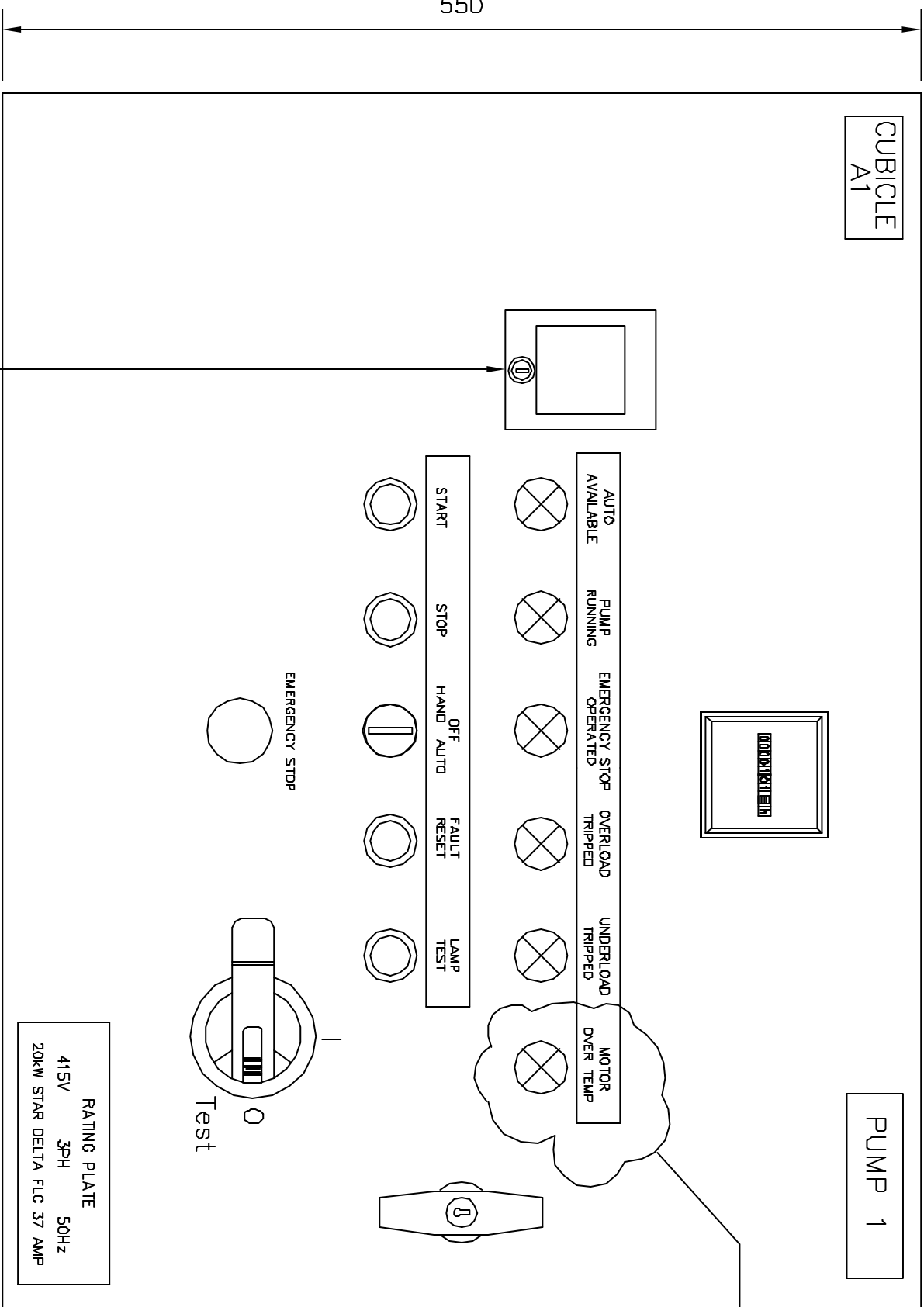
DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

650

550

CUBICLE
A1

PUMP 1



RATING PLATE
415V 3PH 50Hz
20kW STAR DELTA FLC 37 AMP

NOTE:
MOTOR OVER TEMP
CIRCUIT AND ASSOCIATED
INDICATION, TO BE FITTED
WHEN REQUIRED.

TRANSPARENT COVER HINGED
AND LOCKABLE TO PROVIDE IP54
RATING FOR PANEL MOUNTED DEVICE
WHICH CAN BE ADJUSTED FROM THE
HINGED COVER WHEN OPEN

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
01/08/00				01/08/00			
LOAD MONITOR AND ISOLATOR TEST POSITION ADDED							

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE:
 GENERAL ARRANGEMENT
 PUMP No1 (A1)
 STARTER SECTION

DRAWING No: E0702/303-1A
 SHEET: 1 OF 1

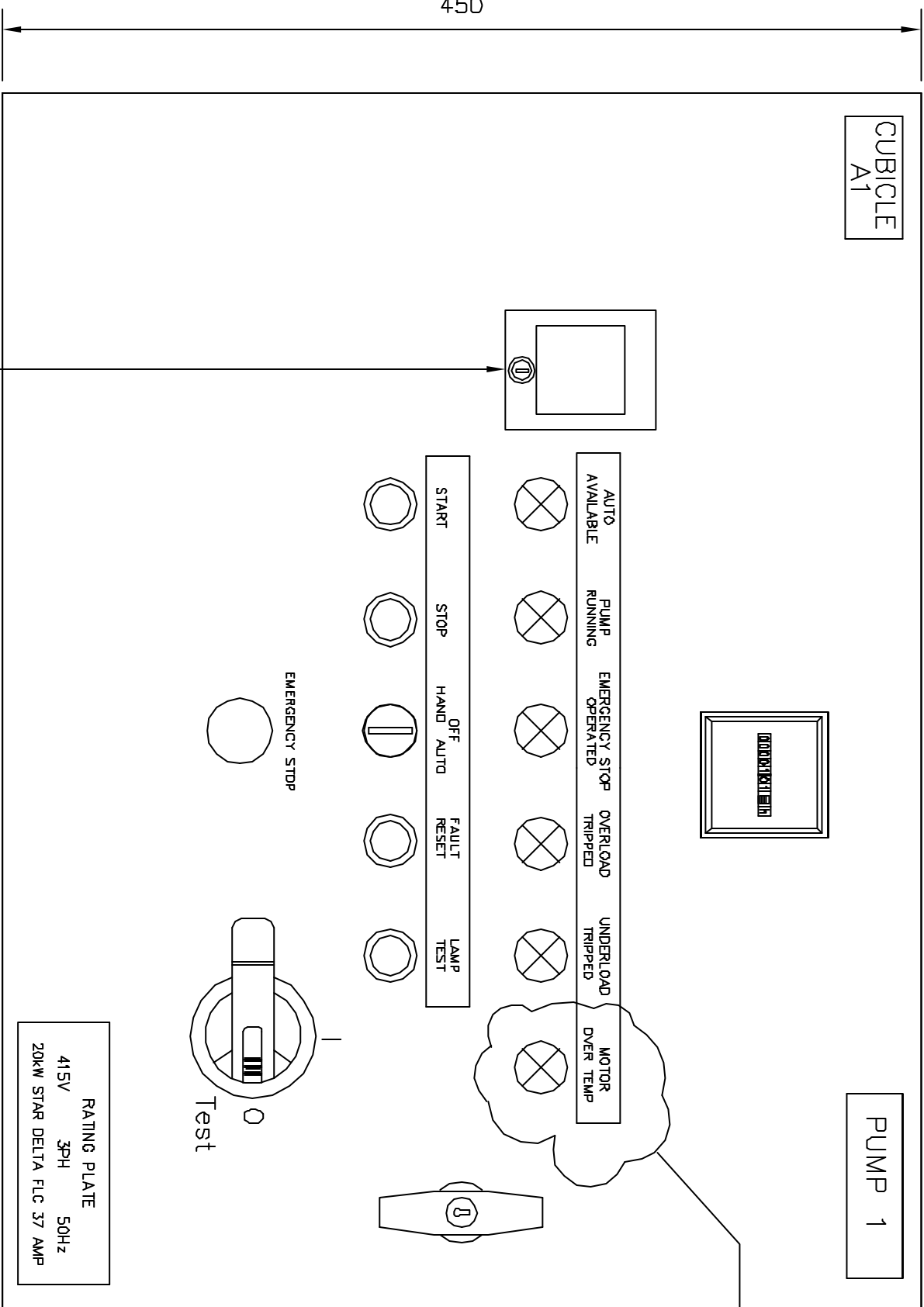
DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

650

450

CUBICLE
A1

PUMP 1



TRANSPARENT COVER HINGED AND LOCKABLE TO PROVIDE IP54 RATING FOR PANEL MOUNTED DEVICE WHICH CAN BE ADJUSTED FROM THE HINGED COVER WHEN OPEN


FOR TT EARTHING SYSTEMS

RATING PLATE
415V 3PH 50Hz
20kW STAR DELTA FLC 37 AMP

NOTE:
MOTOR OVER TEMP
CIRCUIT AND ASSOCIATED
INDICATION, TO BE FITTED
WHEN REQUIRED.

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
LOAD MONITOR AND ISOLATOR TEST POSITION ADDED							

NORTHUMBRIAN WATER LTD
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 DURHAM
 DH1 5FJ



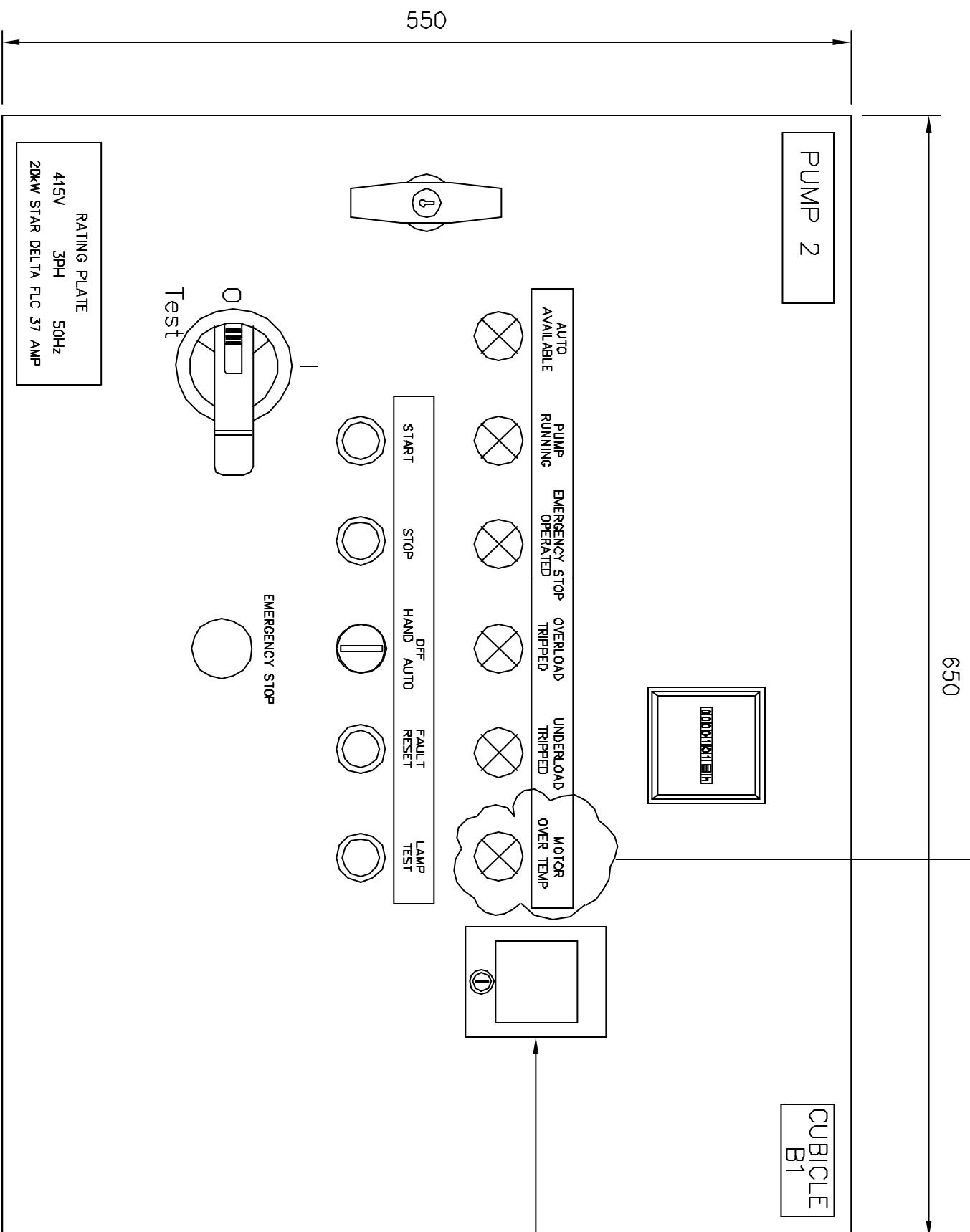
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE:
 GENERAL ARRANGEMENT
 PUMP No1 (A1)
 STARTER SECTION

DRAWING No: E0702/303-1B
 SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

NOTE:
MOTOR OVER TEMP
CIRCUIT AND ASSOCIATED
INDICATION, TO BE FITTED
WHEN REQUIRED.

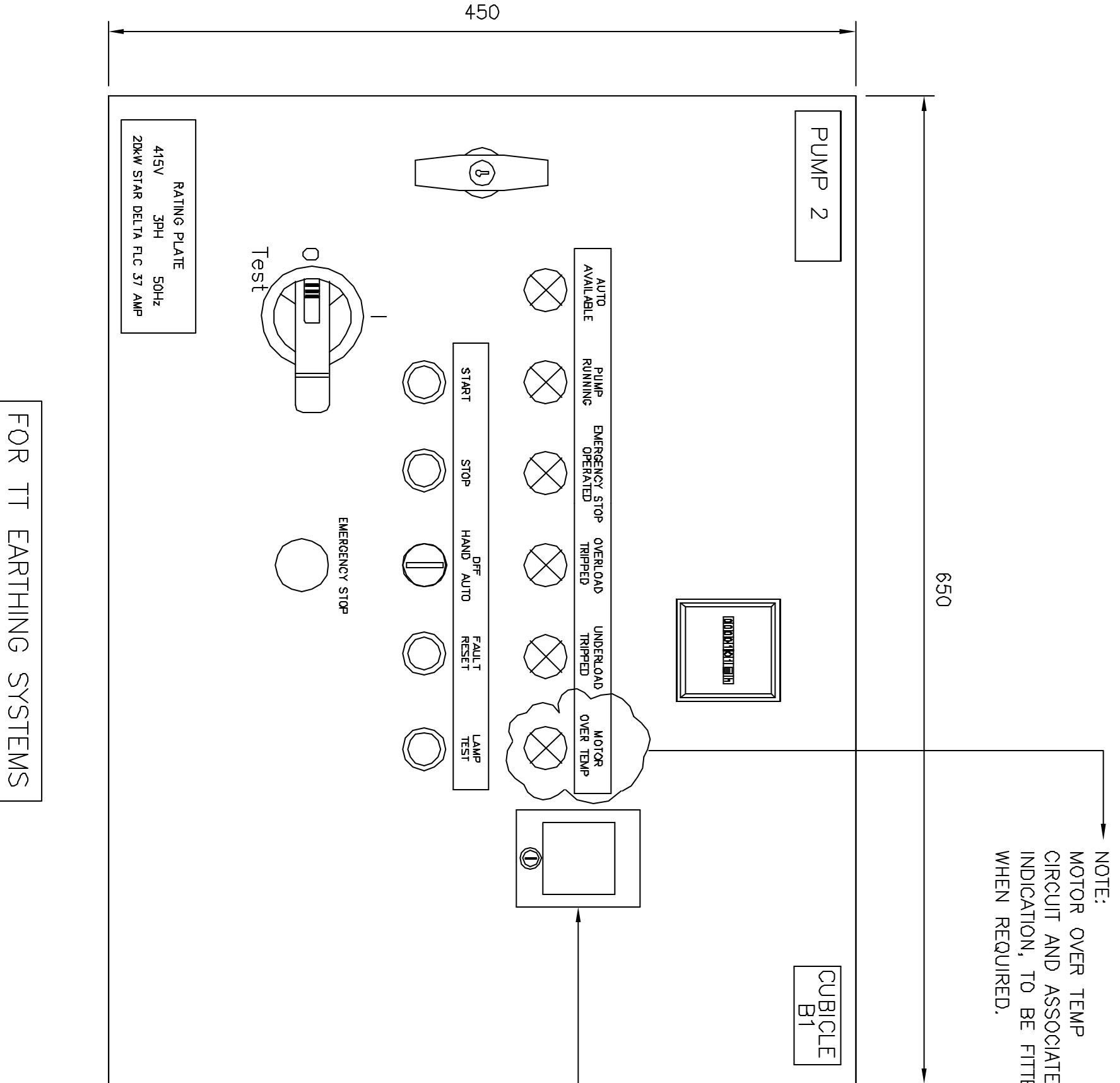


TRANSPARENT COVER HINGED
AND LOCKABLE TO PROVIDE IP54
RATING FOR PANEL MOUNTED DEVICE
WHICH CAN BE ADJUSTED FROM THE
HINGED COVER WHEN OPEN

RATING PLATE
415V 3PH 50Hz
20KW STAR DELTA FLC 37 AMP

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
LOAD MONITOR AND ISOLATOR TEST POSITION ADDED							
PROJECT: SEWAGE PUMPING STATIONS							
DRAWING TITLE: GENERAL ARRANGEMENT PUMP No2 (B1) STARTER SECTION							
DRAWING No: E0702 / 304-1A							
SHEET: 1 OF 1							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
01/08/00	01	DO	DG	DG			

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITTY ME
 DURHAM
 DH1 5FJ




FOR TT EARTHING SYSTEMS

TRANSPARENT COVER HINGED AND LOCKABLE TO PROVIDE IP54 RATING FOR PANEL MOUNTED DEVICE WHICH CAN BE ADJUSTED FROM THE HINGED COVER WHEN OPEN

NOTE:
MOTOR OVER TEMP CIRCUIT AND ASSOCIATED INDICATION, TO BE FITTED WHEN REQUIRED.

REV	DRN	CHD	APP	REV	DRN	CHD	APP		
				01	DO	DG	DG		
DATE				DATE					
				01/08/00					
LOAD MONITOR AND TEST POSITION ON ISOLATOR ADDED									
DRAWING No: E0702 / 304-1B									
SHEET: 1 OF 1									
DATE	REV	DRN	CHD	APP	DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG					

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 PITY ME
 DURHAM
 DH1 5FJ

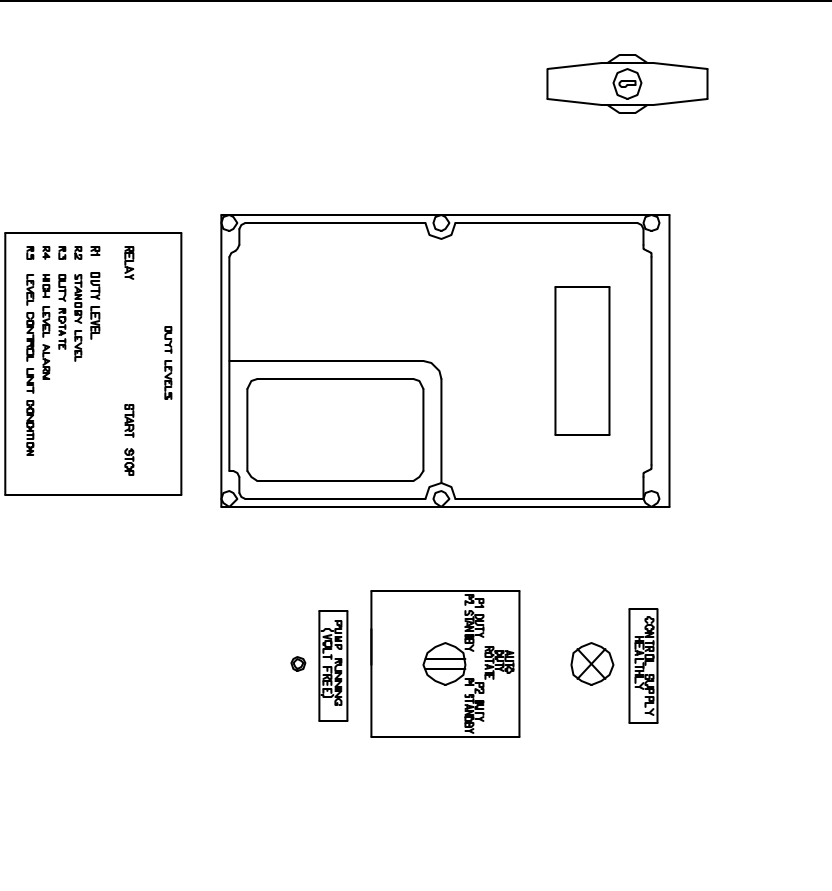


PROJECT: SEWAGE PUMPING STATIONS
 DRAWING TITLE: GENERAL ARRANGEMENT PUMP No2 (B1) STARTER SECTION

500

COMMON CONTROLS
AND TELEMETRY

CUBICLE
B2



RELAY START STOP

DUIT LEVELS

R1 DUIT LEVEL
R2 STANDBY LEVEL
R3 DUIT ROTATE
R4 HIGH LEVEL ALARM
R5 LEVEL CONTROL UNIT POSITION

COMP. SUPPLY

300V AC
R1 R2 R3 R4 R5
R1 R2 R3 R4 R5

PHASE MISSING
(VOLT FIELD)

900

NOTE CUBICLE NUMBERS WILL CHANGE
BETWEEN STANDARD AND LOW PANEL ARRANGEMENTS

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE
PUMPING STATIONS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

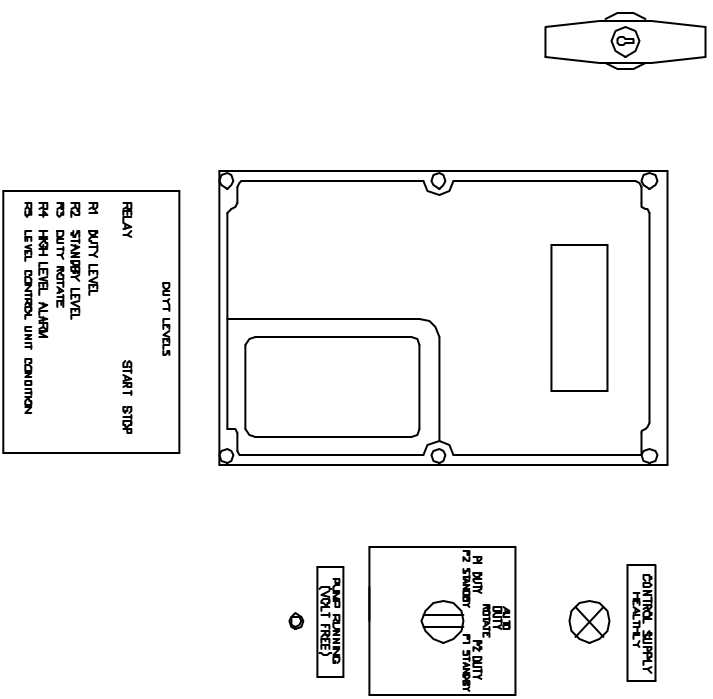
DATE: 01/08/00

DRAWING TITLE: GENERAL ARRANGEMENT COMMON CONTROLS & TELEMETRY SECTION				DRAWING No: E0702 / 305-1A					
DATE: 01/08/00				DOOR FOR A STD HEIGHT PANEL USE G.A. 301-1A					
SHEET: 1 OF 1									
DATE	REV	DRN	CHD	APP	DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG					

500

COMMON CONTROLS
AND TELEMETRY

CUBICLE
B2



DUITT LEVELS

RELAY	START STOP
R1	DUITY LEVEL
R2	STANDBY LEVEL
R3	DUITY ROTATE
R4	HIGH LEVEL ALARM
R5	LEVEL CONTROL UNIT CONDITION


1100

NOTE CUBICLE NUMBERS WILL CHANGE
BETWEEN STANDARD AND LOW PANEL ARRANGEMENTS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
01/08/00				01/08/00			
DOOR FOR A TNC AND TNC-S LOW PANEL ARRANGEMENT USE G.A. 301-1B							

PROJECT: SEWAGE PUMPING STATIONS

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ



DRAWING TITLE:
 GENERAL ARRANGEMENT
 COMMON CONTROLS &
 TELEMETRY SECTION

DRAWING No: E0702 / 305-1B

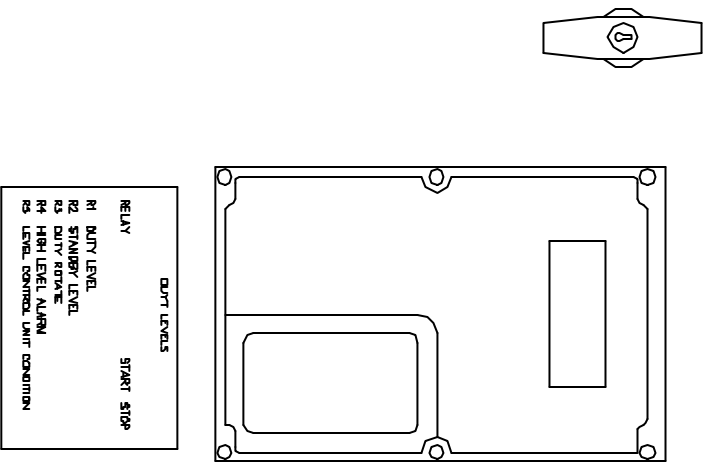
SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

500

COMMON CONTROLS
AND TELEMETRY

CUBICLE
B2



DUTY LEVELS

RELAY START STOP

R1 DUTY LEVEL
R2 STANDBY LEVEL
R3 DUTY RESERVE
R4 HIGH LEVEL ALARM
R5 LEVEL CONTROL UNIT CONDITION

CONTROL SUPPLY

MTR
MTR PI DUTY, RESERVE TO DUTY,
STOPPED AT STANDBY

PUMP RUNNING
(NOT TEST)

1050

FOR TT EARTHING SYSTEMS

NOTE CUBICLE NUMBERS WILL CHANGE
BETWEEN STANDARD AND LOW PANEL ARRANGEMENTS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			

DOOR FOR USE ON A TT
SYSTEM USE G.A.'s
301-1C & 301-1D.

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 DH1 5FJ

PROJECT: SEWAGE
PUMPING STATIONS

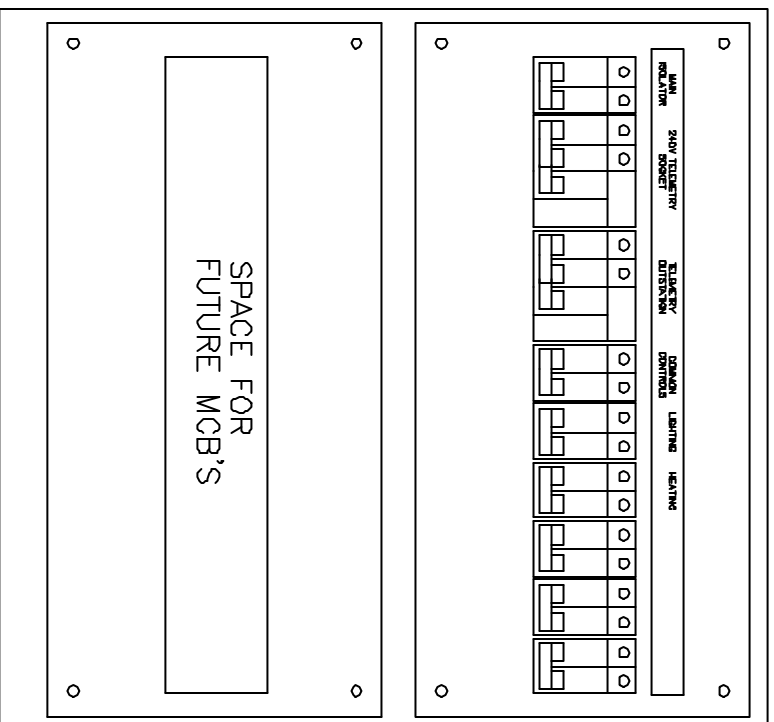
DRAWING TITLE:
GENERAL ARRANGEMENT
COMMON CONTROLS &
TELEMETRY SECTION

DRAWING No: E0702 / 305-1C

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

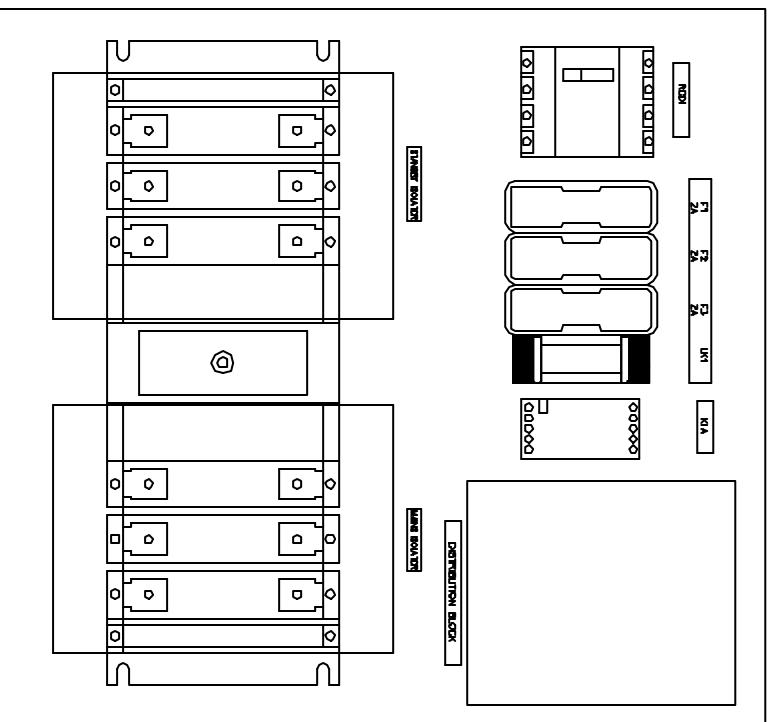
CUBICLE A2
DISTRIBUTION SECTION



NOTE:
ALL MCB's TO BE MOUNTED ON BACKPLATE BEHIND PERSPEX SHROUD. ONLY THE MCB DOLLIES ARE TO PROTRUDE THROUGH THE SHROUD. ALL SPACE FOR FUTURE MCB's ARE TO BE BLANKED OFF.

CUBICLE NUMBERS WILL CHANGE BETWEEN STANDARD AND LOW PANEL ARRANGEMENTS

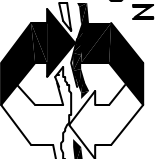
CUBICLE A3
MAIN INCOMER AND GENERATOR SECTION



FOR TN-C & TN-C-S
EARTHING SYSTEMS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
				DISTRIBUTION SECTION MODIFIED			

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 DH1 5FJ



PROJECT: SEWAGE PUMPING STATIONS

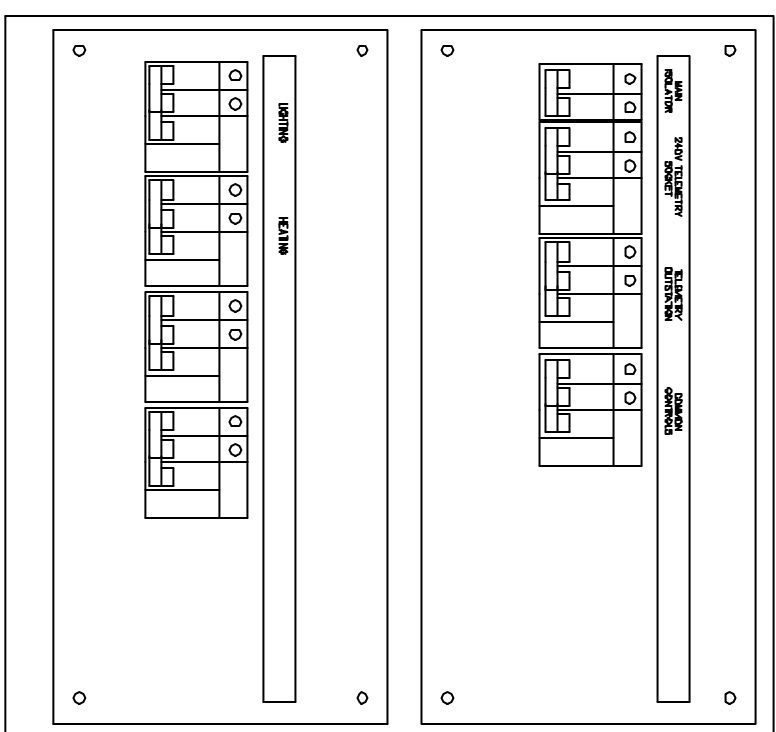
DRAWING TITLE: BACKPLATE ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS (TN-C & TN-C-S)

DRAWING No: E0702 / 306-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

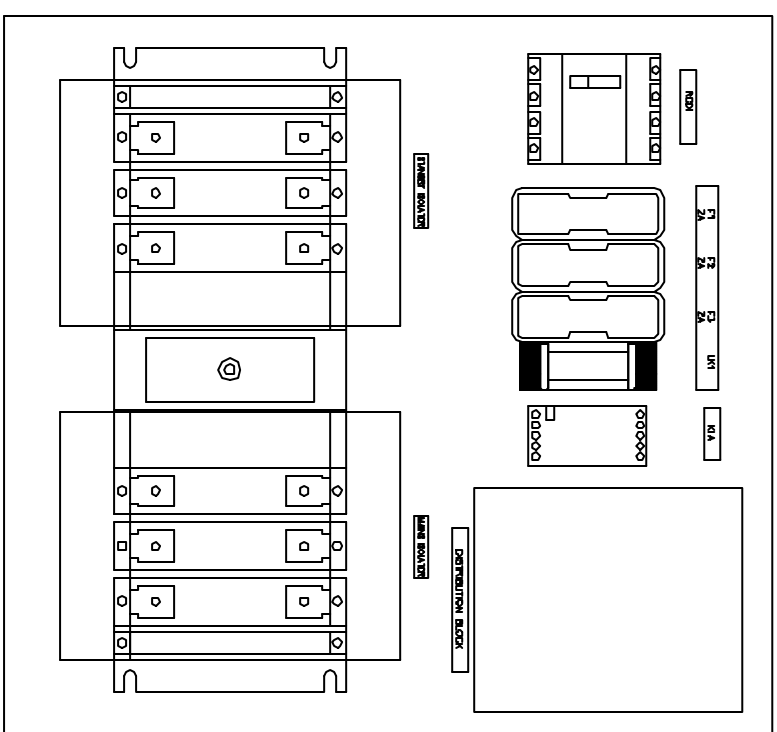
CUBICLE A2
DISTRIBUTION SECTION



NOTE:
ALL MCB's TO BE MOUNTED ON BACKPLATE BEHIND PERSPEX SHROUD. ONLY THE MCB DOLLIES ARE TO PROTRUDE THROUGH THE SHROUD. ALL SPACE FOR FUTURE MCB's ARE TO BE BLANKED OFF.

CUBICLE NUMBERS WILL CHANGE BETWEEN STANDARD AND LOW PANEL ARRANGEMENTS


CUBICLE A3
MAIN INCOMER AND GENERATOR SECTION



FOR TT EARTHING SYSTEMS

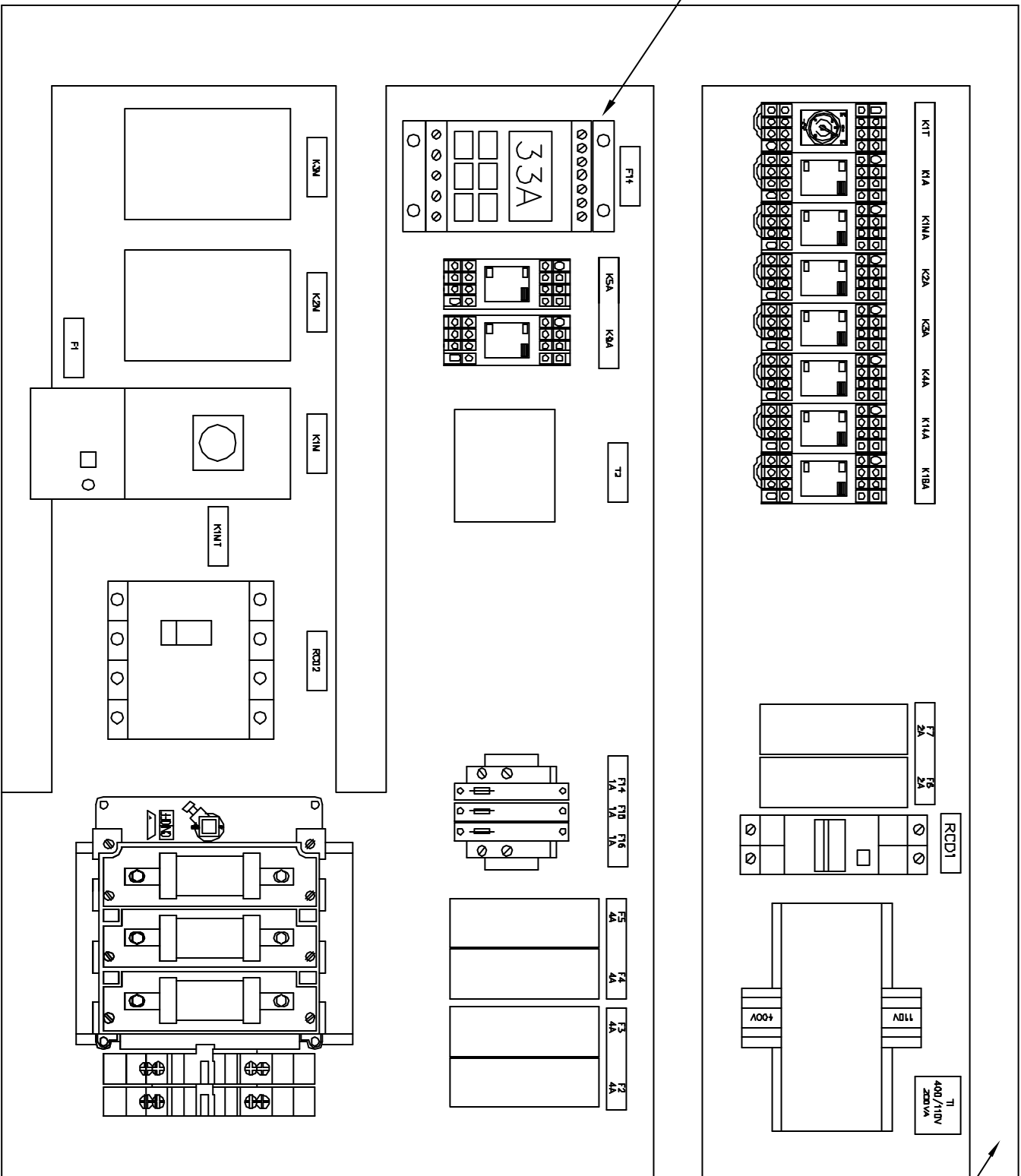
REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			

NORTHUMBRIAN WATER LTD
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 DURHAM
 DH1 5FJ

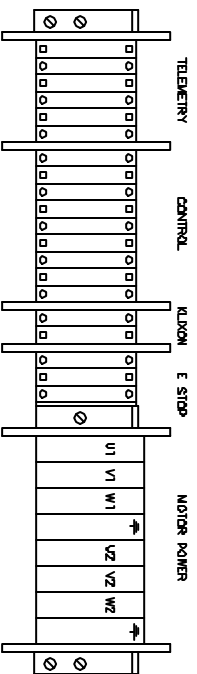


PROJECT: SEWAGE PUMPING STATIONS
DRAWING TITLE: BACKPLATE ARRANGEMENT MAIN INCOMER & DISTRIBUTION SECTIONS (TT)
DRAWING No: E0702 / 306-1B
 SHEET: 1 OF 1
DATE **REV** **DRN** **CHD** **APP**
 01/08/00 01 DO DG DG

DIGITAL LOAD MONITOR TOP HAT BRACKET POSITIONED TO ALLOW THE LOAD MONITOR TO BE ADJUSTED FROM THE CONTROL PANEL DOOR WHEN CLOSED WITH THE ISOLATOR ON



CABLE TRUNKING



- NOTE :
1. TERMINALS TO BE MOUNTED ON ANGLE BRACKETS SECURED TO BASE OF CUBICLE
 2. FOR DOL STARTERS REMOVE DETAILS OF K2M & K3M
 3. F14 TO BE A DIGITAL LOAD MONITOR FOR BOTH UNDER AND OVERLOAD, UNIT SHALL MEASURE THE TRUE POWER, NOT PHASE ANGLE.

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
				LOAD MONITOR ADDED			

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 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

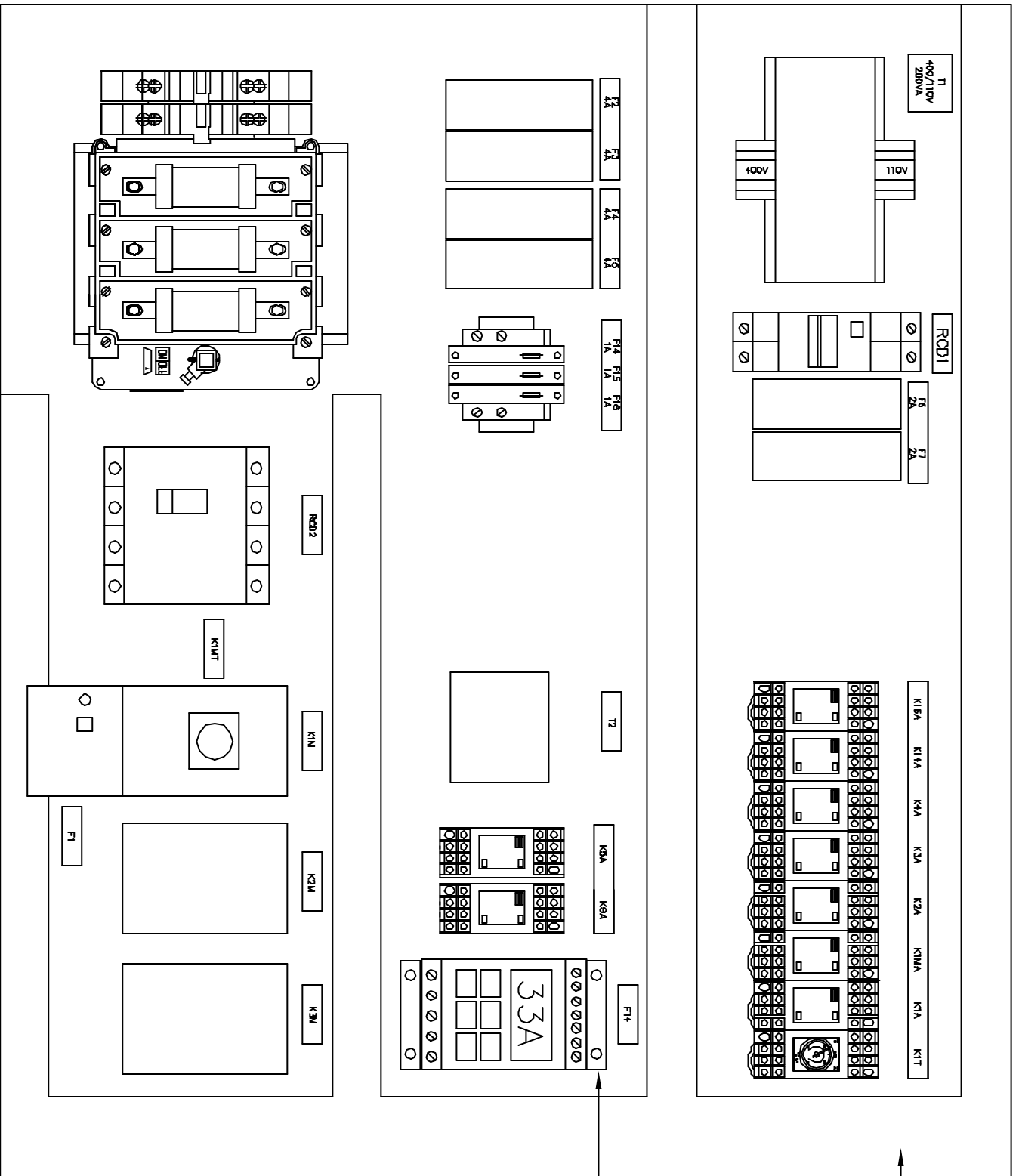
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE:
 BACKPLATE ARRANGEMENT
 PUMP No1 (A1)
 STARTER SECTION

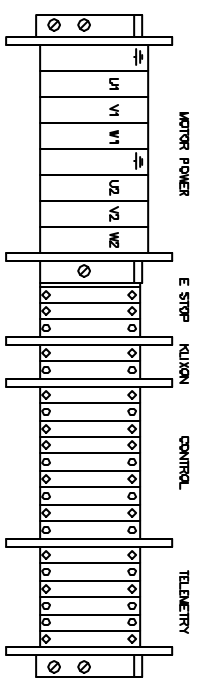
DRAWING No: E0702 / 307-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



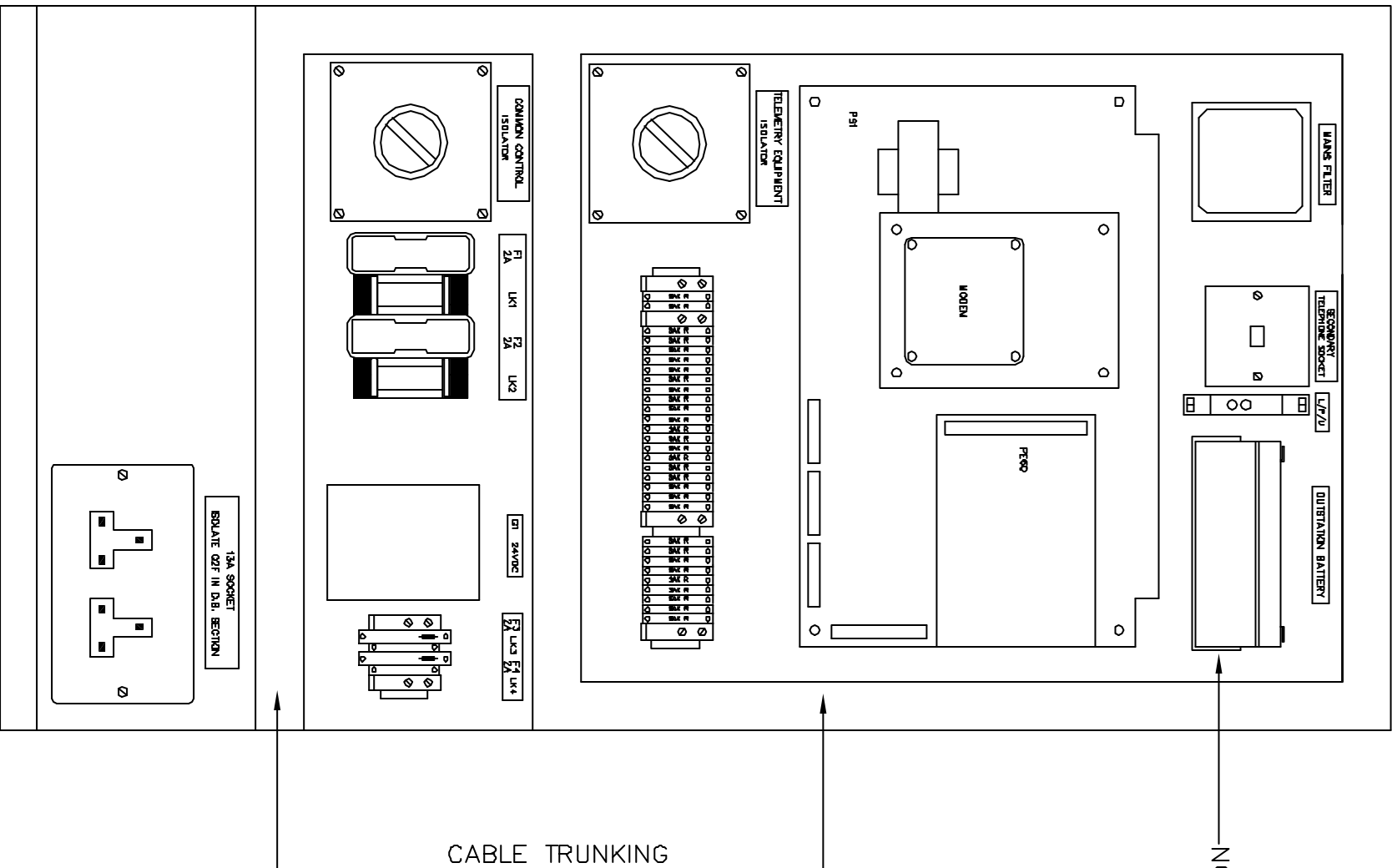
- NOTE :
1. TERMINALS TO BE MOUNTED ON ANGLE BRACKETS SECURED TO BASE OF CUBICLE
 2. FOR DOL STARTERS REMOVE DETAILS OF K2M & K3M
 3. F14 TO BE A DIGITAL LOAD MONITOR FOR BOTH UNDER AND OVERLOAD, UNIT SHALL MEASURE THE TRUE POWER, NOT PHASE ANGLE.



REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
LOAD MONITOR ADDED				01/08/00			
DRAWING TITLE: BACKPLATE ARRANGEMENT PUMP No2 (B1) STARTER SECTION							
DRAWING No: E0702 / 308-1A							
SHEET: 1 OF 1							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
01/08/00	01	DO	DG	DG			

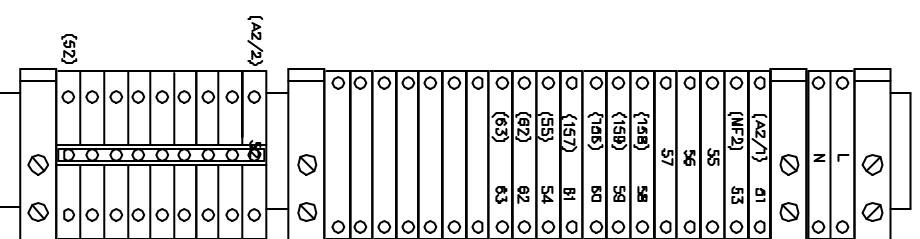
PROJECT: SEWAGE PUMPING STATIONS

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ



NOTE BATTERY MOUNTING BRACKET SHALL BE FITTED DURING THE MANUFACTURE OF THE STEELWORK

TELEMETRY OUTSTATION TERMINAL BLOCK



REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DD	DG	DG	01	DD	DG	DG

DATE 01/08/00

OUTSTATION MOVED FOR EASE OF ACCESS

NORTHUMBRIAN WATER LTD
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 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: BACKPLATE ARRANGEMENT COMMON CONTROLS & TELEMETRY SECTION (PSTN)

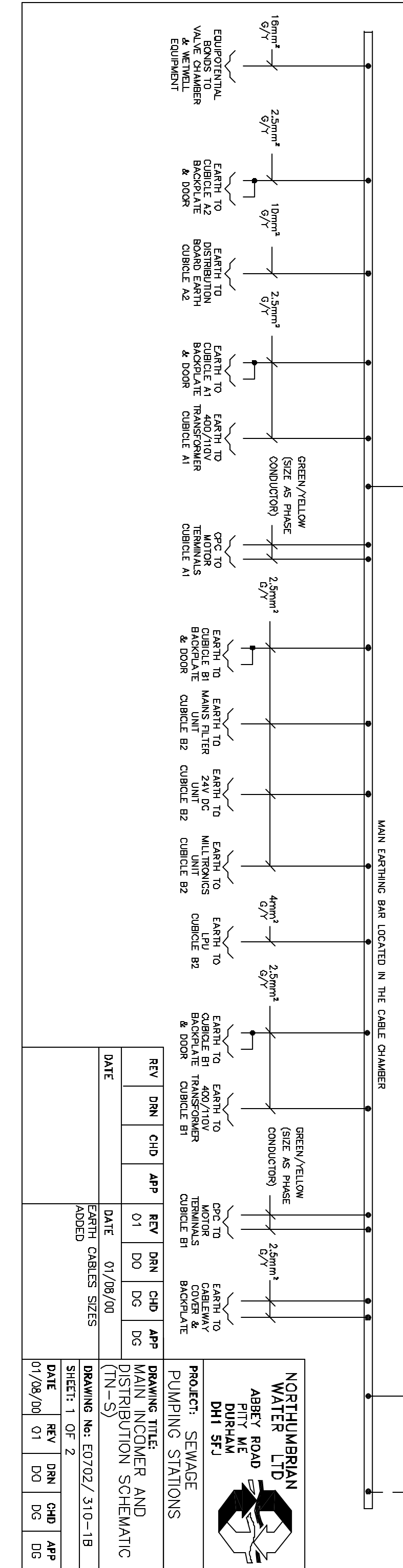
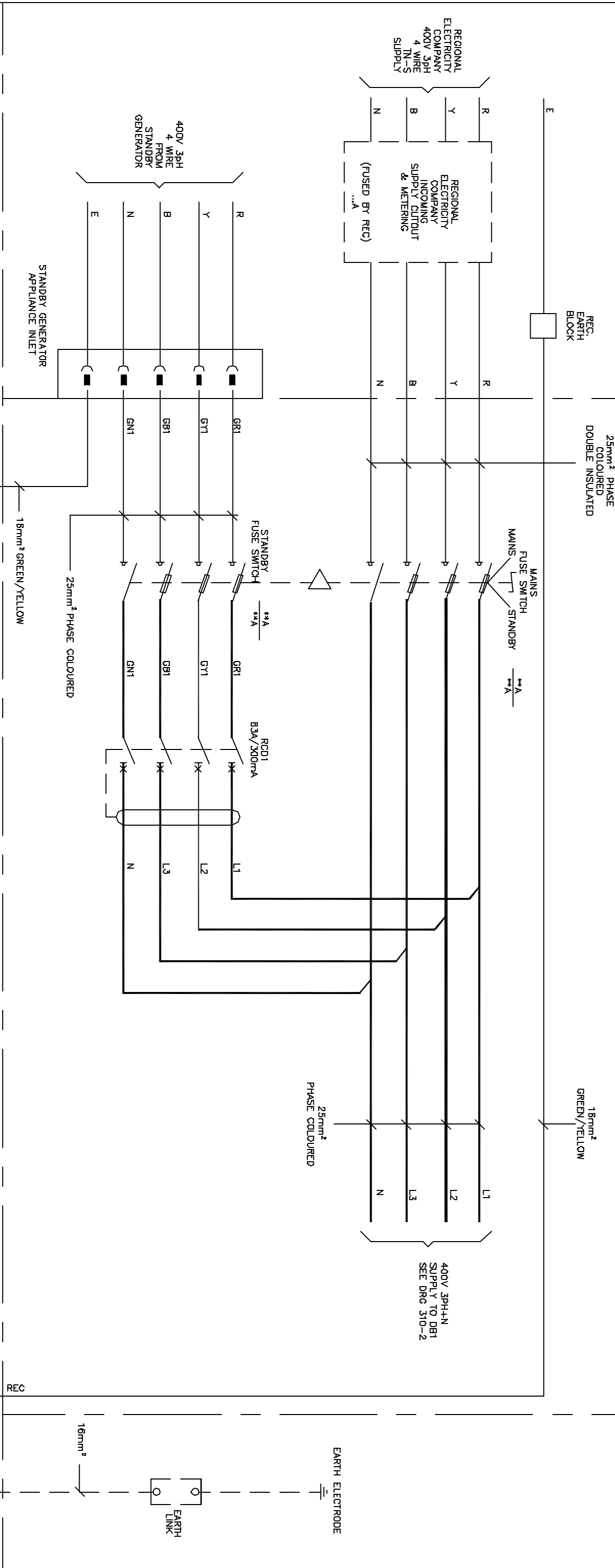
DRAWING No: E0702 / 309-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DD	DG	DG

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---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

INCOMING SUPPLIES AND DISTRIBUTION SECTION



REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE: 01/08/00

EARTH CABLES SIZES ADDED

DRAWING TITLE: MAIN INCOMER AND DISTRIBUTION SCHEMATIC (TN-S)

DRAWING No: E0702/310-1B

SHEET: 1 OF 2

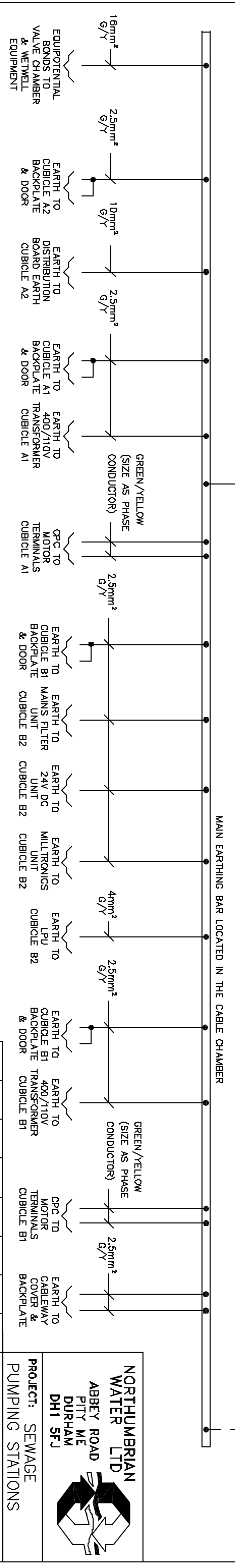
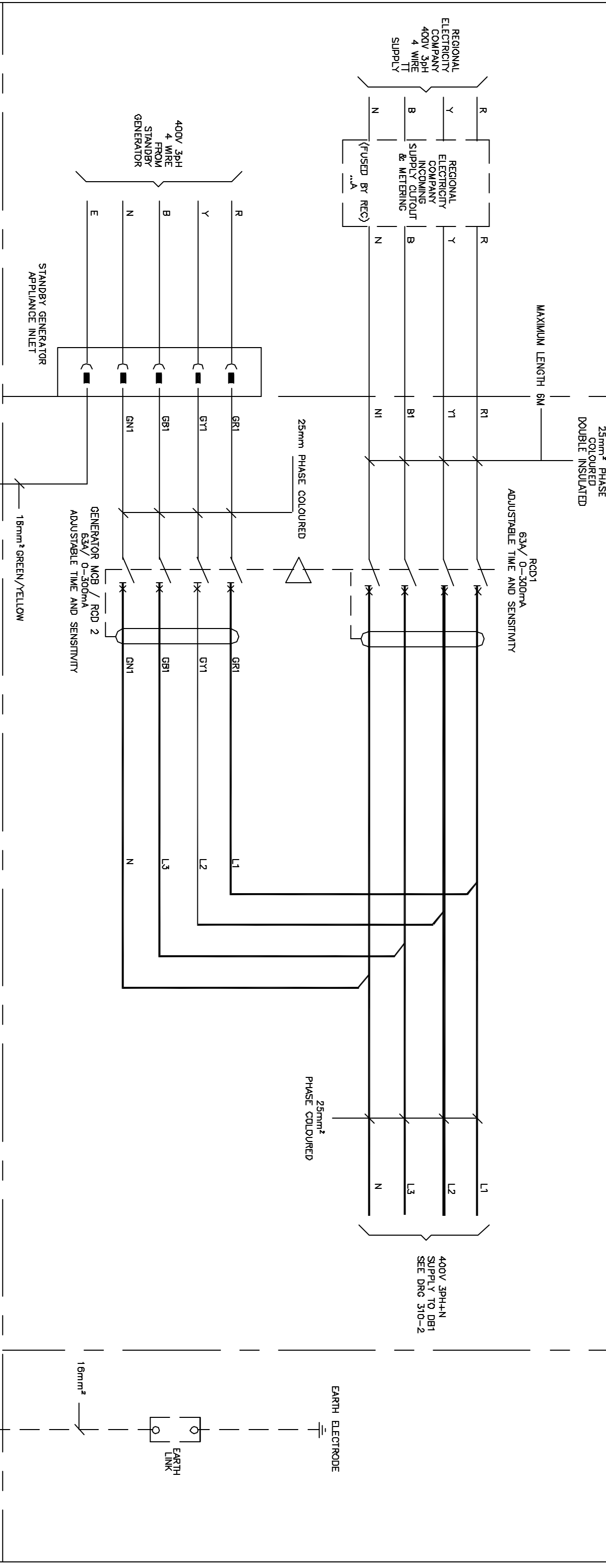
DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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INCOMING SUPPLIES AND DISTRIBUTION SECTION



REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE 01/08/00

EARTH CABLE SIZES ADDED

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

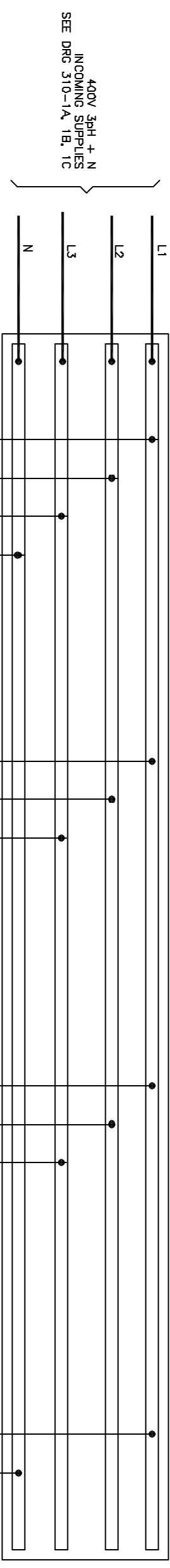
DRAWING TITLE: MAIN INCOMER AND DISTRIBUTION SCHEMATIC (TT)

DRAWING No: E0702/ 310-1C

SHEET: 1 OF 2

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

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400V 3ph + N
INCOMING SUPPLIES
SEE DRG 310-1A, 1B, 1C

DISTRIBUTION BLOCK

ELECTRICITY SUPPLY CONDITION
TO COMMON CONTROLS AND TELEMETRY
SEE DRG 315-1A AND 315-1B

400VAC SUPPLY TO PUMP 1 STARTER
FOR PUMPS 1 & 2 STAR DELTA TYPE USE DRG'S 312-1A OR 312-1C

400VAC SUPPLY TO PUMP 2 STARTER
FOR PUMPS 1 & 2 STAR DELTA TYPE USE DRG'S 312-1B OR 312-1D

230VAC SUPPLY
INCOMING SUPPLIES AND DISTRIBUTION
SEE DRG XXXX

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE	DATE
01/08/00	01/08/00

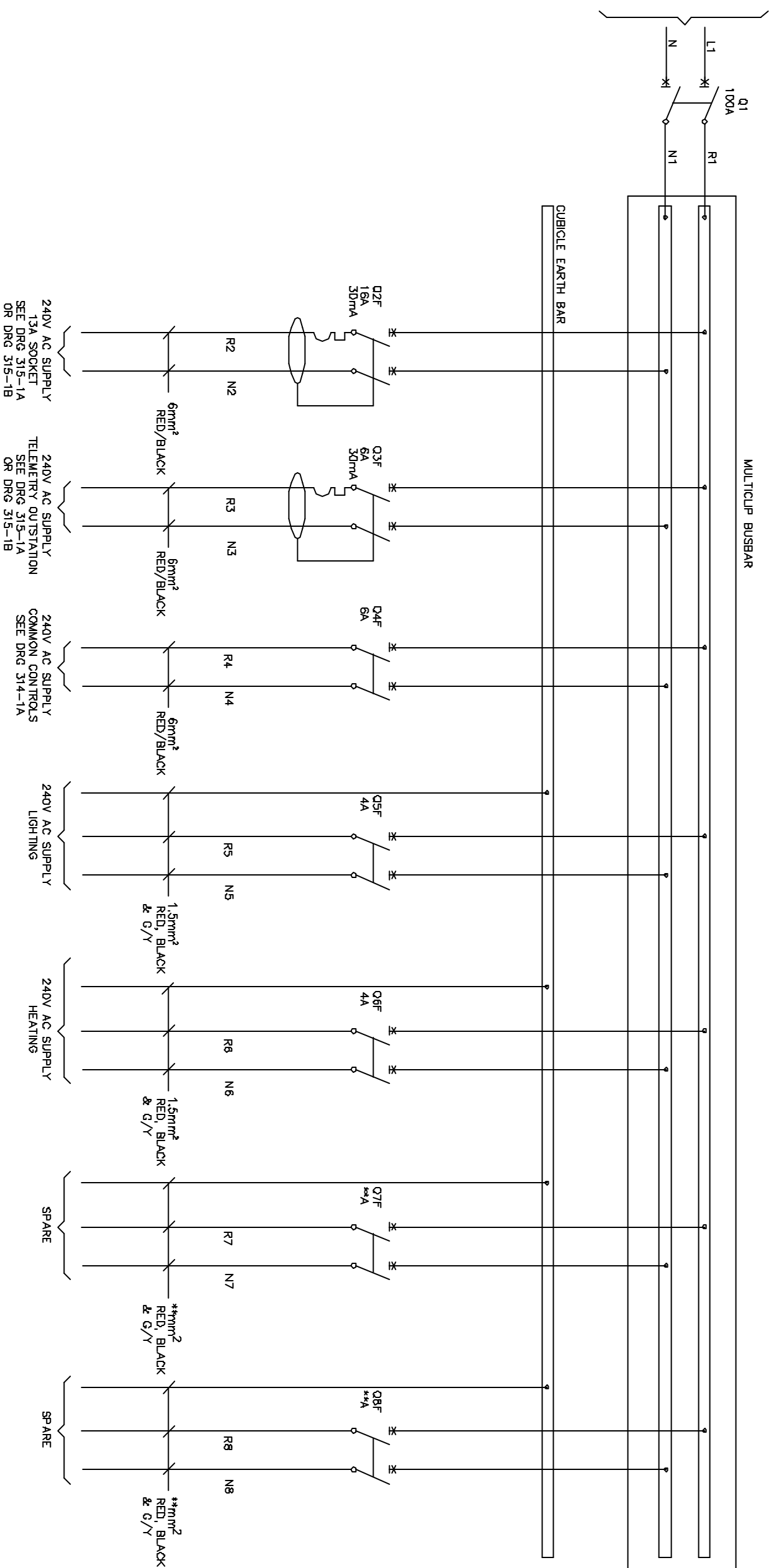
DRAWING SHEET
REFERENCES CHANGED

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS
 DRAWING TITLE: MAIN INCOMER AND DISTRIBUTION SECTION WIRING SCHEMATIC
 DRAWING No: E0702/ 310-2A
 SHEET: 2 OF 2

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

230V 1PH + N SUPPLY
FROM LINE 22
ON DRG 310-2



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PROJECT: SEWAGE PUMPING STATIONS

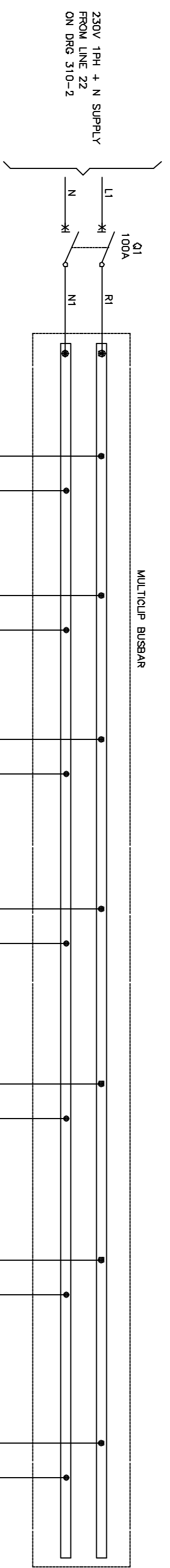
REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DRAWING TITLE:
 DISTRIBUTION SECTION
 WIRING SCHEMATIC (A2)
 (TN-S & TN-C-S)

DATE	DRAWING No:	DATE	REV	DRN	CHD	APP
01/08/00	E0702/311-1A	01/08/00	01	DO	DG	DG

SHEET: 1 OF 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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230V 1PH + N SUPPLY FROM LINE 22 ON DRG 310-2

100A Q1

L1 N1

MULTICLIP BUSBAR

CUBICLE EARTH BAR

Q1F 16A 30mA

R2 N2 6mm² RED/BLACK

Q2F 6A 30mA

R3 N3 6mm² RED/BLACK

Q3F 6A 30mA

R4 N4 6mm² RED/BLACK

Q4F 6A 30mA

R5 N5 1.5mm² RED, BLACK & G/Y

Q5F 4A 30mA

R6 N6 1.5mm² RED, BLACK & G/Y

Q6F 4A 30mA

R7 N7 **mm² RED, BLACK & G/Y

Q7F **A 30mA

R8 N8 **mm² RED, BLACK & G/Y

Q8F **A 30mA

240V AC SUPPLY 13A SOCKET SEE DRG 315-1A OR DRG 315-1B

240V AC SUPPLY TELEMETRY OUTSTATION SEE DRG 315-1A OR DRG 315-1B

240V AC SUPPLY COMMON CONTROLS SEE DRG 314-1A

240V AC SUPPLY LIGHTING

240V AC SUPPLY HEATING

SPARE

SPARE

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DD	DG	DG	01	DD	DG	DG

DATE 01/08/00

DRAWING REFERENCE SHEET NUMBERS CHANGED

DRAWING No: E0702/ 311-1B

SHEET: 1 OF 1

PROJECT: SEWAGE PUMPING STATIONS

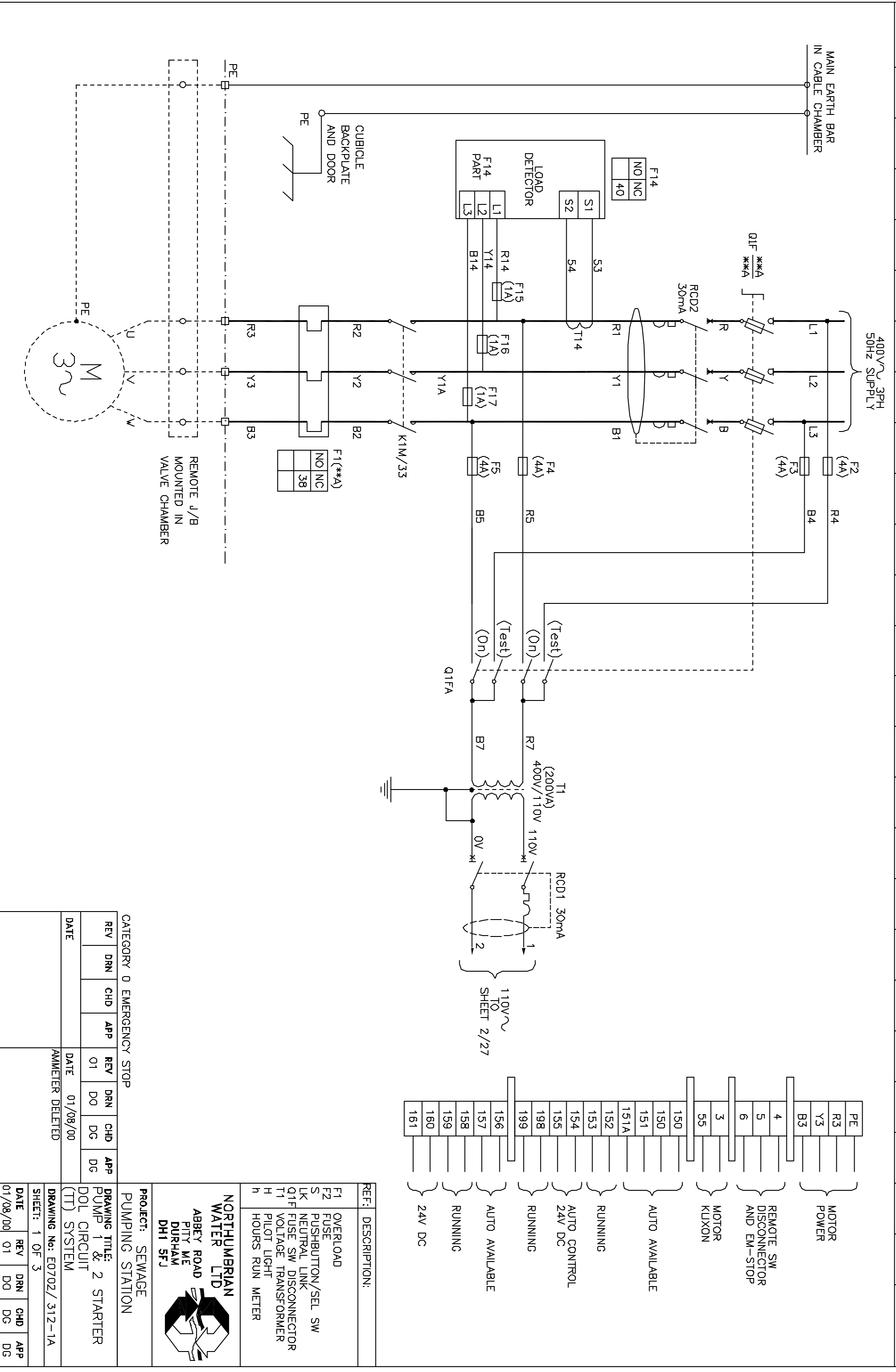
DRAWING TITLE: DISTRIBUTION SECTION WIRING SCHEMATIC (A2)

(TT)

NORTHUMBRIAN WATER LTD
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DATE	REV	DRN	CHD	APP
01/08/00	01	DD	DG	DG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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PE	
R3	
Y3	
B3	
4	REMOTE SW DISCONNECTOR AND EM-STOP
5	
6	
3	MOTOR KLIXON
55	
150	
150	
151	
151A	
152	
153	
154	
155	
198	
199	
156	
157	
158	
159	
160	
161	

REF: DESCRIPTION:

- F1 OVERLOAD
- F2 FUSE
- S PUSHBUTTON/SEL SW
- LK NEUTRAL LINK
- Q1F FUSE SW DISCONNECTOR
- T1 VOLTAGE TRANSFORMER
- H PILOT LIGHT
- H HOURS RUN METER

NORTHUMBRIAN WATER LTD
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 DH1 5FJ

PROJECT: SEWAGE PUMPING STATION

DRAWING TITLE: PUMP 1 & 2 STARTER DOL CIRCUIT (TT) SYSTEM

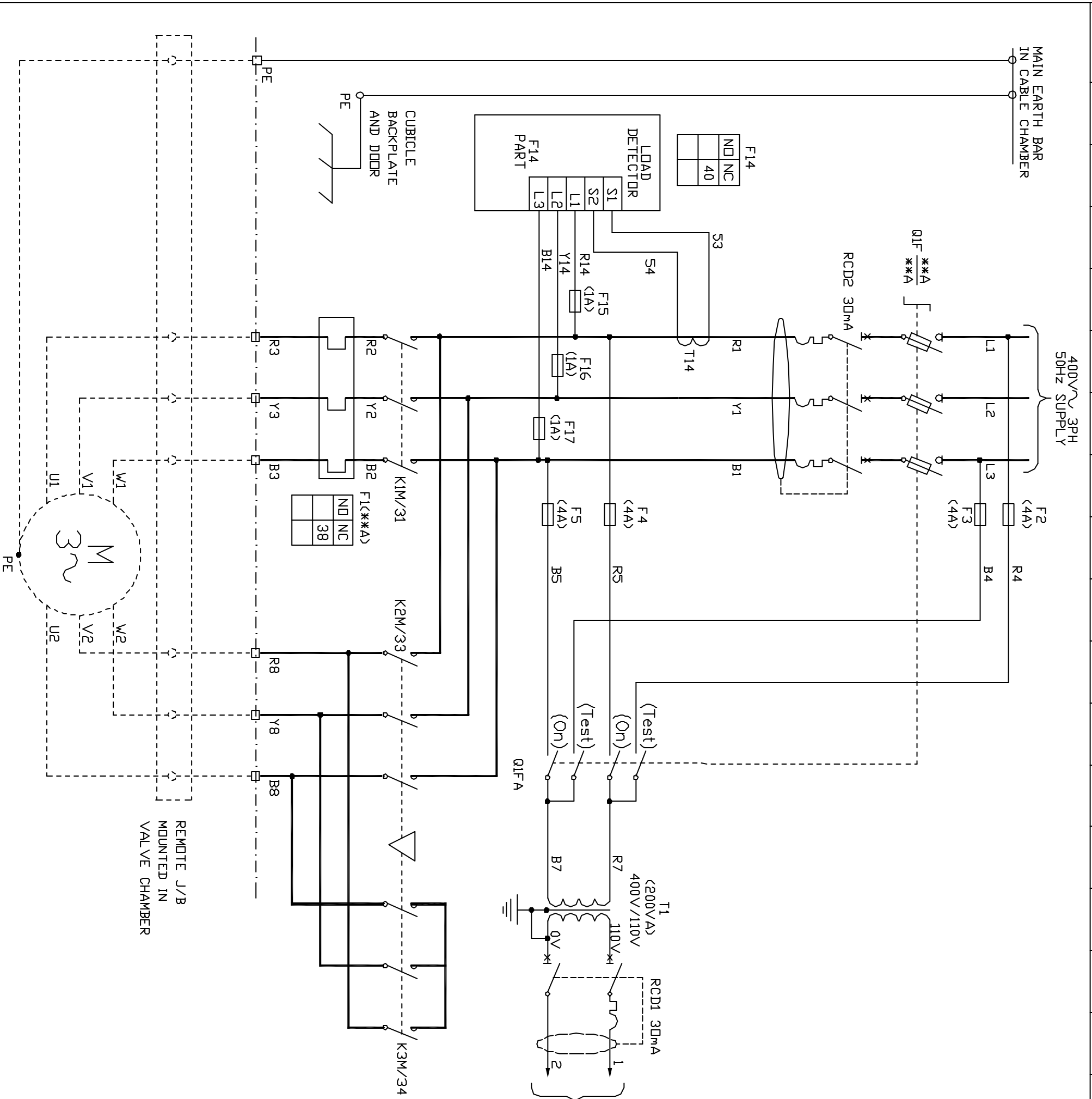
DATE	01/08/00
REV	01
DRN	DO
CHD	DG
APP	DG
DATE	01/08/00
REV	01
DRN	DO
CHD	DG
APP	DG

CATEGORY 0 EMERGENCY STOP

AMMETER DELETED

DATE	01/08/00
REV	01
DRN	DO
CHD	DG
APP	DG

SHEET: 1 OF 3
 DRAWING No: E0702/312-1A



R3	Y3	B3	PE	R8	Y8	B8	4	5	6	3	55	150	150	151	151A	152	153	154	155	198	199	156	157	158	159	160	161								
MOTOR POWER				MOTOR KLIXON				REMOTE SW DISCONNECTOR AND EM-STOP				MOTOR CONTROL 24V DC				RUNNING				AUTO AVAILABLE				RUNNING				AUTO AVAILABLE				24V DC			

REF: DESCRIPTION:

- F1 OVERLOAD
- F2 FUSE
- S PUSHBUTTON/SEL SW
- LK NEUTRAL LINK
- Q1F FUSE SW DISCONNECTOR
- T1 VOLTAGE TRANSFORMER
- H PILOT LIGHT
- h HOURS RUN METER

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
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PROJECT: SEWAGE PUMPING STATION

DRAWING TITLE: PUMP 1 & 2 STARTER STAR DELTA CIRCUIT (TT) SYSTEM

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

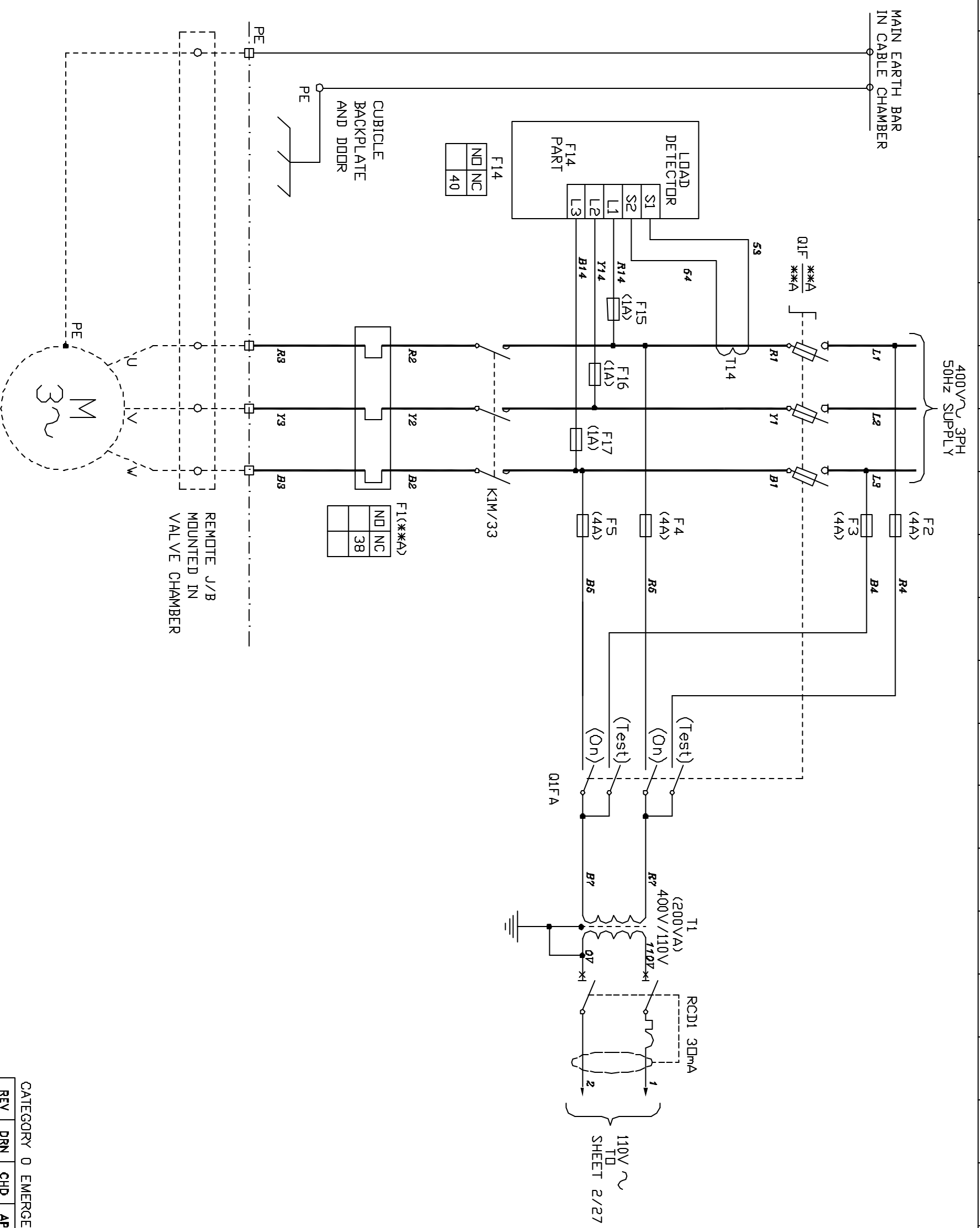
DRAWING No: E0702/312-1B
 SHEET: 1 OF 3

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE: 01/08/00
 AMMETER REMOVED

CATEGORY 0 EMERGENCY STOP



PE	MOTOR POWER
R3	
Y3	
B3	
4	REMOTE SW DISCONNECTOR AND EM-STOP
5	
6	
3	MOTOR KLIXON
SS	
150	AUTO AVAILABLE
150	
151	
151A	
152	RUNNING
153	
154	AUTO CONTROL
155	24V DC
198	RUNNING
199	
156	AUTO AVAILABLE
157	
158	RUNNING
159	
160	
161	24V DC

REF: DESCRIPTION:

- F1 OVERLOAD
- F2 FUSE
- S PUSHBUTTON/SEL SW
- LK NEUTRAL LINK
- Q1F FUSE SW DISCONNECTOR
- T1 VOLTAGE TRANSFORMER
- H PILOT LIGHT
- h HOURS RUN METER

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PROJECT: SEWAGE PUMPING STATION

DRAWING TITLE: PUMP 1 & 2 STARTER PUL CIRCUIT (TN-S & TN-C) SYSTEM

DRAWING No: E0702/312-1C

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

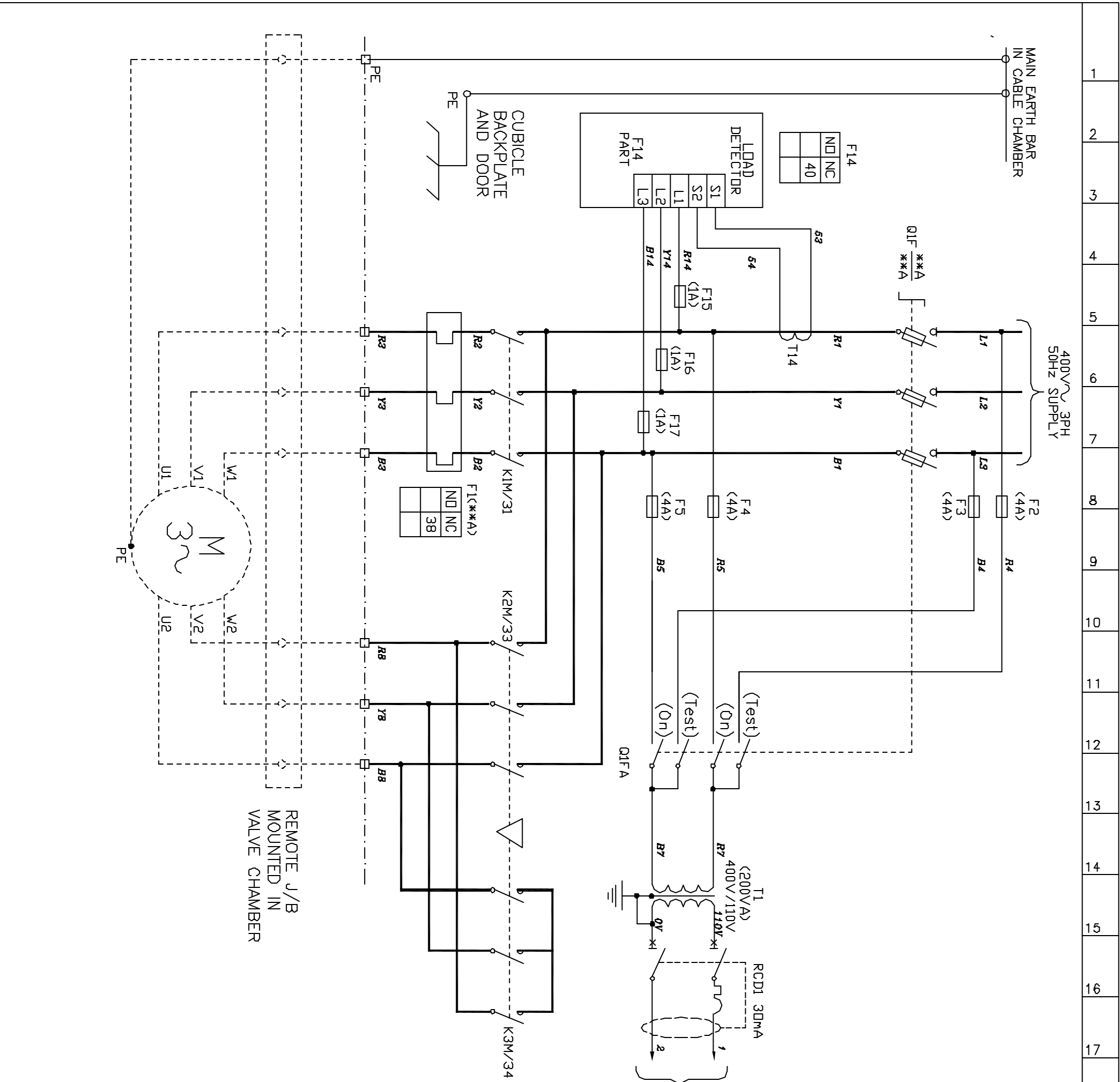
SHEET: 1 OF 3

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE: 01/08/00

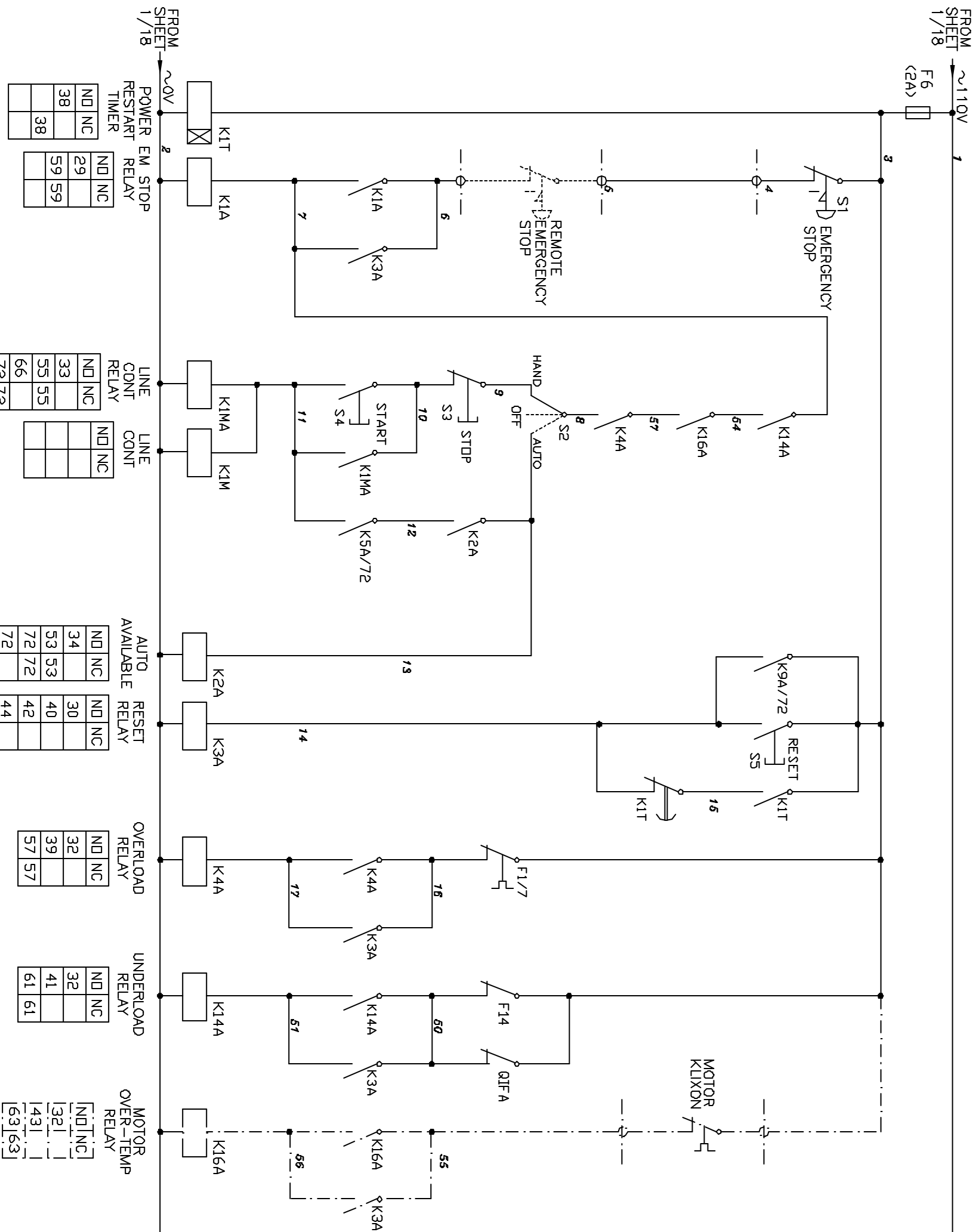
ANMMETER REMOVED

CATEGORY 0 EMERGENCY STOP



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
<p>MAIN EARTH BAR IN CABLE CHAMBER</p> <p>400V 3PH 50Hz SUPPLY</p> <p>CUBICLE BACKPLATE AND DOOR</p> <p>REMOTE J/B MOUNTED IN VALVE CHAMBER</p> <p>110V TD SHEET 2/27</p>																					<p>R3</p> <p>Y3</p> <p>B3</p> <p>PE</p> <p>R8</p> <p>Y8</p> <p>B8</p>	<p>4</p> <p>5</p> <p>6</p>	<p>3</p> <p>55</p>	<p>150</p> <p>150</p> <p>151</p> <p>151A</p> <p>152</p> <p>153</p> <p>154</p> <p>155</p> <p>198</p> <p>199</p>	<p>156</p> <p>157</p> <p>158</p> <p>159</p> <p>160</p> <p>161</p>	<p>24V DC</p>
<p>PROJECT: SEWAGE PUMPING STATION</p> <p>DRAWING TITLE: PUMP 1 & 2 STARTER STAR DELTA CIRCUIT (TN-S & TN-C) SYSTEM</p> <p>DRAWING No: E0702/312-1D</p> <p>SHEET: 1 OF 3</p> <p>DATE 01/08/00</p> <p>REV 01</p> <p>DRN DO</p> <p>CHD DG</p> <p>APP DG</p>																					<p>REF: DESCRIPTION:</p> <p>F1 OVERLOAD</p> <p>F2 FUSE</p> <p>S PUSHBUTTON/SEL SW</p> <p>LK NEUTRAL LINK</p> <p>Q1F FUSE SW DISCONNECTOR</p> <p>T1 VOLTAGE TRANSFORMER</p> <p>H PILOT LIGHT</p> <p>h HOURS RUN METER</p>					

TO SHEET 3/52



NOTE:
MOTOR OVER TEMP
CIRCUITRY TO BE
FITTED WHEN REQUIRED.

POWER EM RESTART	ND	NC
TIMER	38	38

STOP RELAY	ND	NC
	29	59

LINE CONT RELAY	ND	NC
	33	55

LINE CONT	ND	NC
	66	72

AUTO AVAILABLE	ND	NC
	34	53

RESET RELAY	ND	NC
	30	40

OVERLOAD RELAY	ND	NC
	32	39

UNDERLOAD RELAY	ND	NC
	32	41


MOTOR OVER-TEMP RELAY	ND	NC
	132	143

	163	163
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CATEGORY 0 EMERGENCY STOP

PROJECT: SEWAGE PUMPING STATION

NORTHUMBRIAN WATER LTD
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 DURHAM
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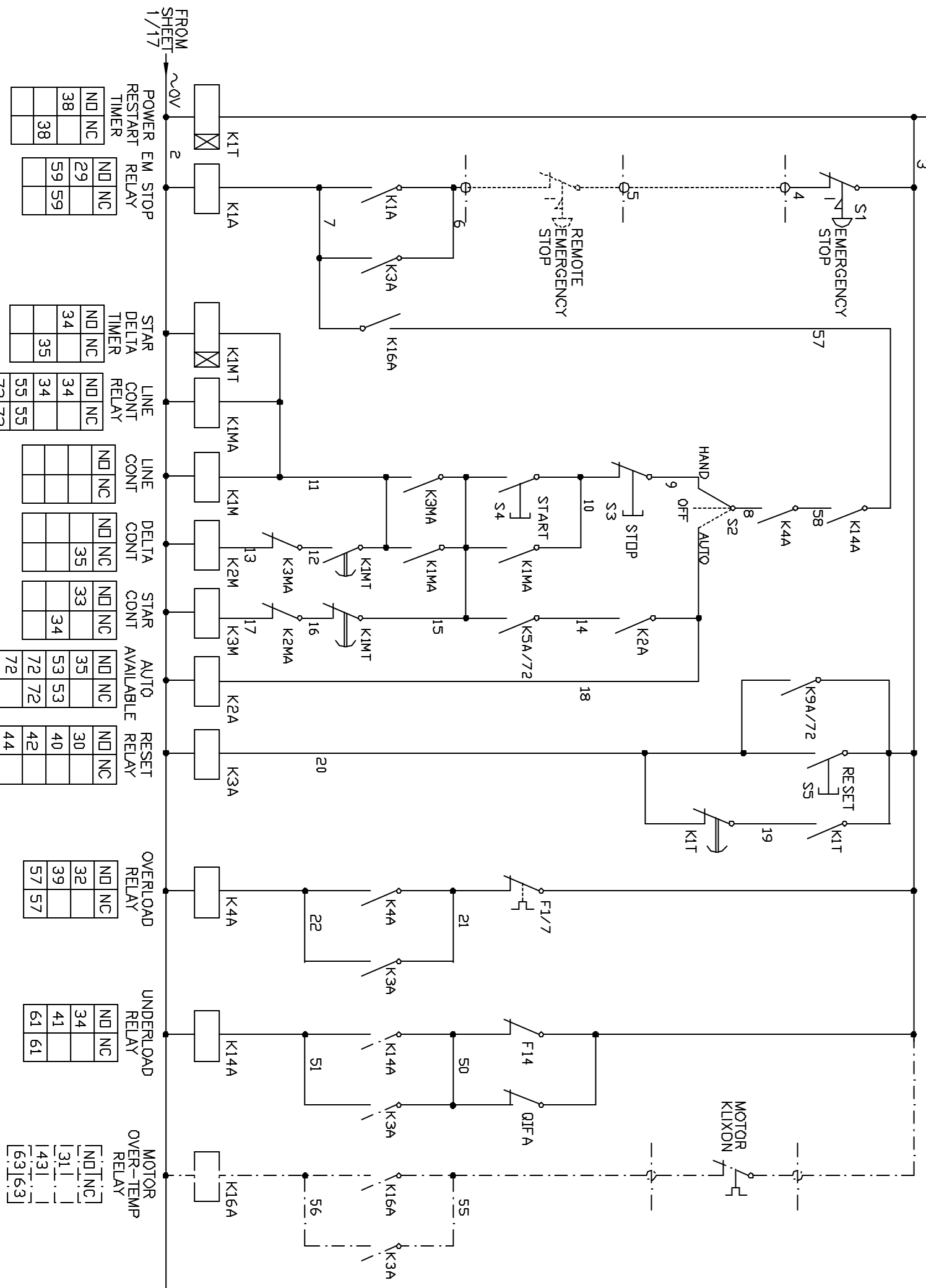
REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE: 01/08/00

UNDERLOAD RELAY NOW NOT OPTIONAL

DRAWING TITLE:			
PUMP 2 (B1) STARTER			
DOL CONTROL SCHEMATIC			
DRAWING No: E0702/312-2B			
SHEET: 2 OF 3			
DATE	REV	DRN	APP
01/08/00	01	DO	DG

TO SHEET 3/52



NOTE:
MOTOR OVER TEMP
CIRCUITRY TO BE
FITTED WHEN REQUIRED.

FROM SHEET 1/17	~0V	2	K1T	POWER EM STOP RESTART TIMER	ND	NC	38	38
			K1A	STOP RELAY	ND	NC	29	59

			K1M	STAR DELTA TIMER	ND	NC	34	35
			K1M	LINE CONT RELAY	ND	NC	34	34
			K1M	LINE CONT RELAY	ND	NC	55	55
			K1M	LINE CONT RELAY	ND	NC	72	72

			K1M	STAR CONT	ND	NC	33	34
			K2M	STAR CONT	ND	NC	33	34
			K3M	STAR CONT	ND	NC	33	34

			K2A	AUTO AVAILABLE RELAY	ND	NC	35	53
			K2A	AUTO AVAILABLE RELAY	ND	NC	53	53
			K2A	AUTO AVAILABLE RELAY	ND	NC	72	72

			K3A	RESET RELAY	ND	NC	30	40
			K3A	RESET RELAY	ND	NC	40	42
			K3A	RESET RELAY	ND	NC	42	44

			K4A	OVERLOAD RELAY	ND	NC	32	39
			K4A	OVERLOAD RELAY	ND	NC	39	57
			K4A	OVERLOAD RELAY	ND	NC	57	57

			K14A	UNDERLOAD RELAY	ND	NC	34	41
			K14A	UNDERLOAD RELAY	ND	NC	41	61
			K14A	UNDERLOAD RELAY	ND	NC	61	61

			K16A	MOTOR OVER-TEMP RELAY	ND	NC	31	43
			K16A	MOTOR OVER-TEMP RELAY	ND	NC	43	63
			K16A	MOTOR OVER-TEMP RELAY	ND	NC	63	63

CATEGORY 0 EMERGENCY STOP

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
				UNDERLOAD RELAY NOT OPTIONAL			

PROJECT: SEWAGE PUMPING STATION

DRAWING TITLE: PUMP 1 (A1) STARTER STAR DELTA CONTROL SCHEMATIC

DRAWING No: E0702/312-2C

SHEET: 2 OF 3

DATE: 01/08/00

REV: 01

DRN: DO

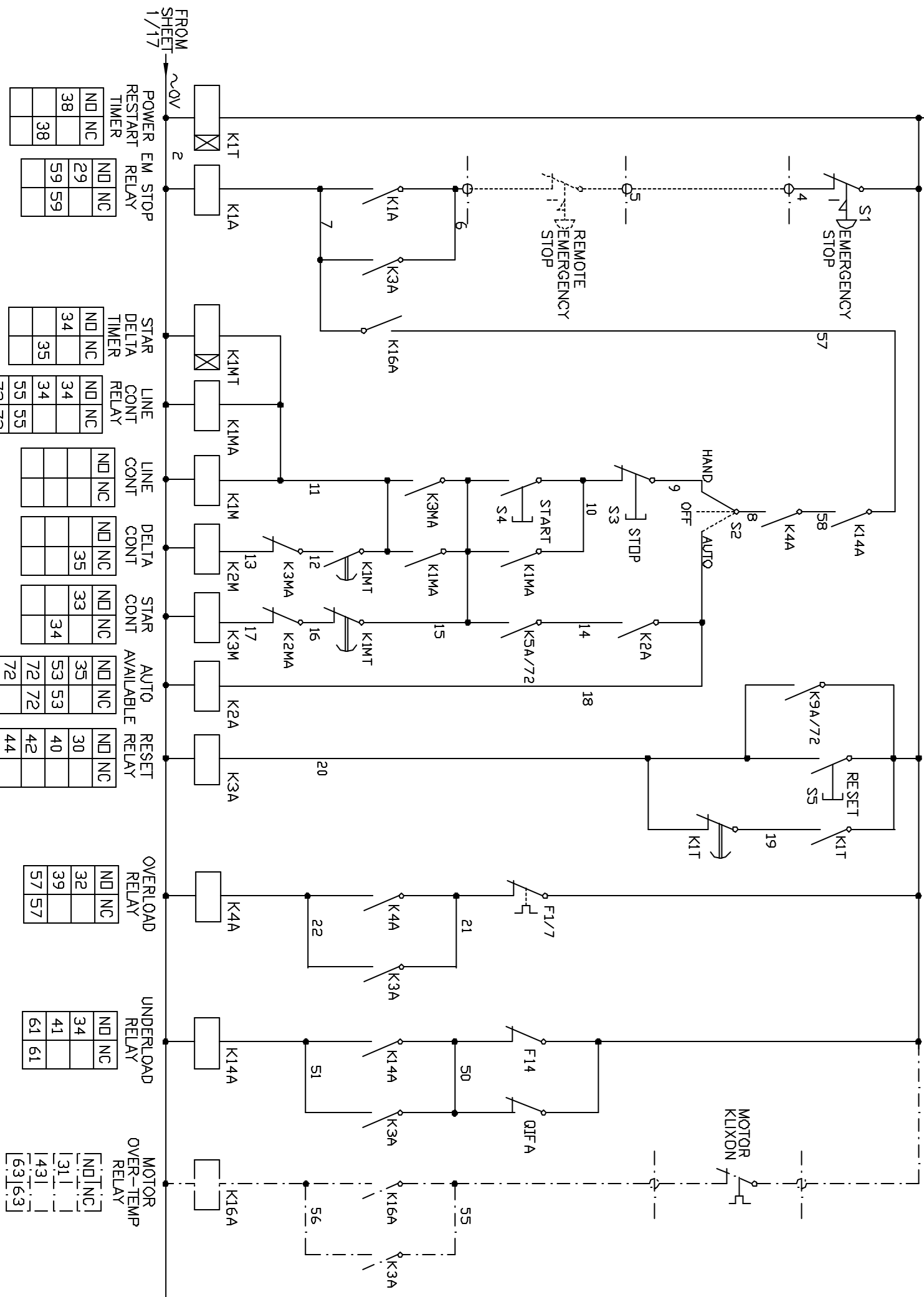
CHD: DG

APP: DG



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 PITY ME
 DURHAM
 DH1 5FJ

TO SHEET 3/52



NOTE:
MOTOR OVER TEMP
CIRCUITRY TO BE
FITTED WHEN REQUIRED.

POWER RESTART TIMER	EM STOP RELAY	STAR DELTA TIMER	LINE COUNT RELAY	LINE COUNT RELAY	DELTA COUNT RELAY	STAR COUNT RELAY	AUTO AVAILABLE RELAY	RESET RELAY	OVERLOAD RELAY	UNDERLOAD RELAY	MOTOR OVER-TEMP RELAY
ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC	ND NC
38	29	34	34	35	33	34	35	30	32	34	31
38	59	35	55	72	33	34	53	40	39	41	1431
			72	72	72	72	44	57	57	61	63

PROJECT: SEWAGE PUMPING STATION

DRAWING TITLE: PUMP 2 (B1) STARTER STAR DELTA CONTROL SCHEMATIC

DRAWING No: E0702/312-2D

SHEET: 2 OF 3

DATE: 01/08/00

REV: 01

DRN: DO

CHD: DG

APP: DG

UNDERLOAD CIRCUIT NOT NOW OPTIONAL

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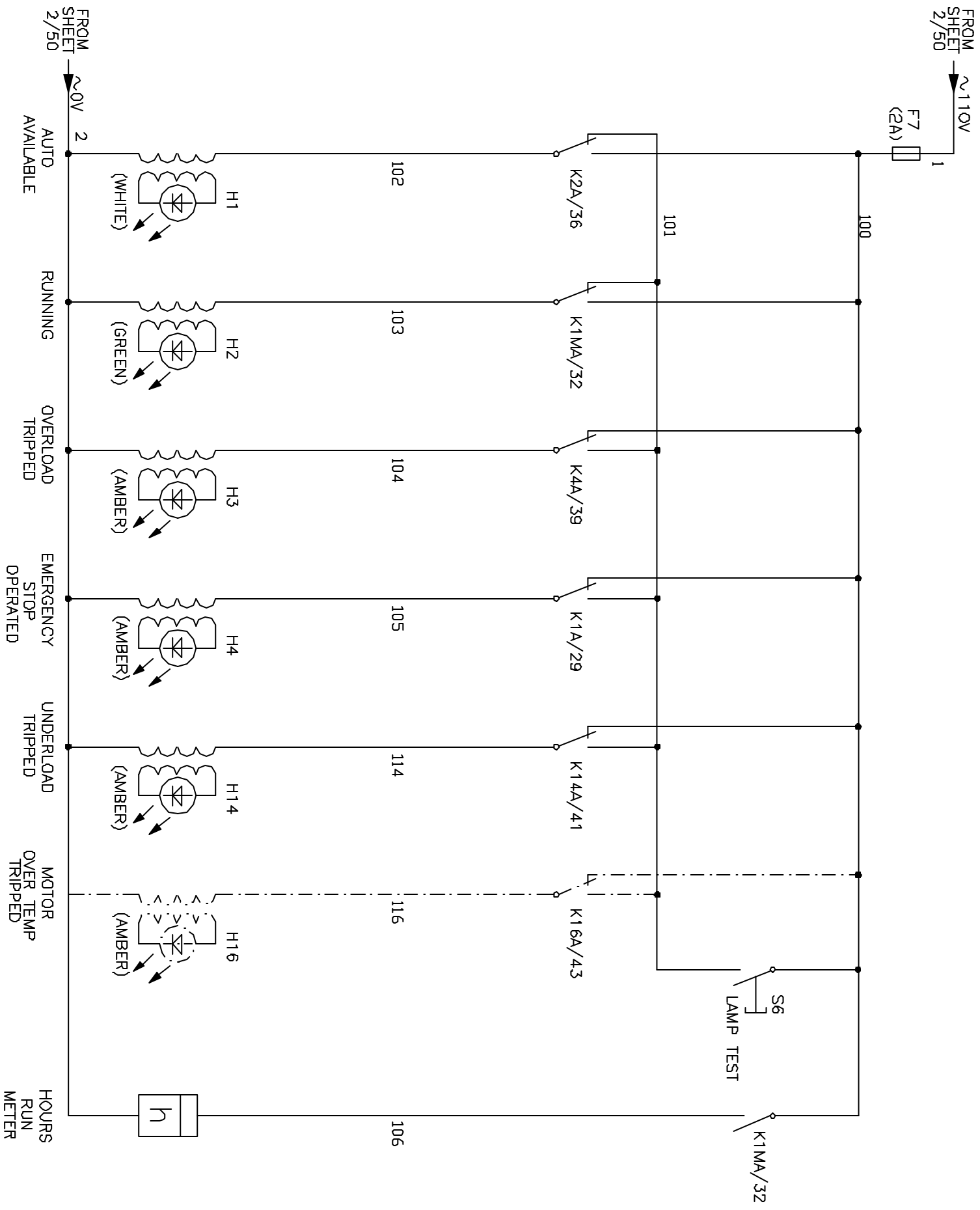
FROM SHEET 1/17

FROM SHEET 1/17

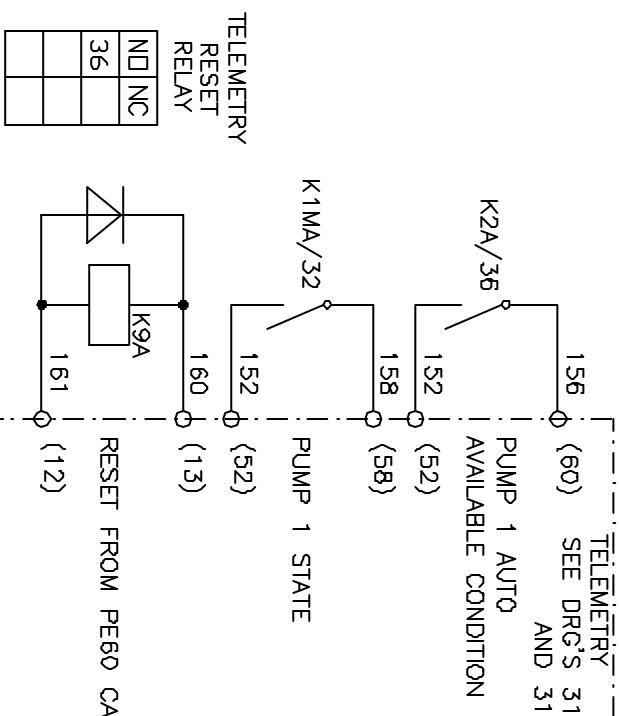
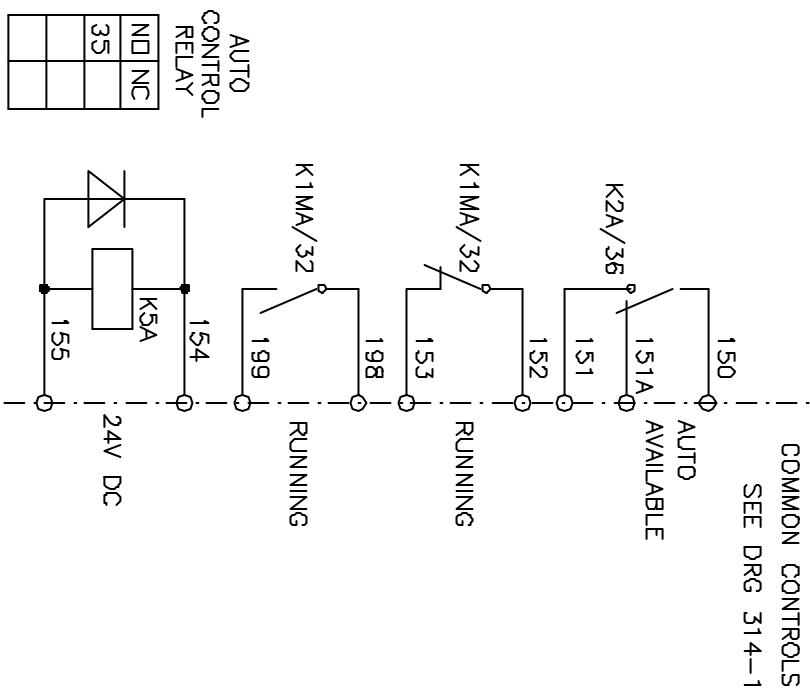
TO SHEET 3/52

TO SHEET 3/52

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
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NOTE:
MOTOR OVER TEMP
CIRCUITRY TO BE FITTED WHEN REQUIRED.



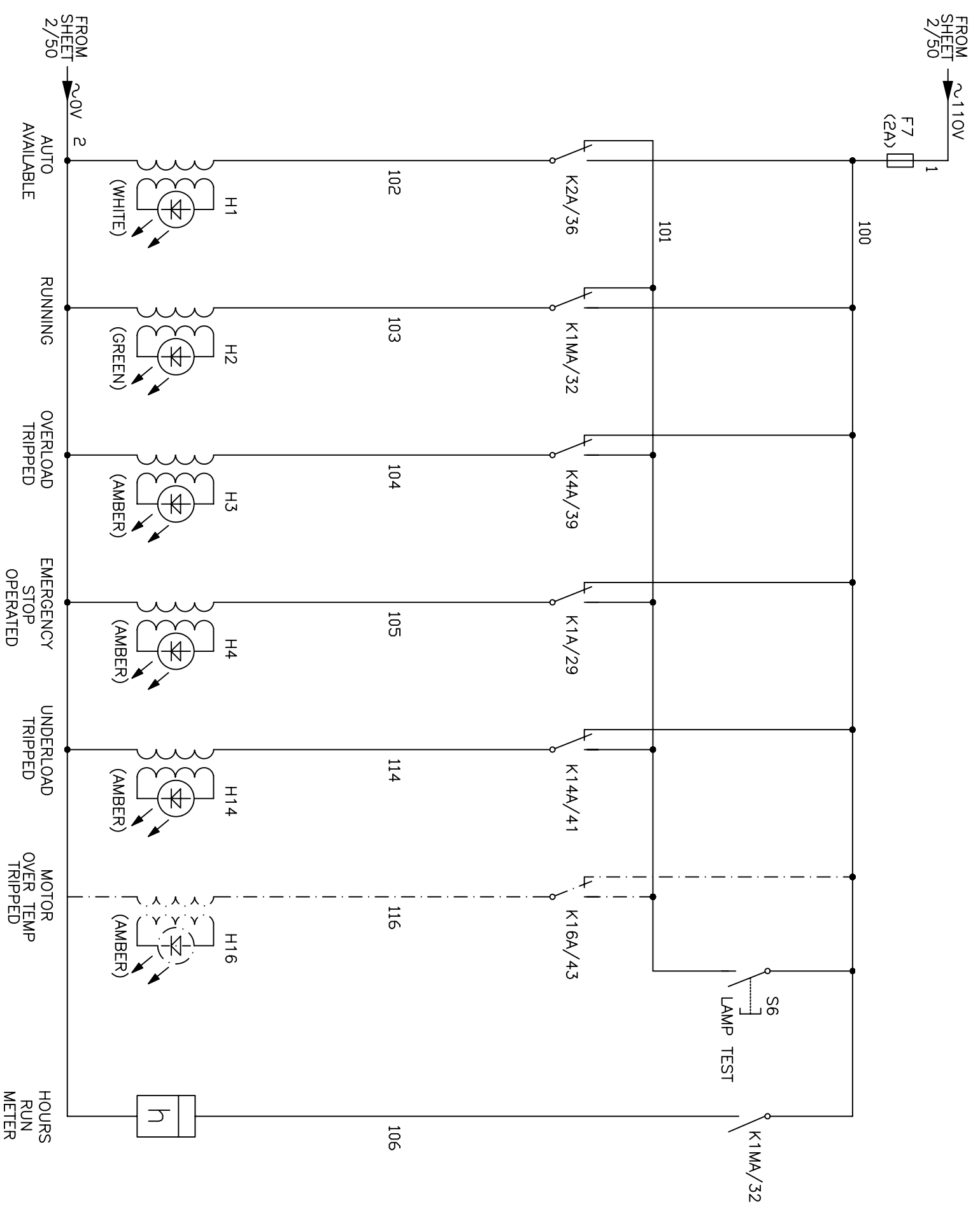
CATEGORY 0 EMERGENCY STOP				TELEMETRY INPUTS CHANGED, UNDERLOAD INDICATION NOW NOT OPTIONAL			
REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG
DATE: 01/08/00				DATE: 01/08/00			
DRAWING TITLE: PUMP 1 (A1) STARTER CONTROL INDICATION SCHEMATIC				DRAWING No: E0702/312-3A			
SHEET: 3 OF 3				SHEET: 3 OF 3			
DATE	REV	DRN	CHD	DATE	REV	DRN	CHD
01/08/00	01	DO	DG	01/08/00	01	DO	DG

PROJECT: SEWAGE PUMPING STATIONS

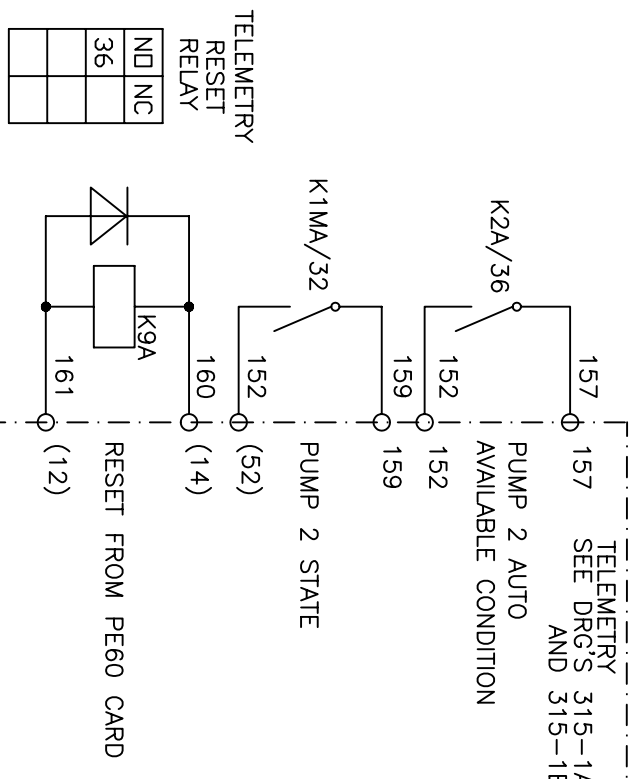
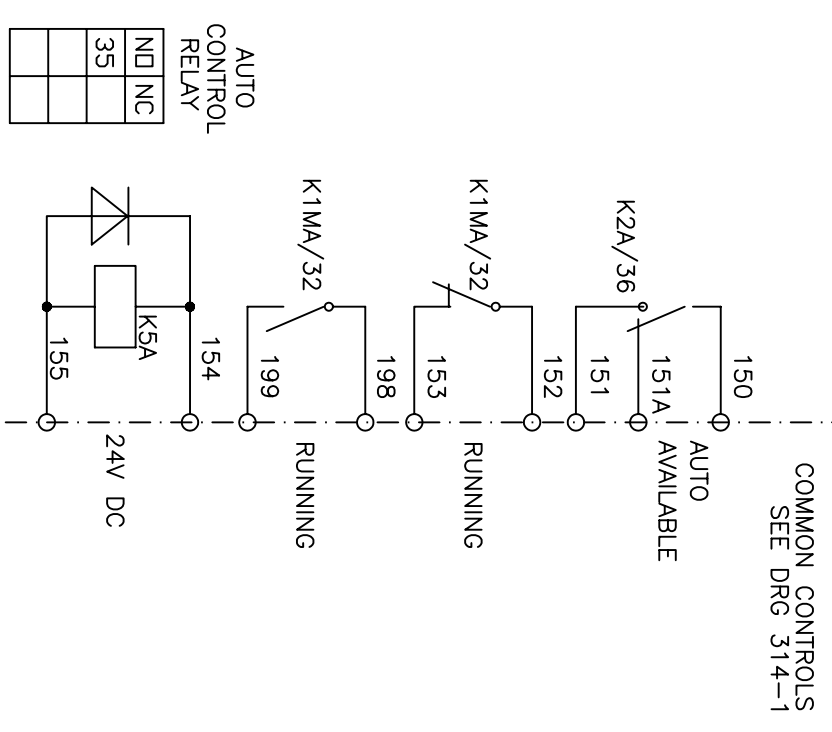
NORTHUMBRIAN WATER LTD
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 PITTY ME
 DURHAM
 DH1 5FJ



51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
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NOTE:
MOTOR OVER TEMP
CIRCUITRY TO BE FITTED WHEN REQUIRED.



CATEGORY 0 EMERGENCY STOP

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE				DATE					
01/08/00				01/08/00					
TELEMETRY INPUTS DESCRIPTIONS CHANGED, UNDERLOAD INDICATION NOW NOT OPTIONAL									
DRAWING No: E0702/312-3B									
SHEET: 3 OF 3									
DATE	REV	DRN	CHD	APP	DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG	01/08/00	01	DO	DG	DG

PROJECT: SEWAGE PUMPING STATIONS

NORTHUMBRIAN WATER LTD
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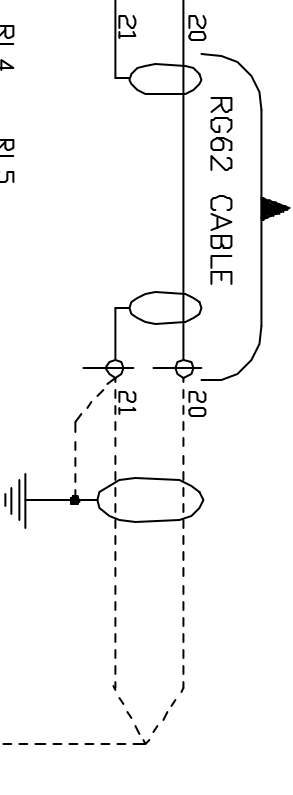
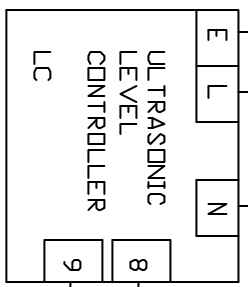
DRAWING TITLE:
PUMP 2(B1) STARTER CONTROL INDICATION SCHEMATIC

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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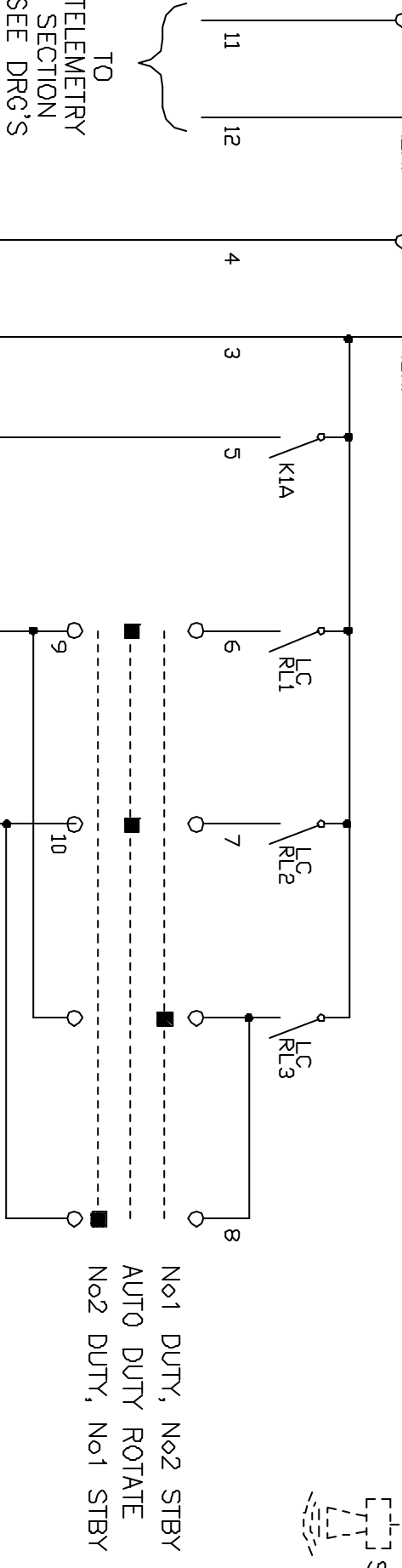
240V AC FROM CUBICLE A2
MAIN EARTH BAR IN CABLE CHAMBER

NOTE:
RELAYS 1 & 3 IN MILLTRONICS SET AT DUTY LEVEL
RELAY 2 IN MILLTRONICS SET AT STANDBY LEVEL
RELAYS 1 & 2 PROGRAMMED FOR SEQUENTIAL LOOP CONTROL (ie: DE9)
RELAY 3 PROGRAMMED FOR PUMP CONTROL (ie: DE8)
RELAY 4 PROGRAMMED FOR HIGH LEVEL ALARM TO TELEMETRY
RELAY 5 PROGRAMMED FOR MILLTRONICS HEALTHY

NOTE 1
SENSOR HEAD CABLE SHALL ALWAYS BE HARD WIRED, UNLESS DUE TO EXCESSIVE LENGTH TO COMMON CONTROL SECTION, THEN INSTALL JUNCTION BOX (CONSULT NWL)



RL1	ND	NC	7
RL2	ND	NC	9
RL3	ND	NC	11
RL4	ND	NC	22
RL5	ND	NC	22



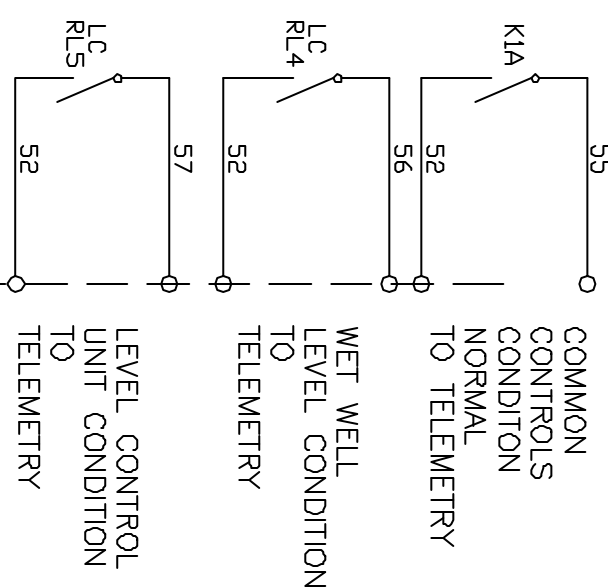
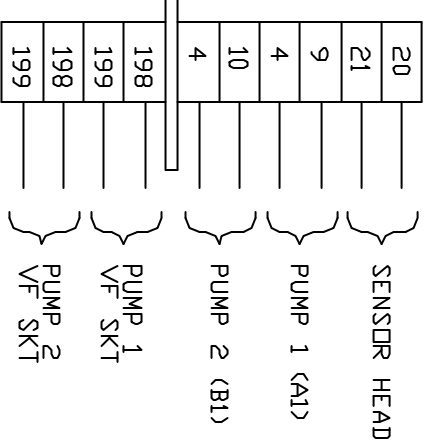
No1 DUTY, No2 STBY
AUTO DUTY ROTATE
No2 DUTY, No1 STBY

FOR DOL CONTROL SCHEMATICS REFER TO PUMP STARTER DRAWINGS
PUMP 1,(A1) 312-2A & 312-3A
PUMP 2,(B1) 312-2B & 312-3B
FOR STAR DELTA CONTROL SCHEMATICS REFER TO PUMP STARTER DRAWINGS
PUMP 1,(A1) 312-2C & 312-3A
PUMP 2,(B1) 312-2D & 312-3B

COMMON CONTROLS HEALTHY RELAY

NO	NC
5	
22	

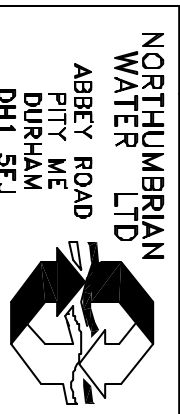
COMMON SUPPLY HEALTHY



NOTE:
24V DC WIRING TO BE GREY
TELEMETRY WIRING TO BE VIOLET
SENSOR HEAD CABLE TO BE RG62

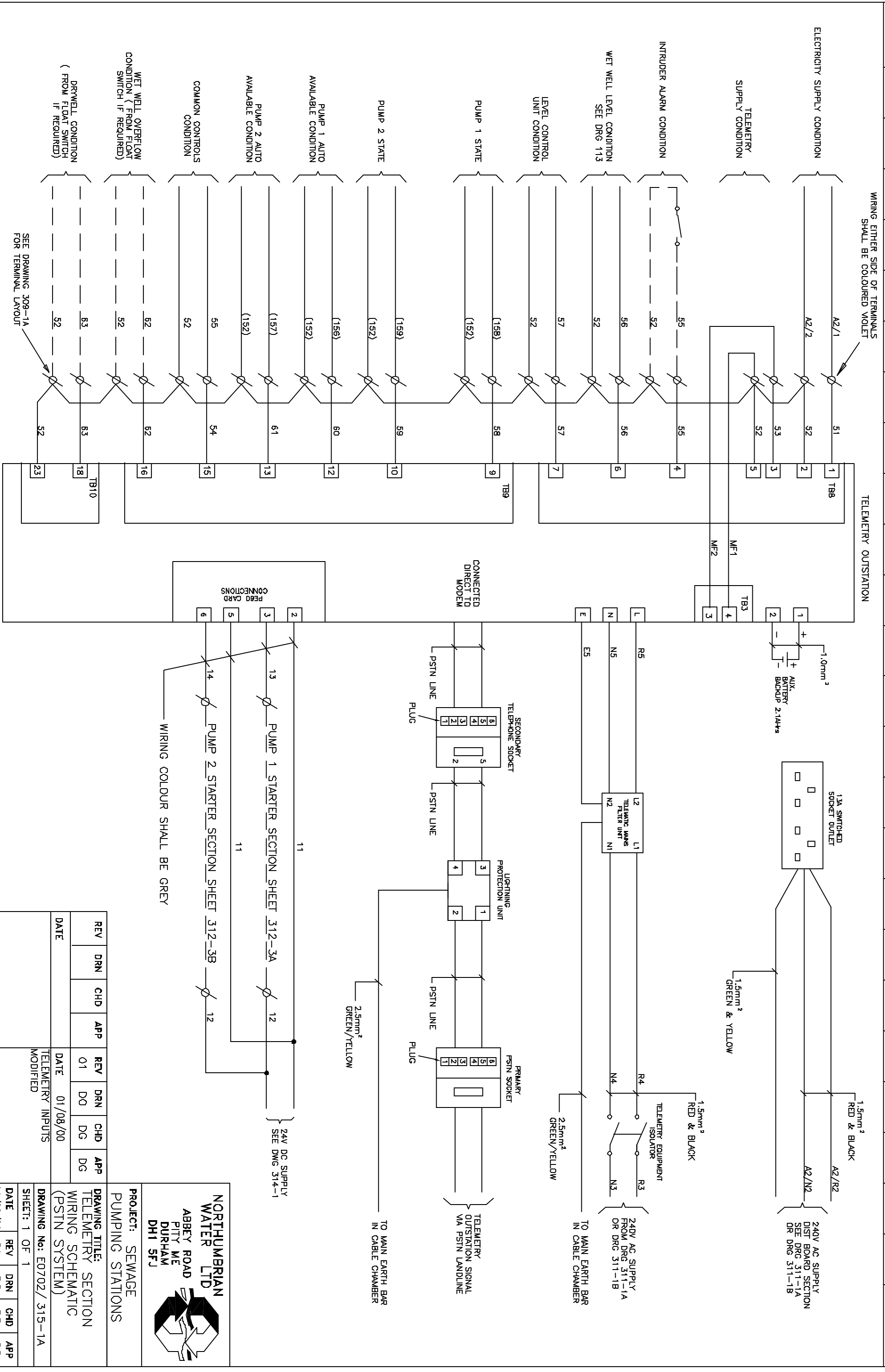
REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE 01/08/00			

DRAWING TITLE:				PROJECT: SEWAGE PUMPING STATION			
COMMON CONTROLS WIRING SCHEMATIC				DRAWING No: E0702/314-1A			
SHEET: 1 OF 1				DATE 01/08/00			
REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG



TO TELEMETRY SECTION SEE DRG'S 315-1A & 1B

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

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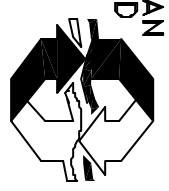
PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: SECTION TELEMETRY WIRING SCHEMATIC (PSTN SYSTEM)

DRAWING No: E0702 / 315-1A

DATE: 01/08/00

DATE: 01/08/00

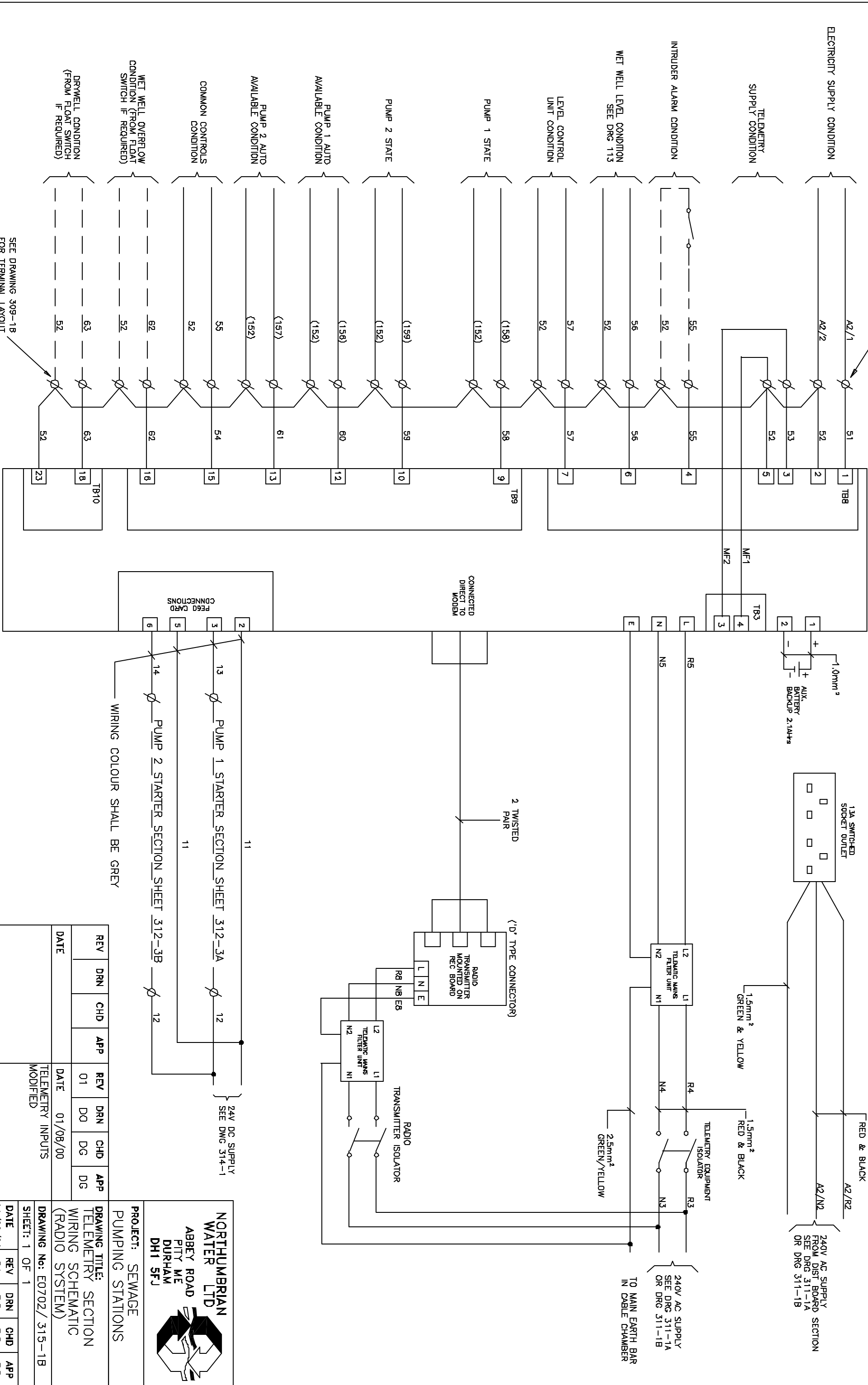


REV	DRN	CHD	APP	DATE	REV	DRN	CHD	APP	DATE
01	DO	DG	DG	01/08/00	01	DO	DG	DG	01/08/00

SHEET: 1 OF 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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TELEMETRY OUTSTATION
WIRING EITHER SIDE OF TERMINALS SHALL BE COLOURED VIOLET



REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE 01/08/00

TELEMETRY INPUTS MODIFIED

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PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: SECTION TELEMETRY WIRING SCHEMATIC (RADIO SYSTEM)

DRAWING No: E0702/315-1B

SHEET: 1 OF 1


DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

CABLE No.	FROM	TO	CABLE/WIRING	MAX LENGTH (M)	COMMENTS
R	REC. METER No.1	MAINS INCOMER	1 CORE 25mm ² 6181Y DOUBLE INSULATED	1.5	
Y	REC. METER No.2	MAINS INCOMER	1 CORE 25mm ² 6181Y DOUBLE INSULATED	1.5	
B	REC. METER No.3	MAINS INCOMER	1 CORE 25mm ² 6181Y DOUBLE INSULATED	1.5	
N	REC. CUTOOUT	MAINS INCOMER	1 CORE 25mm ² 6181Y DOUBLE INSULATED	1.5	
E1	REC. EARTH BLOCK	MAIN EARTHING TERMINAL	1 CORE 16mm ² BS6231 TRI RATED	1.5	
E2	MAIN EARTHING TERMINAL	EARTH ELECTRODE DISCONNECT LINK	1 CORE 16mm ² BS6231 TRI RATED	5	
E3	EARTH ELECTRODE DISCONNECT LINK	EARTH ELECTRODE	1 CORE 16mm ² BS6231 TRI RATED	10	
E4	MAIN EARTHING TERMINAL	VALVE CHAMBER EQUIPOTENTIAL BONDS	1 CORE 16mm ² BS6231 TRI RATED	25	EQUIPOTENTIAL BONDING CONDUCTORS
C1	COMMON CONTROLS AND TELEMETRY	ULTRASONIC LEVEL TRANSDUCER	RG82U POTTED TO TRANSDUCER	25	CONTINUOUS, NOT VIA JB.
C2	COMMON CONTROLS AND TELEMETRY	JUNCTION BOX 3	3 CORE 1.5mm ² XLPE/SWA/PVC	15	ONLY WHERE FLOAT SWITCH REQUIRED
C3	JUNCTION BOX 3	FLOAT SWITCH	AS SUPPLIED WITH FLOAT SWITCH	15	ONLY WHERE FLOAT SWITCH REQUIRED
P1	PUMP1 STARTER	JUNCTION BOX 1 (PUMP 1)			
	Select cable P1 according to motor full load current and starting methods as follows:				
	FOR DIRECT-ON-LINE STARTING (TNC-S) SYSTEM:	FLC below 24A	4 CORE 2.5mm ² XLPE/SWA/PVC		
		FLC 24A TO 29A	4 CORE 4.0mm ² XLPE/SWA/PVC		
		FLC ABOVE 29A TO 37A (MAX)	4 CORE 10mm ² XLPE/SWA/PVC		
	FOR DIRECT-ON-LINE STARTING (TN-S) SYSTEM:	FLC BELOW 19A	4 CORE 2.5mm ² XLPE/SWA/PVC		
		FLC 19A TO 22A	4 CORE 6.0mm ² XLPE/SWA/PVC	25	
		FLC ABOVE 22A TO 37A (MAX)	4 CORE 10mm ² XLPE/SWA/PVC		
	FOR STAR-DELTA STARTING (TNC-S) SYSTEM:	FLC BELOW 32A	7 CORE 2.5mm ² XLPE/SWA/PVC		
		FLC ABOVE 32A TO 37A (MAX)	7 CORE 4.0mm ² XPLE/SWA/PVC		
	FOR STAR-DELTA STARTING (TN-S) SYSTEM:	FLC BELOW 32A	7 CORE 2.5mm ² XPLE/SWA/PVC		
		FLC ABOVE 32A TO 37A (MAX)	7 CORE 6.0mm ² XPLE/SWA/PVC		
P1M	JUNCTION BOX 1 (PUMP 1)	PUMP 1	AS SUPPLIED WITH PUMP		
P2	PUMP 2 STARTER	JUNCTION BOX 2 (PUMP 2)	SELECT CABLE AS FOR P1	25	
P2M	JUNCTION BOX 2 (PUMP 2)	PUMP 2	AS SUPPLIED WITH PUMP		
(HEATING)	MAINS INCOMER AND DISTRIBUTION	HEATER	1.5mm ² SINGLES/CONDUIT OR 3C FLEX/CONDUIT	5	VIA DP SWITCH AND THERMOSTAT
(LIGHTING)	MAINS INCOMER AND DISTRIBUTION	LIGHTING FITTING ON INSIDE ROOF OF KIOSK	1.5mm ² SINGLES/CONDUIT OR 3C FLEX/CONDUIT	5	VIA DP SWITCH
(INTRUDER)	COMMON CONTROLS AND TELEMETRY	KIOSK INTRUDER ALARM DOOR CONTACTS 1 & 2	4 CORE BS 4737 FLEX	10	UPVC CONDUIT OR SIMILAR
(TELEM PSTN LINE)	COMMON CONTROLS AND TELEMETRY	PSTN SERVICE SOCKET	'BT' CORD SET WITH PLUG	5	
OR					
(TELEM RADIO)	COMMON CONTROLS AND TELEMETRY	RADIO TRANSMITTER	0.75mm ² TWO TWISTED PAIR PVC/PVC WITH OVERALL SCREEN	5	
(TELEM RADIO)	COMMON CONTROLS AND TELEMETRY	RADIO TRANSMITTER 240V ISOLATOR	1.5mm ² SINGLES/CONDUIT OR 3C FLEX/CONDUIT	5	
(TELEM RADIO)	RADIO TRANSMITTER 240V ISOLATOR	RADIO TRANSMITTER	3 CORE 1.5mm ² FLEX	0.5	
(TELEM RADIO)	RADIO TRANSMITTER	RADIO AERIAL	CO-AXIAL CABLE TYPE UR67	3	

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE 01/08/00			

ALL TEXT NOW STANDARDIZED

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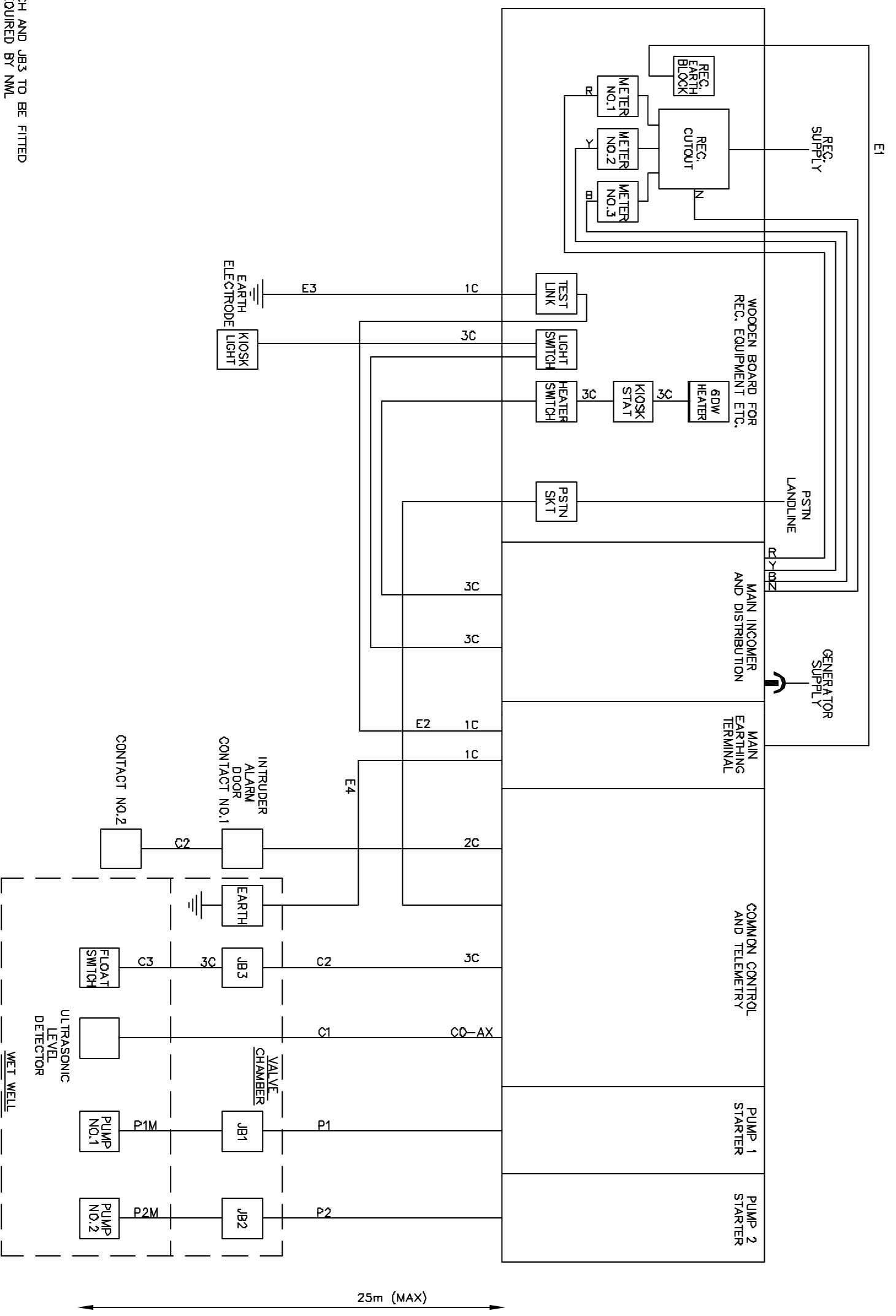


PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE:
 CABLE SCHEDULE

DRAWING No: E0702/ 320-1A
 SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



NOTE
 1. FLOAT SWITCH AND JB3 TO BE FITTED ONLY WHEN REQUIRED BY NWL
 2. FOR CABLE SCHEDULE SEE DRG. 320-1A

REV	DRN	CHD	APP	DATE
01	DD	DG	DG	01/08/00

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PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: CABLE BLOCK DIAGRAM
 PSTN SYSTEM

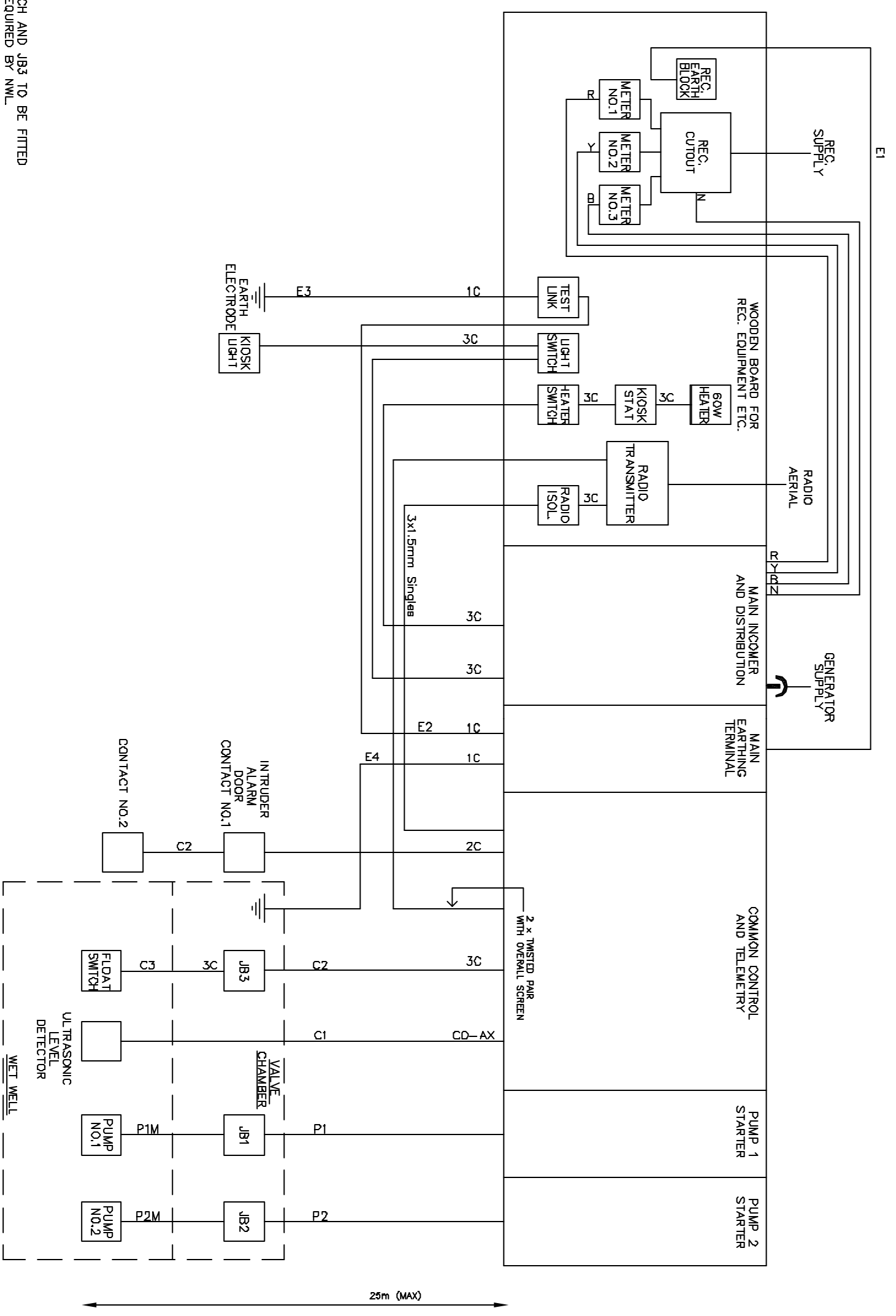
DRAWING No.: E0702/321-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DD	DG	DG



NOTE
 1. FLOAT SWITCH AND JB3 TO BE FITTED
 ONLY WHEN REQUIRED BY NWL
 2. FOR CABLE SCHEDULE SEE DRG. 32D-1A



REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE 01/08/00

ALL TEXT NOW STANDARDIZED

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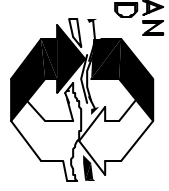
PROJECT: SEWAGE PUMPING STATIONS

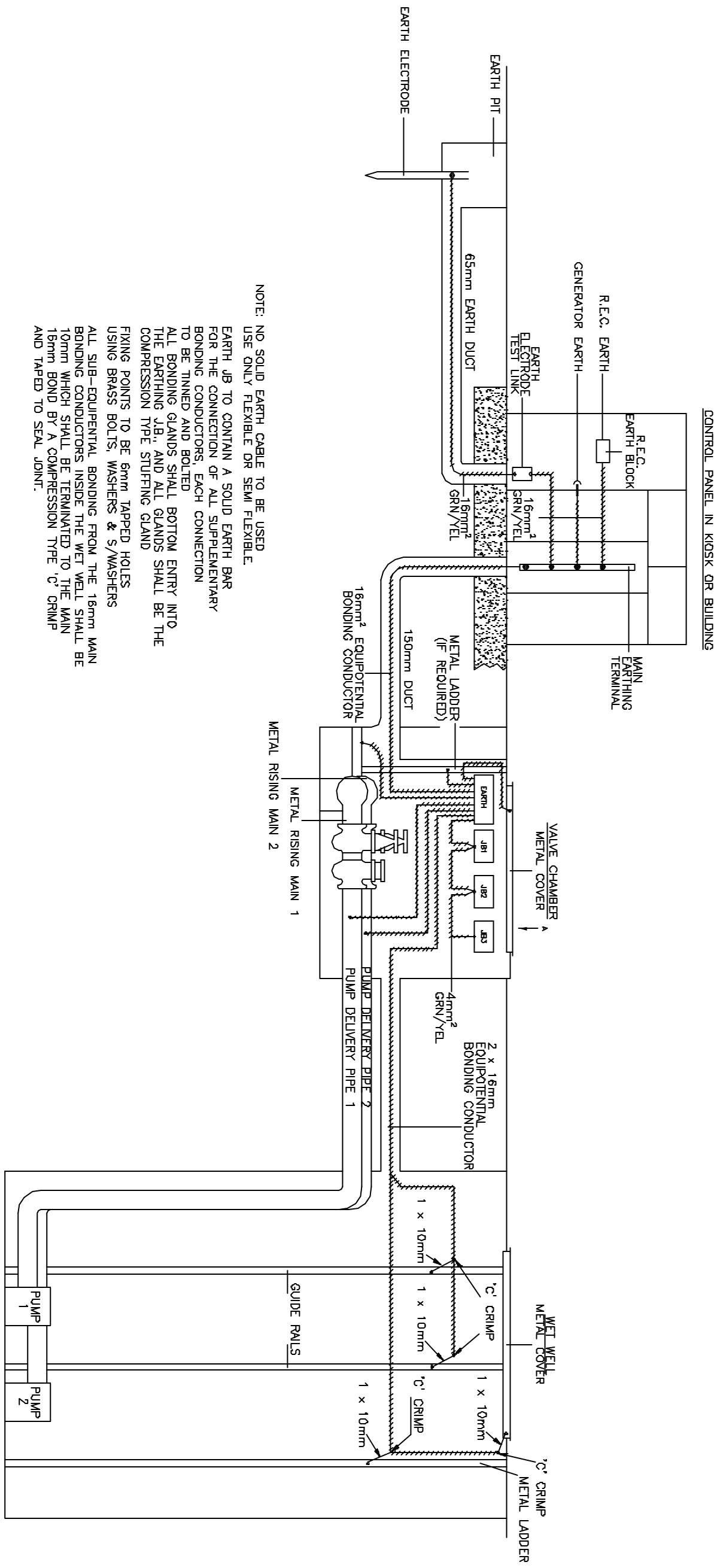
DRAWING TITLE: CABLE BLOCK DIAGRAM RADIO SYSTEM

DRAWING No.: E0702/322-1A

SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG





NOTE: NO SOLID EARTH CABLE TO BE USED
 USE ONLY FLEXIBLE OR SEMI FLEXIBLE
 EARTH JB TO CONTAIN A SOLID EARTH BAR
 FOR THE CONNECTION OF ALL SUPPLEMENTARY
 BONDING CONDUCTORS, EACH CONNECTION
 TO BE TINNED AND BOLTED
 ALL BONDING GLANDS SHALL BOTTOM ENTRY INTO
 THE EARTHING JB., AND ALL GLANDS SHALL BE THE
 COMPRESSION TYPE STUFFING GLAND
 FIXING POINTS TO BE 6mm TAPPED HOLES
 USING BRASS BOLTS, WASHERS & S/WASHERS
 ALL SUB-EQUIPMENTAL BONDING FROM THE 16mm MAIN
 BONDING CONDUCTORS INSIDE THE WET WELL SHALL BE
 10mm WHICH SHALL BE TERMINATED TO THE MAIN
 16mm BOND BY A COMPRESSION TYPE 'C' CRIMP
 AND TAPED TO SEAL JOINT.

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

DATE 01/08/00

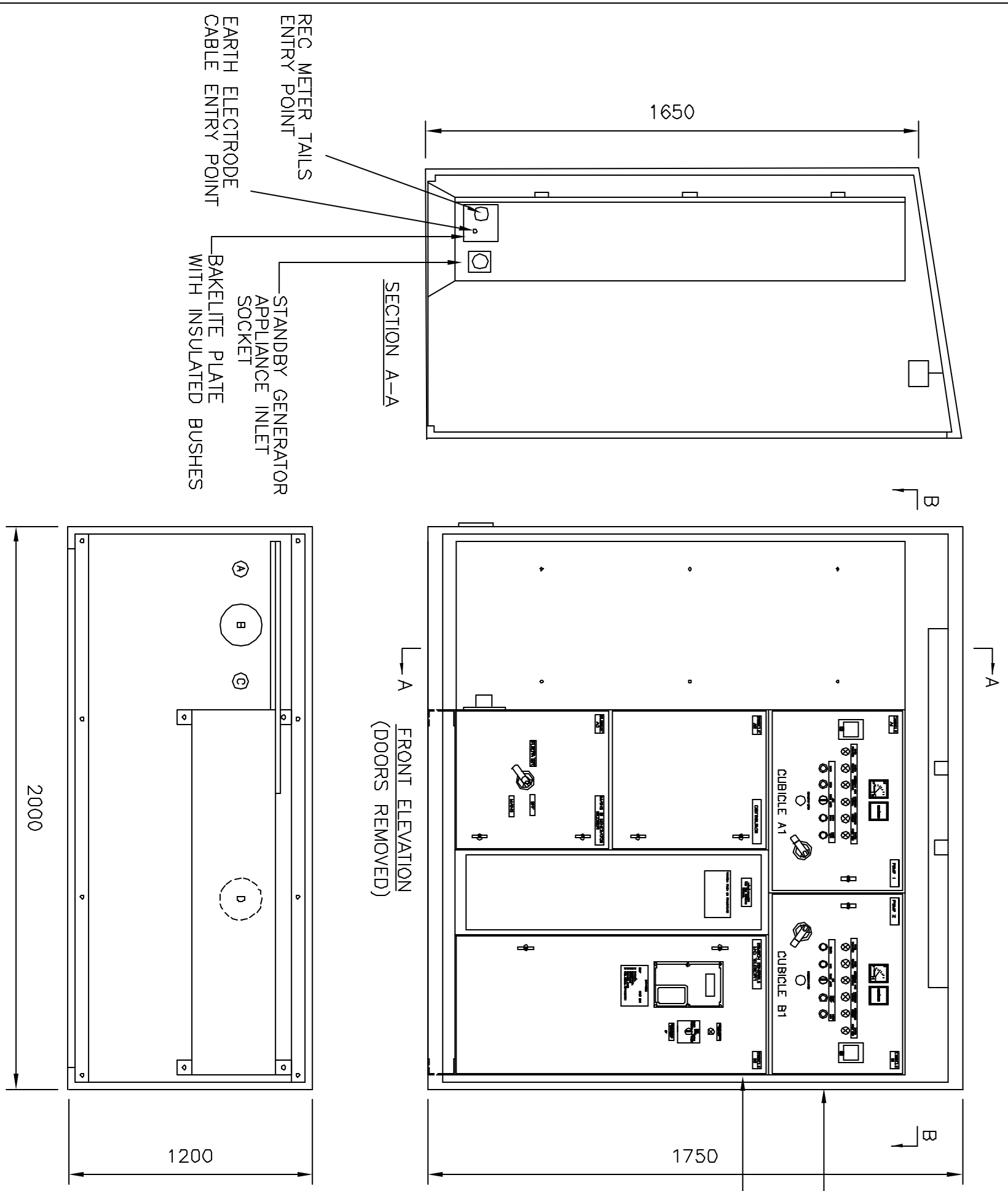
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 DRAWING TITLE: EARTHING ARRANGEMENT
 DRAWING No: E0702/323-1A
 SHEET: 1 OF 1

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DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

EARTHING ARRANGEMENT MODIFIED

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



NOTE

FLOOR CABLE DUCTS ALLOCATED AS FOLLOWS

A = PSTN LANDLINE (WHEN USED) ϕ 50mm

B = R.E.C. SUPPLY ϕ 100mm (FOR SUPPLIES UPTO 30KW)

C = EARTH ELECTRODE ϕ 50mm

D = VALVE CHAMBER / WET WELL ϕ 150mm

E = DEPTH OF KIOSK SHALL BE 1200mm MIN

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

DATE	01/08/00
PUMP DOOR LAYOUTS MODIFIED	

DATE	01/08/00	REV	01	DRN	DO	CHD	DG	APP	DG
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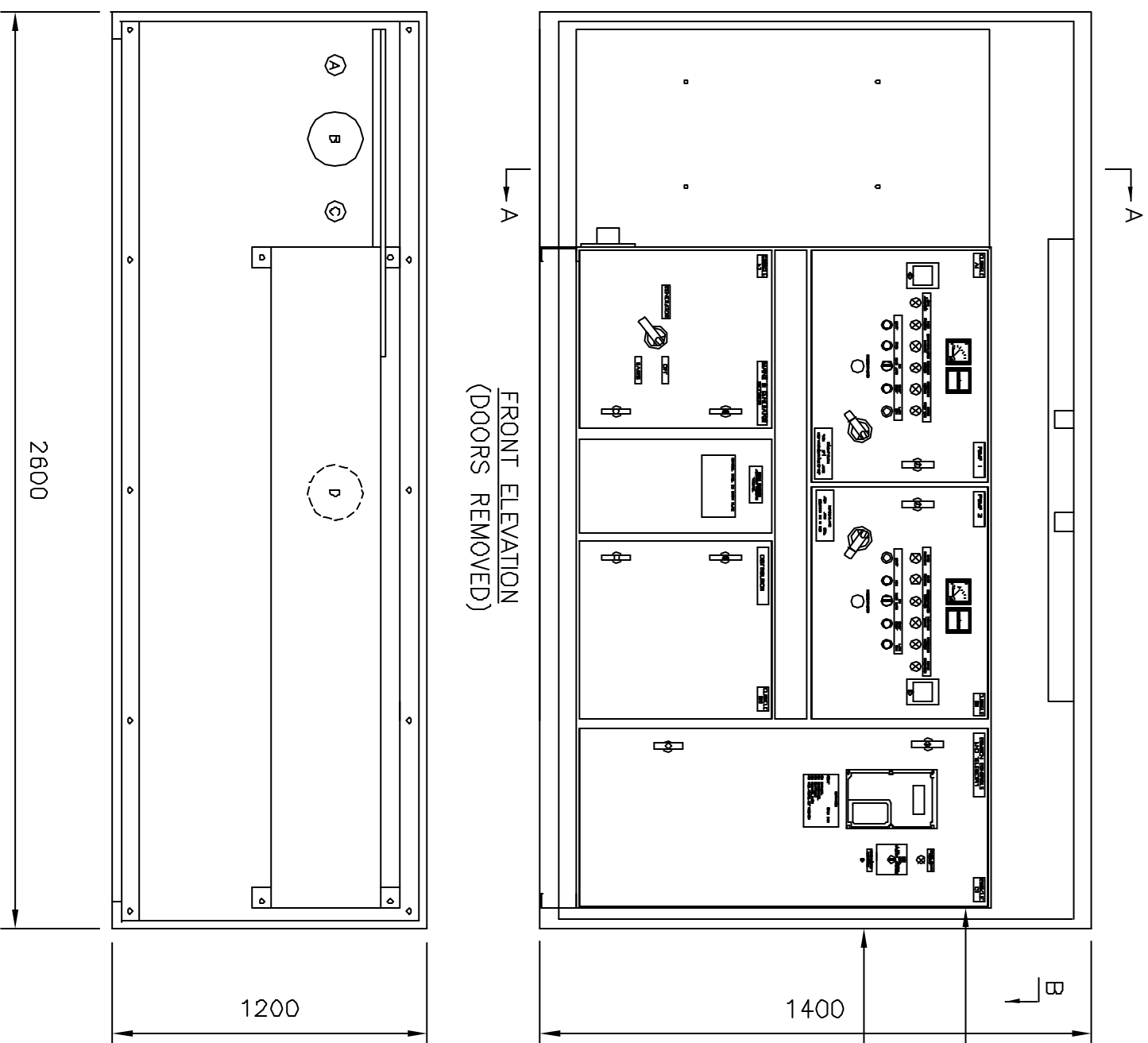
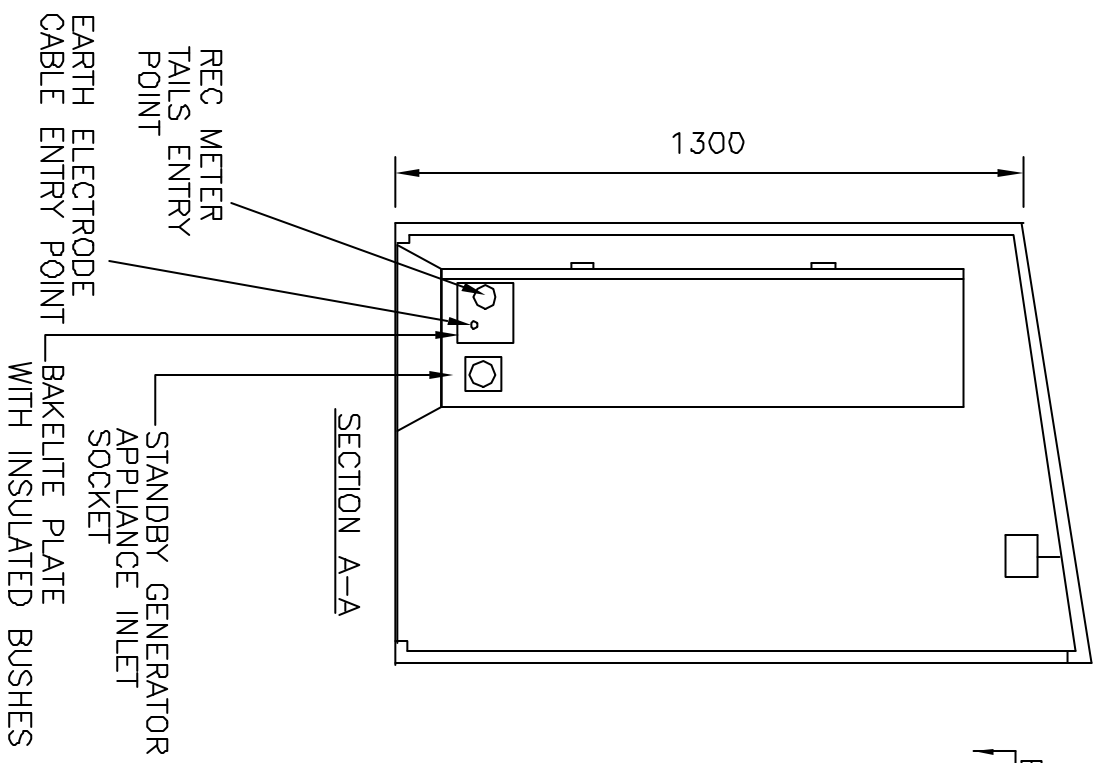
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PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: KIOSK AND PANEL LAYOUT DETAILS

DRAWING No: E0702/324-1A

SHEET: 1 OF 1




NOTE
 FLOOR CABLE DUCTS ALLOCATED AS FOLLOWS
 A = PSTN LANDLINE (WHEN USED) Ø50mm
 B = R.E.C. SUPPLY Ø100mm (FOR SUPPLIES UPTO 30KW)
 C = EARTH ELECTRODE Ø25mm
 D = VALVE CHAMBER / WET WELL Ø150mm
 E = DEPTH OF KIOSK SHALL BE 1200mm MIN

SECTION B-B

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG

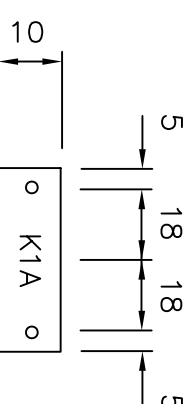
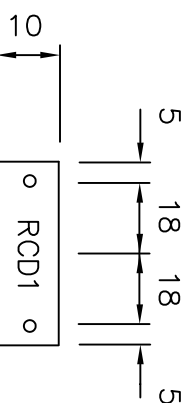
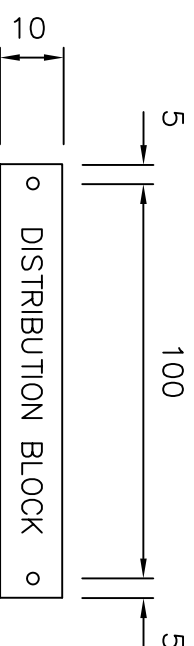
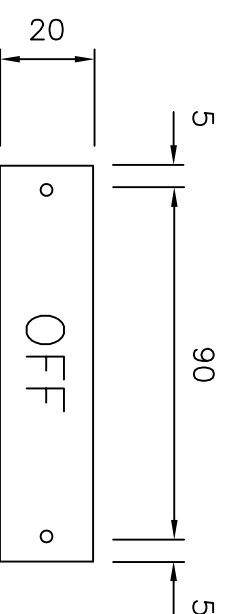
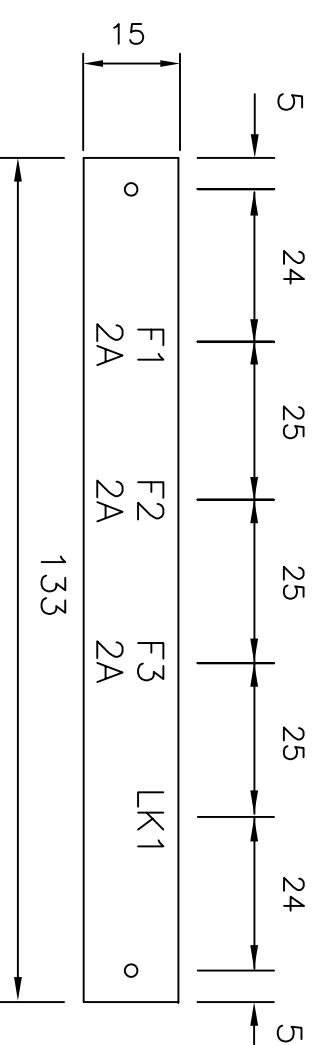
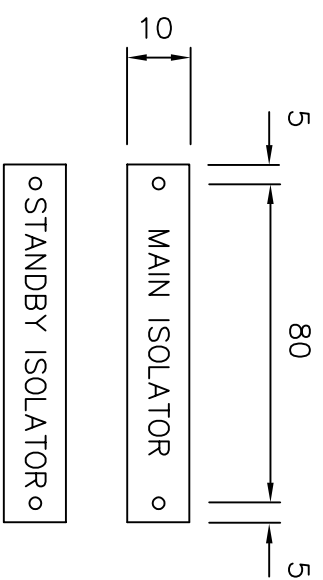
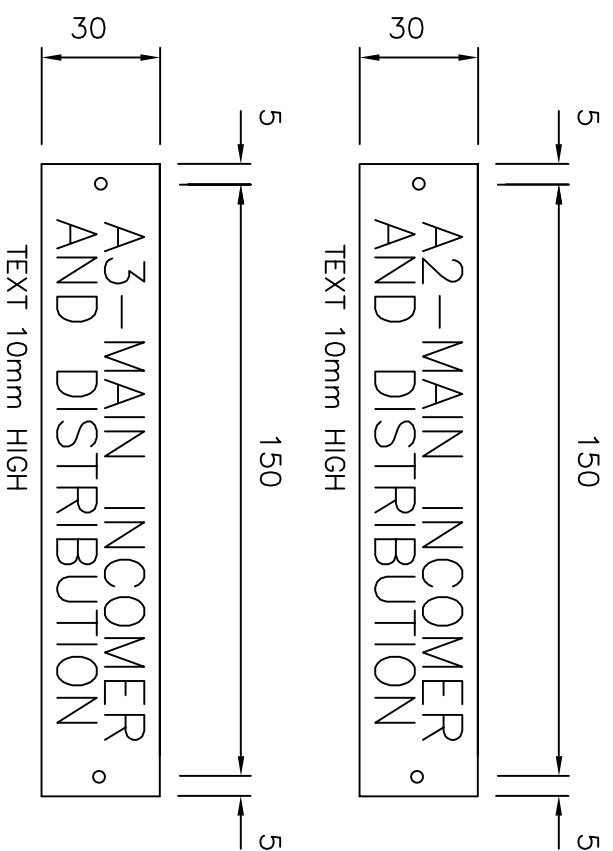
DATE: 01/08/00
 PUMP DOORS LAYOUT MODIFIED

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PROJECT: SEWAGE PUMPING STATIONS
DRAWING TITLE: KIOSK AND PANEL LAYOUT DETAILS
DRAWING No.: E0702/324-1B
 SHEET: 1 OF 1

DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG



TEXT 10mm HIGH

NOTE INTERNAL LABELS


ALL LABELS TO BE MIN 0.5mm THICK
CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

NOTE EXTERNAL LABELS

ALL LABELS TO BE MIN 1.5mm THICK
CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

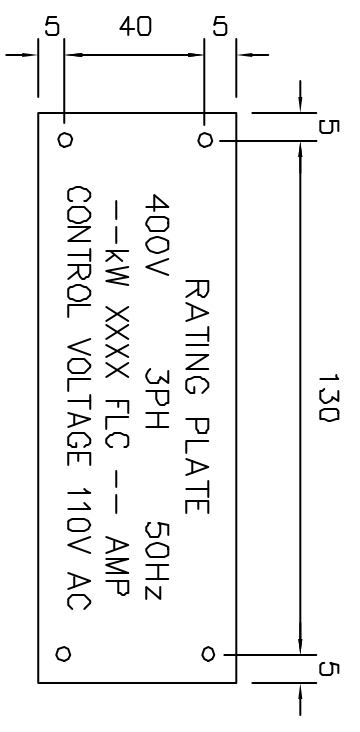
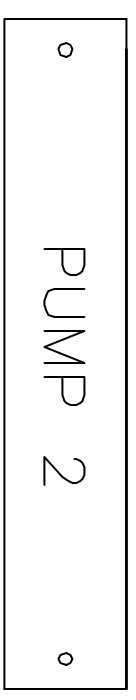
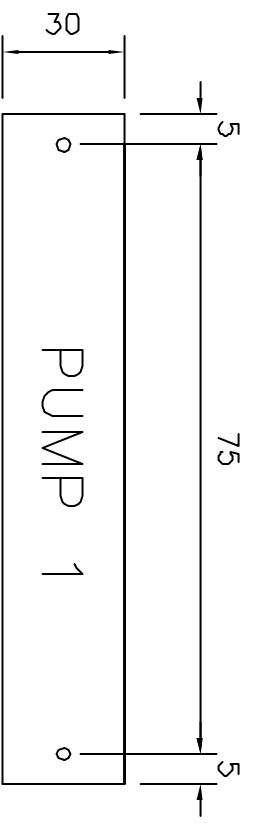
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DATE				DATE			
DRAWING No: E0702/325-1							
SHEET: 1 OF 6							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
11/09/98	00	DO	DG	DG			

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PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE:
 MAIN INCOMER AND DISTRIBUTION SECTION LABEL SCHEDULE



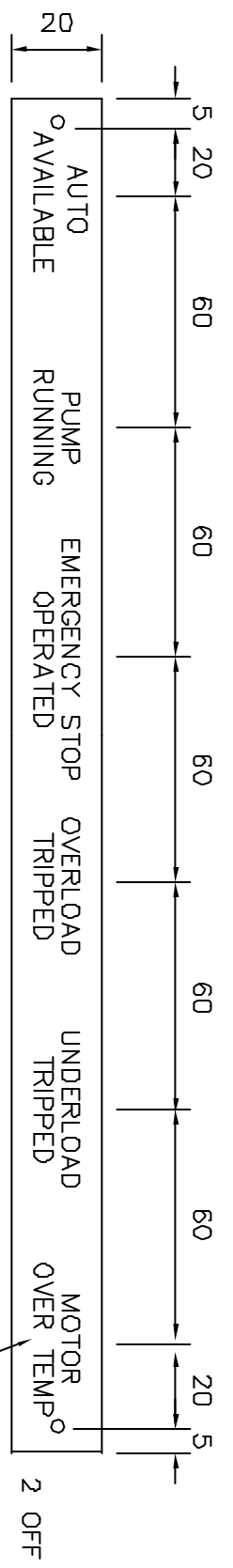
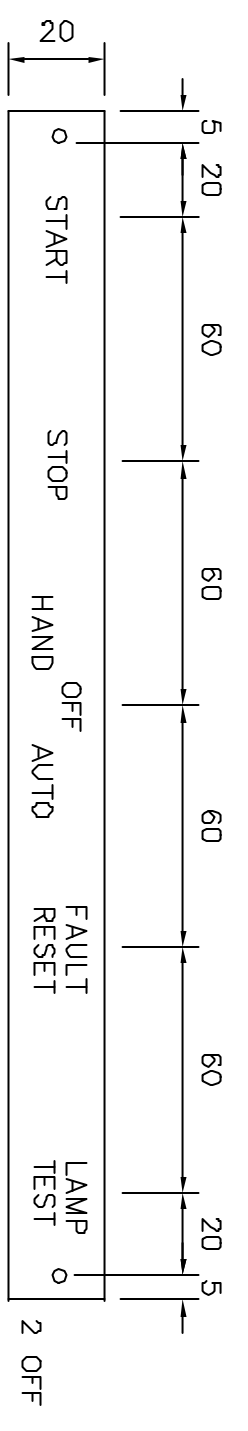
XXXX = TO IDENTIFY STAR/DELTA OR DOL SYSTEM
2 OFF DETAILS SHOWN BELOW

NOTE INTERNAL LABELS

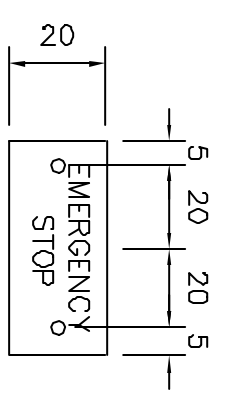
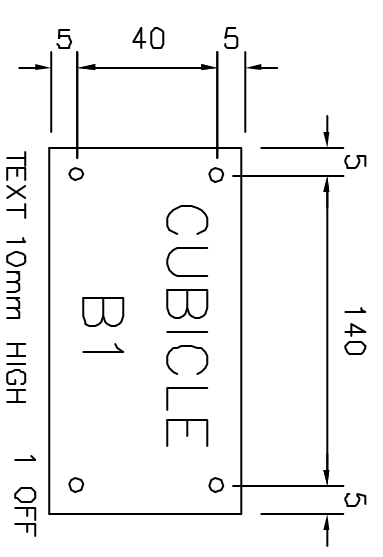
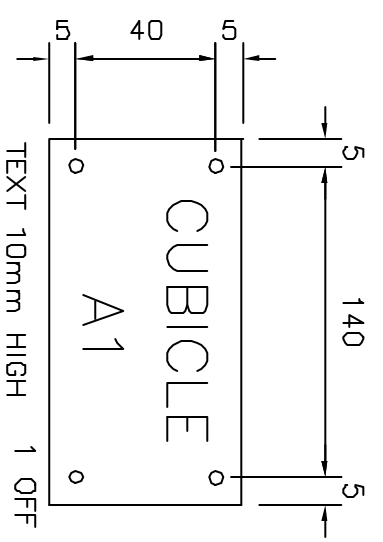
ALL LABELS TO BE MIN 0.5mm THICK
CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

NOTE EXTERNAL LABELS

ALL LABELS TO BE MIN 1.5mm THICK
CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN



MOTOR OVER TEMP PART OF LABEL TO BE
ADDED ONLY WHEN CIRCUITRY IS REQUIRED



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PROJECT: SEWAGE
PUMPING STATIONS

DRAWING TITLE:
PUMP STARTER
CUBICLES A1 AND B1
LABEL SCHEDULE

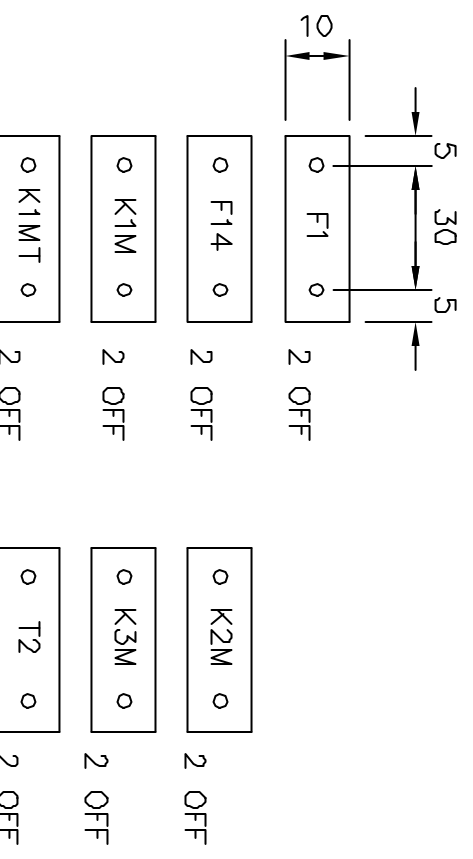
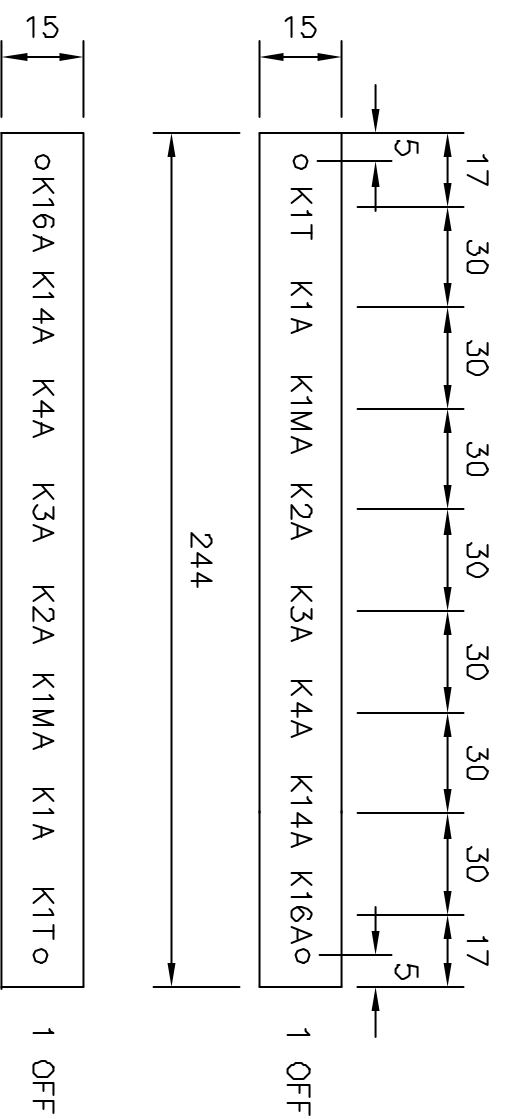
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01	DD	DG	DG	01	DD	DG	DG

DATE	DATE
01/08/00	01/08/00

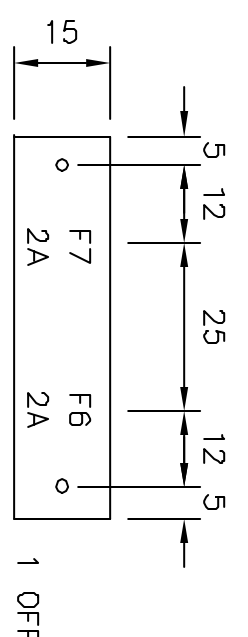
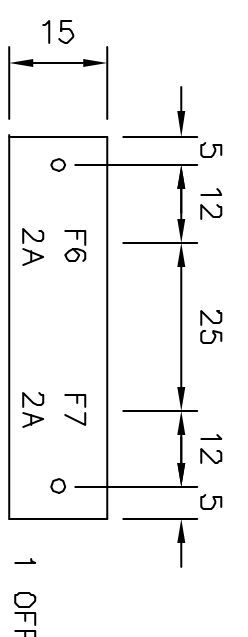
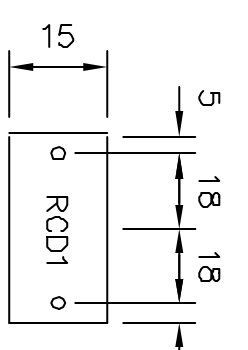
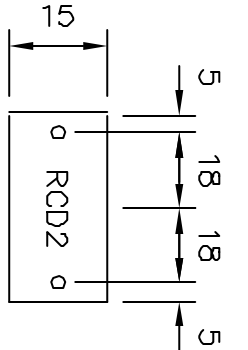
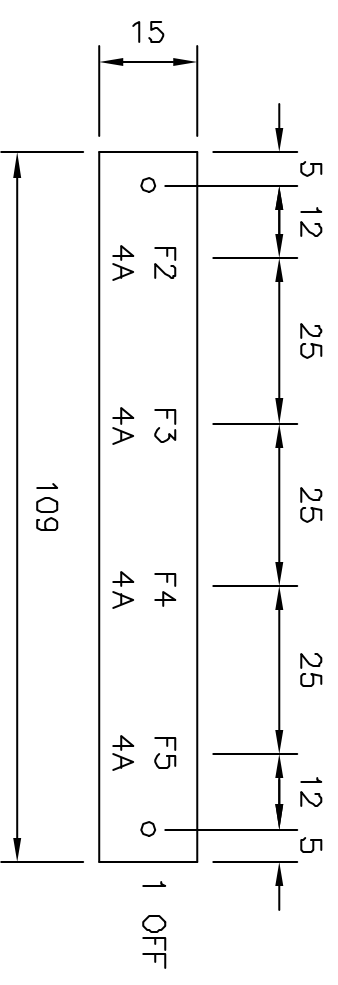
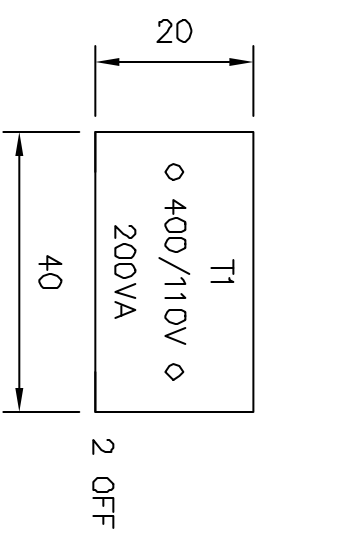
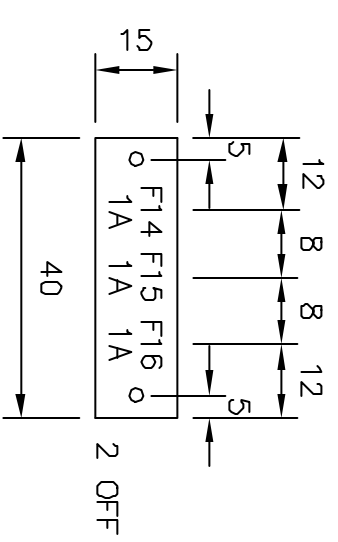
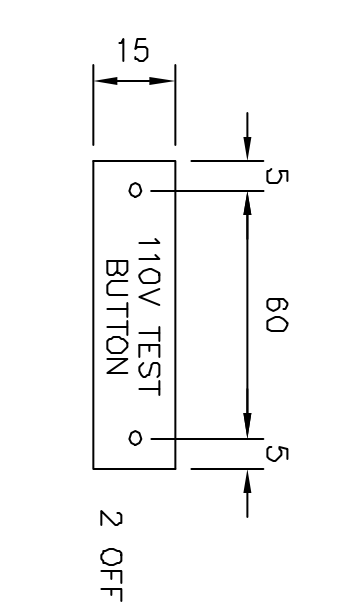
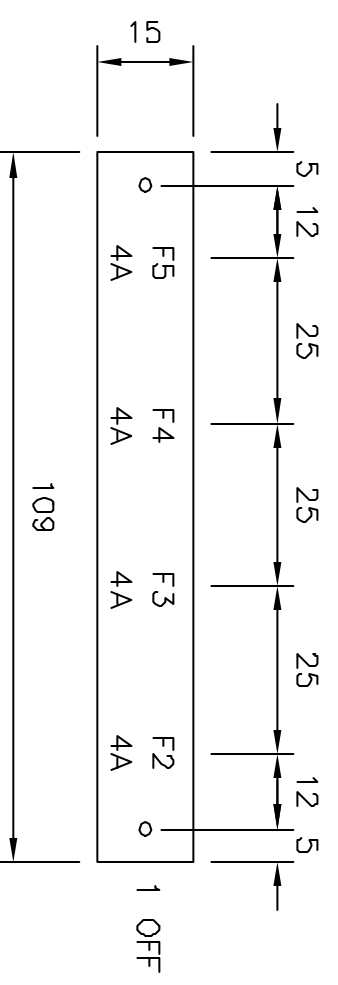
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01/08/00	01	DD	DG	DG

ALL LETTERING NOW STANDARDIZED

SHEET: 2 OF 6
DRAWING No: E0702/325-2A



WHERE REQUIRED



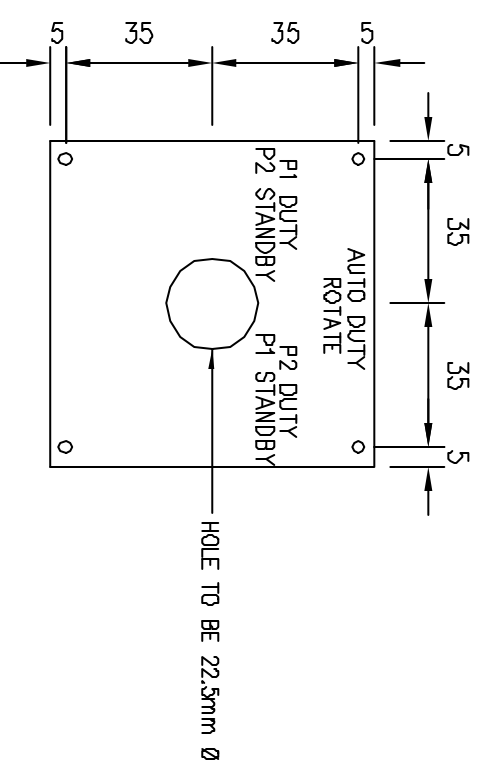
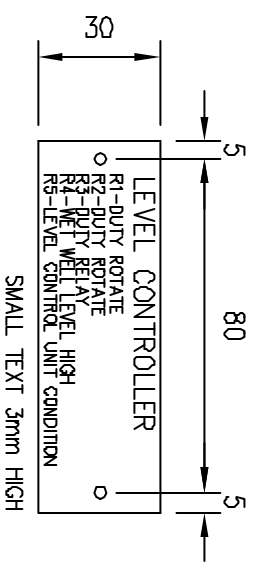
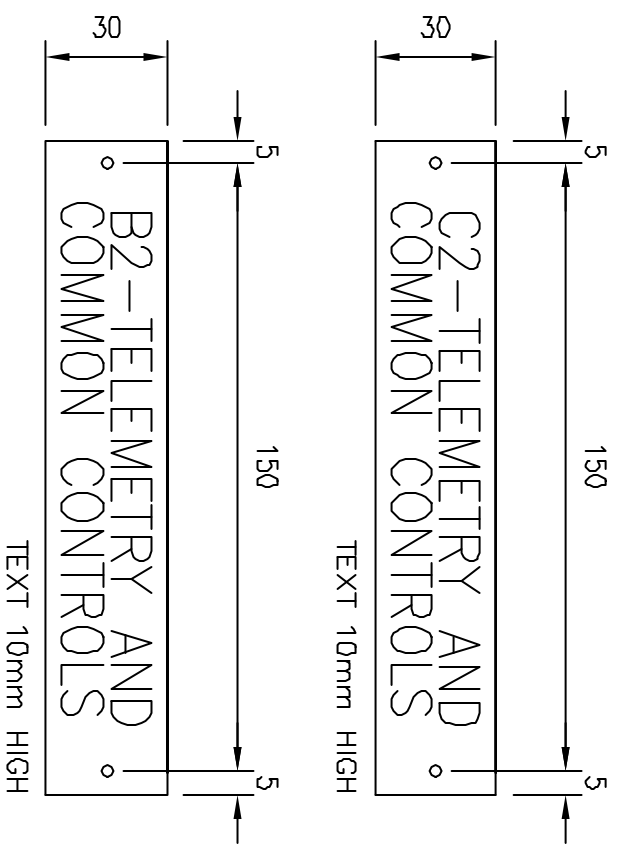
NOTE INTERNAL LABELS
 ALL LABELS TO BE MIN 0.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG
DATE				DATE			
01/08/00				01/08/00			
ALL LETTERING NOW STANDARDIZED							
DRAWING No: E0702/325-3A							
SHEET: 3 OF 6							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
01/08/00	01	DO	DG	DG	01/08/00	01	DO

PROJECT: SEWAGE PUMPING STATIONS

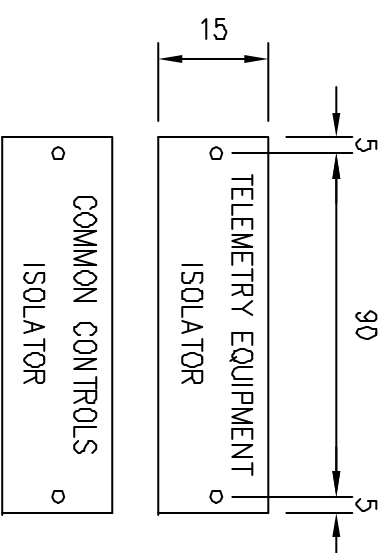
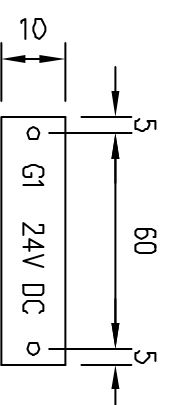
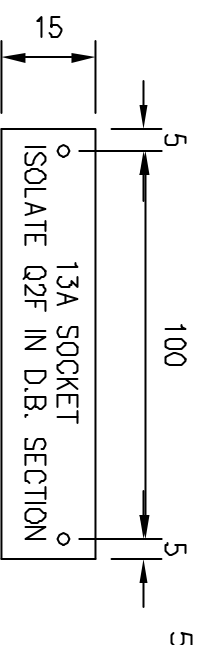
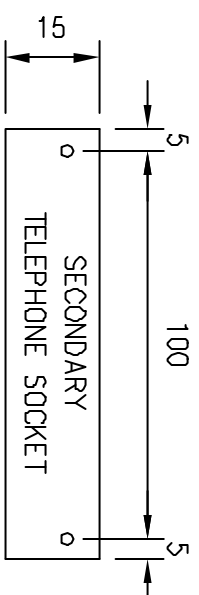
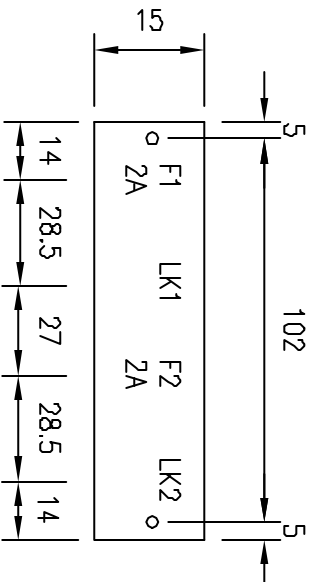
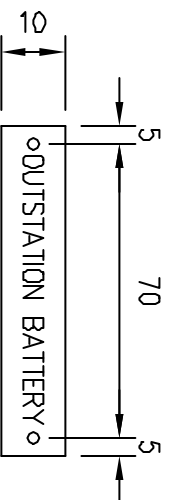
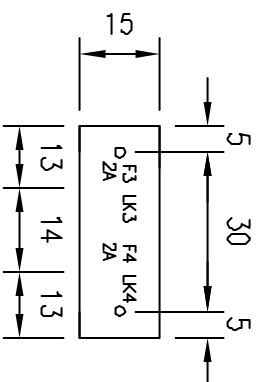
DRAWING TITLE: PUMP STARTER CUBICLES A1 AND B1 LABEL SCHEDULE

NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ



NOTE EXTERNAL LABELS

ALL LABELS TO BE MIN 1.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN



NOTE INTERNAL LABELS

ALL LABELS TO BE MIN 0.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 4mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

REV	DRN	CHD	APP	REV	DRN	CHD	APP
01	DO	DG	DG	01	DO	DG	DG

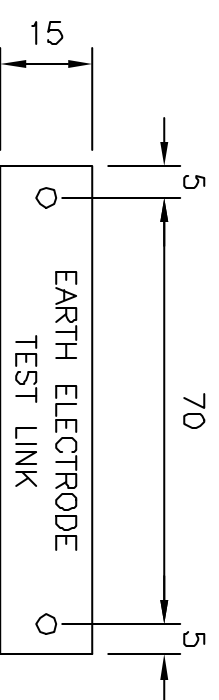
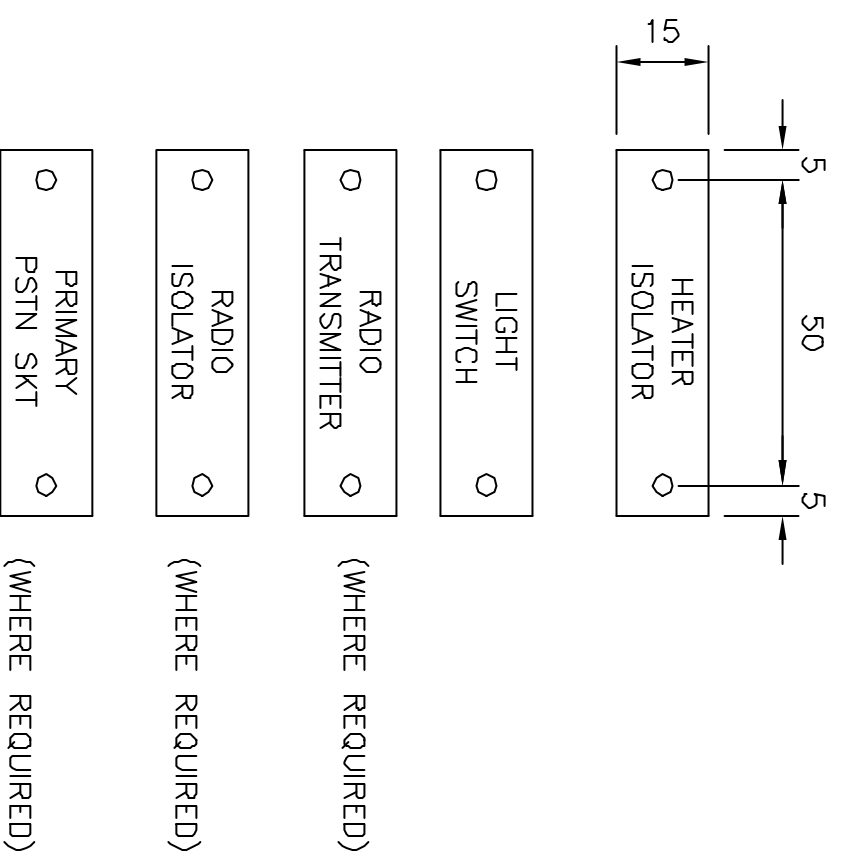
NORTHUMBRIAN WATER LTD
 ABBEY ROAD
 PITTY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

DRAWING TITLE: COMMON CONTROLS AND TELEMETRY LABEL SCHEDULE

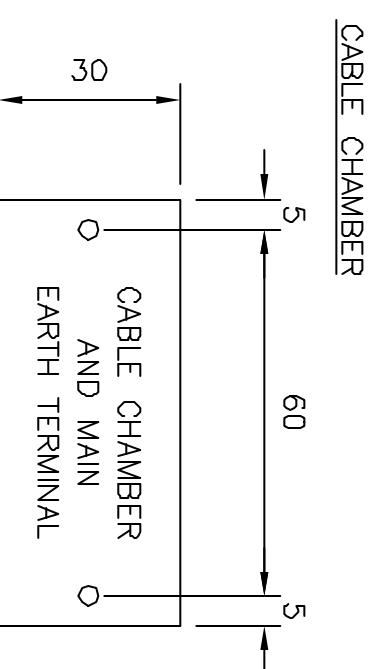
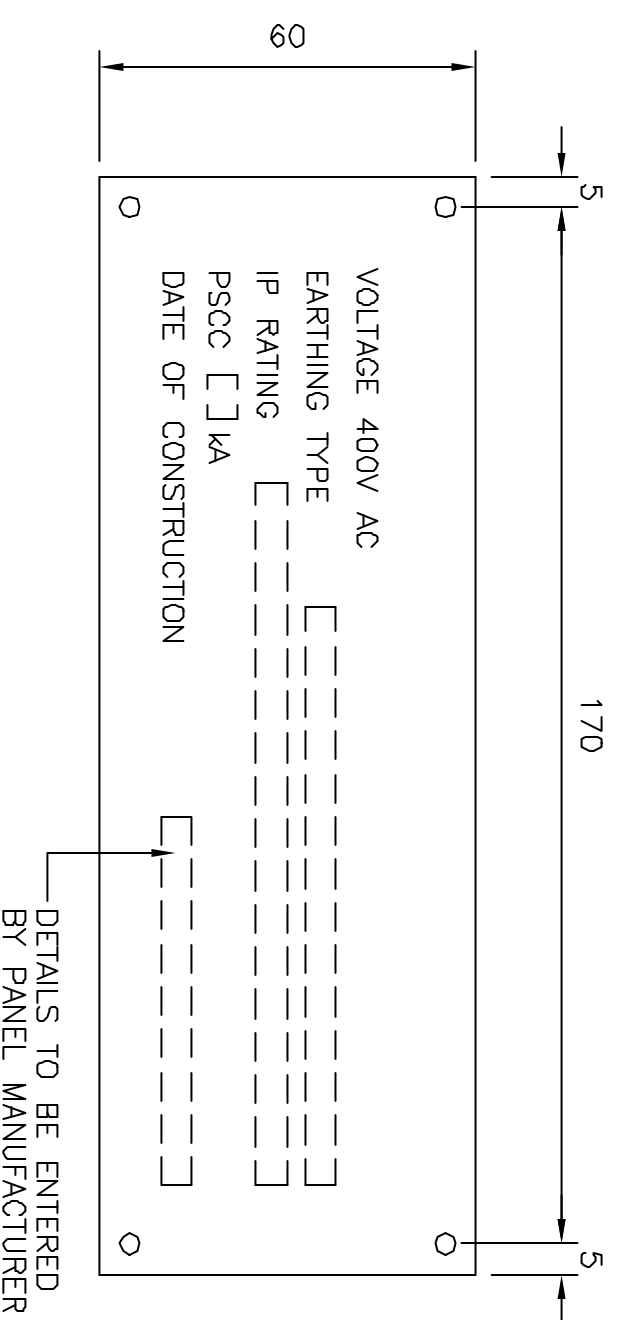
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DRAWING No:	E0702/325-4A			
SHEET: 4 OF 6				
DATE	REV	DRN	CHD	APP
01/08/00	01	DO	DG	DG

REC. BOARD



NOTE EXTERNAL LABELS

ALL LABELS TO BE MIN 1.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 5mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

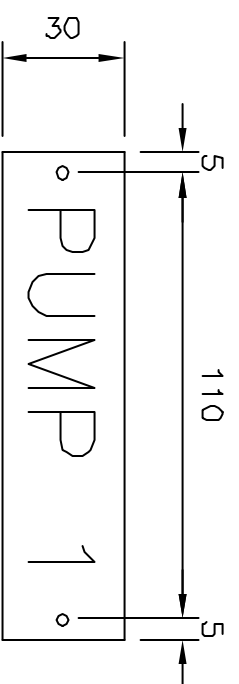


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 DH1 5FJ

PROJECT: SEWAGE PUMPING STATIONS

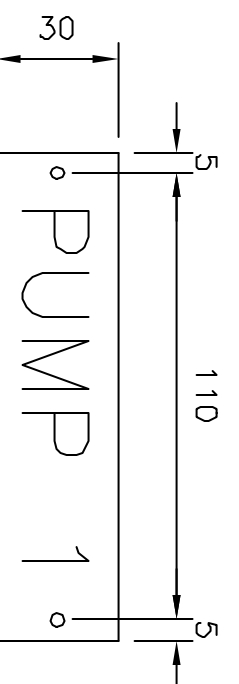
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REV	DRN	CHD	APP	REV	DRN	CHD	APP
				01	DO	DG	DG
DATE				DATE			
				01/08/00			
ALL LETTERING NOW STANDARDIZED							
DRAWING No: E0702/325-5A							
SHEET: 5 OF 6							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
01/08/00	01	DO	DG	DG			



◦ PUMP 2 ◦

◦ FLOAT SWITCH ◦



◦ PUMP 2 ◦

◦ FLOAT SWITCH ◦

◦ JB 1 ◦

◦ JB 2 ◦

◦ JB 3 ◦

◦ EARTH JB ◦

WET WELL LABELS
 ALL LABELS TO BE 1.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 20mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN

VALVE CHAMBER LABELS
 ALL LABELS TO BE 1.5mm THICK
 CLEAR POLYCARBONATE REVERSE SCREEN PRINTED
 WITH 20mm HIGH TEXT UNLESS OTHERWISE STATED
 FIXING HOLES TO BE 3.3mm POSITIONED AS SHOWN



ABBEEY ROAD
 PITY ME
 DURHAM
 DH1 5FJ

PROJECT: SEWAGE
 PUMPING STATIONS

REV	DRN	CHD	APP	REV	DRN	CHD	APP
				D1	DO	DG	DG
DATE				DATE			
				01/08/00			

LETTERING SIZE FOR
 NOTES STANDARDIZED

DRAWING No: E0702/325-6A							
SHEET: 6 OF 6							
DATE	REV	DRN	CHD	APP	DATE	REV	DRN
01/08/00	01	DO	DG	DG	01/08/00	01	DO

A.9 CONTACT LIST

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Fax: (0191) 3846357

Environment Agency (EA)
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Newcastle Business Park
Newcastle upon Tyne
Tyne and Wear
NE4 7AR

Tel: (0191) 203 4000

Fax: (0191) 203 4004

A10 PIPES, VALVES AND FITTINGS

1.0 Pipes and Fittings

- (a) Where macerating pumps are not fitted, all pipework and fittings shall be sized to allow the free passage of nominal 100 mm spherical solids. Pipework and pumps shall be sized for nominal 1.0 m/s flow (and should be within the range 0.75 m/s to 1.8 m/s).
- (b) All wet well, valve chamber and connecting straight pipework shall be ductile iron to BS EN 598, cement mortar lined on the inside and bitumen coated on the outside. Pipe fittings may be ductile iron to BS EN 598. Fittings shall be bitumen or epoxy coated inside and out.
- (c) Where a pipe is laid in the ground; exposed Flanges, Couplings and Flange Adaptors shall be additionally protected from corrosion in line with manufacturer's recommendations.
- (d) Joints within the wet well and valve chamber shall be flanged to BS 4504: Section 3.2 PN16 or a higher rating if necessary. Each joint shall contain no more than one joint gasket. All gaskets shall be made from 3 mm rubber and conform to BS4865:Part1.
- (e) Flexible joints shall be used where the pipe is laid in the ground. These will normally be of the spigot and socket type with a rubber joint, and shall conform to BS437. Double flexible joints i.e. VJ Couplings or similar, are to be installed on all pipes between the wet well and valve chamber.
- (f) Self anchoring flanges may only be used when sufficient care is taken to ensure that pipe linings are not damaged. The use of any device to anchor the flange which imparts a point loading onto the pipe shall be avoided.
- (g) Where a pipe passes through a chamber wall, a puddle flange shall be used to secure the pipe rigidly in place. This puddle flange shall be an integral part of the pipe, produced during manufacture and prior to coating or painting. Box outs for the puddle flange shall be a reducing taper to both faces so as to resist movement in either direction.

2.0 ISOLATING VALVES

- (a) Isolating valves shall be of a wedge gate pattern. These shall generally be in accordance with the requirements of BS 5150 for flanged valves, and shall be of the same nominal size as the pipework.
- (b) All valves shall be provided with hand wheels and shall be clockwise to close, as indicated by a directional arrow cast onto the rim of the valve hand wheel.

3.0 REFLUX VALVES

- (a) Reflux valves shall be flanged, swing check single disc to BS 5153, of the same nominal size as the pipework.

4.0 GAUGE COCKS

- (a) The outlet main and each pump delivery main shall be drilled and tapped $\frac{1}{2}$ " BSPT in the position shown on the drawings. Each tapping shall be fitted with a brass gauge cock, to allow the fitting of a 150mm diameter gauge by others. The spindle

in the cock shall be capable of being rotated 360°. These connections may be used during testing of the pipework, suitable brass plugs shall be fitted to protect the gauge cocks when not in use.

5.0 VALVE MATERIALS

A10 Table 1 shows the minimum acceptable materials of construction. However the Contractor may offer alternative materials provided the mechanical properties and resistance to chemical and galvanic corrosion are at least equal to those of the materials listed.

6.0 PENSTOCKS

- (a) All penstocks shall comply with BS 7775 or the latest edition of the American Water Works Association, Publication C501-87 for cast iron penstocks. Plastic gate type penstocks shall not be used.
- (b) The Penstock shall have cast iron wall mounting frames, having standard invert, non-rising stems, and be suitable for off seating heads. Penstocks shall be supplied with Tee Key operated spindles, clockwise closing. The operating Tee Key is to be provided.
- (c) Penstocks shall be constructed and installed to be capable of withstanding the impact of floating debris.
- (d) Construction shall be such that effluent cannot readily collect on the penstocks, but any that does can be removed by pressure water jetting.
- (e) Penstocks shall normally be designed for use only in the fully open or the fully closed positions and intermediate travel. Where specified penstocks shall be suitable for modulating duties or flow control purposes.
- (f) The Contractor shall ensure that all materials used in the construction and installation of Penstocks are selected to prevent galvanic corrosion. Contact between stainless steel and galvanised fittings shall be prevented. Where unavoidable insulating sleeves shall be inserted.
- (g) Penstocks shall be capable of sustaining a differential pressure of up to 6m head of water in either the on-seating or off-seating directions subject to a maximum permissible leakage rate of 30 litres per metre of sealing perimeter per hour. The Contractor shall guarantee this maximum leakage rate for one year following commissioning.
- (h) The frame and gate shall be made from BS 1452 cast iron and the sealing faces from BS 1400 gunmetal.
- (i) The spindle and all fixing bolts, pins and screws shall be made from BS 970 stainless steel except for those retaining the gunmetal faces which shall be non-ferrous.
- (j) Operating cams shall be bronze or other approved non-ferrous material.

TABLE 1: VALVE TYPES AND MINIMUM ACCEPTABLE MATERIALS STANDARDS

	Knife Gate Valves	Reflux Valves	Air Relief Valves
Valve body See Note B	Cast iron grade 220 Stainless steel type 304/316	Cast iron grade 220	Cast iron grade 220
Valve bonnet/cover	Cast iron grade 220	Cast iron grade 220	Cast iron grade 220
Body sealing face	Rubber/plastic	Gunmetal LG2	Nitrile rubber/plastic
Gate disc	Stainless steel type 304/316	Cast iron grade 220	
Gate disc sealing face		Gunmetal LG2	
Gate/disc securing pins	Stainless steel type 304/316	Stainless steel type 304/316	
Hinge pins/shafts/spindles	Stainless steel type 304/316	Stainless steel type 304/316	Stainless steel type 304/316
Hinge pins/shaft/spindle bearings	Phosphor bronze BP102	Phosphor bronze BP 102	PTFE/phosphor bronze
Hinge pin/shaft gatebody leak seals	Nitrile rubber/plastic	Nitrile rubber/plastic	
Internal fittings and miscellaneous trim	Stainless steel type 304/316 or plastic	See Note A	See Note A

- NOTES:
- A. Manufactured from suitable corrosion resistance materials.
 - B. Cast iron Grade 220 is only to be used for valves installed inside buildings with no risk of freezing. Where installations could be subject to freezing conditions, valve bodies and bonnets/covers shall be manufactured in ductile iron (spheroidal graphite cast iron 425/12) only.

GENERAL: The Contractor and/or manufacturer will be responsible for ensuring that all materials used in the construction of valves are suitable for the duty and application for which they are intended.

A11 FASTENERS AND FIXINGS

- (a) All bolts and fixings are to be metric, complying with BS 4190 and BS 3692 having hexagonal heads and nuts.
- (b) Bolts not subject to immersion or splashing shall be manufactured from low carbon steel, unless otherwise stated, and shall be sherradised or hot dipped galvanised.
- (c) Bolts subject to immersion or splashing shall be stainless steel A4 quality.
- (d) All bolts when fully assembled with a standard washer under the nut, and fully tightened, shall have a maximum of 3 threads protruding from the nut.
- (e) No bolts shall be installed without the thread being either flush or protruding up to 3 threads from the nut.
- (f) All rag bolts and expanding type anchors for use in concrete shall be as supplied by Rawlplug, Hilti, Leibig or other approved suppliers, and manufactured from A4 stainless steel. Where rag bolts, expanding anchors or resin anchor bolts are used, the manufacturer's recommendations regarding minimum distances from the edge of concrete shall be observed.
- (g) All fasteners used shall have an anti-seize component smeared on the thread section.
- (h) Materials used shall be selected to prevent galvanic corrosion. Special precautions shall be taken to prevent corrosion at joints, or points of intimate contact, between metals of differing electrochemical potential. Wherever possible electrochemically compatible materials shall be used. Contact between stainless steel fixings and galvanised fittings shall be prevented by plastic sleeves and washers.

A12 HYDRAULIC TESTING

- (a) Inspection and testing shall conform to the relevant provisions of NWG Engineering Standard E0111 Specification for Testing and Commissioning.
- (b) The Designer shall take into account all foreseeable changes to the installation which may affect the maximum working pressure of the system and accommodate these within the design. This shall include:
 - Any foreseeable pump changes that would increase the system pressure.
 - An allowance for any reduction in pipe bore due to deposition.
- (c) In order to prevent leakage, it is essential that the fasteners of all flanged pipework joints are tightened sufficiently to withstand the internal pressures of the pipework.

NWG require all flanged pipework connections to be tightened to the bolting torque specified by the pipework supplier in order to achieve a PN16 pressure rating. An appropriate quality assurance record shall be kept by the installer to confirm the required torque has been applied and verified. This record shall be made available to NWG on request.

- (d) The proposed system test pressure shall not be below the relevant provisions of the Civil Engineering Specification for the Water Industry (CESWI) and will allow for any foreseeable changes to the installation as described in (b) above.



A13.2 NWG P.I.T. SHEET FOR SUPPLY EARTHING AND BONDING TEST RESULTS

INSTALLATION SUPPLY, EARTHING AND BONDING - TEST RESULTS

C SUPPLY CHARACTERISTICS

Type of System: T..... Voltage..... V

Phases..... Ze..... Ω

Ipsc(Ph- N)..... kA Ipsc(Ph-Ph)..... kA

Test Results				PIT Report Serial No.	Tested By :	
Voltage (v)	Supply earth loop Impedance $Z_e \Omega$	Ipsc (kA)			Name	Date
		Ph- N	Ph-Ph			

Continuation Sheet No.

D RCD AT ORIGIN OR MAIN SWITCH

COMPLETE RELEVANT PARTS OF
SECTIONS A AND B

E MAIN EQUIPOTENTIAL BONDING CONDUCTORS

Test Results CONTINUITY (✓)				PIT Report Serial No.	Tested By :	
Identify Extraneous Conductive Part/ Service					Name	Date

Continuation Sheet No :

F EARTH ELECTRODE(S)

Test Results ELECTRODE RESISTANCE (Ω)				PIT Report Serial No.	Tested By :	
Identify each Electrode by location					Name	Date

Continuation Sheet No :

A13.3 NWG P.I.T. SHEET FOR INSPECTION AND FUNCTIONAL TESTS

SCHEDULE OF INSPECTION AND FUNCTIONAL TESTS

ITEM No.	DESCRIPTION	STATUS *				ITEM No.	DESCRIPTION	STATUS (TICK BOX)			
		S	U/S	N/A	N/V			S	U/S	N/A	N/V
	<i>INFORMATION</i>					31	ELECTRODE CONNECTION PROTECTED AGAINST MECHANICAL DAMAGE/CORROSION				
1	DRAWINGS, INSTRUCTIONS ETC. AVAILABLE					32	MAIN BONDING PROVIDED TO STRUCTURAL STEELWORK AND METALLIC SERVICES				
2						33	MAIN BONDING CONDUCTORS LABELLED				
	<i>GENERAL</i>					34					
3	CORRECT IDENTIFICATION					35					
4	LABELS LEGIBLE AND DURABLE						<i>ASSEMBLIES - GENERAL</i>				
5	DANGER/WARNING NOTICES					36	ISOLATING DEVICES SECURABLE (LOCKABLE OFF)				
6	ACCESS TO EQUIPMENT					37	COVER PLATES, DOORS, GASKETS ETC				
7	EQUIPMENT AND FIXINGS SUITABLE FOR ENVIRONMENT					38	IDENTIFICATION OF PROTECTIVE DEVICES, SWITCHES & TERMINALS				
8	PROTECTION AGAINST THERMAL EFFECTS					39	DEVICES CORRECT FOR SHOCK PROTECTION DISCONNECTION TIME				
9	FREEDOM FROM PHYSICAL DEFECTS/CORROSION					40	INTERNAL/EXTERNAL CLEANLINESS				
10	COMPLETENESS OF ASSEMBLIES AND INSTALLATION					41	PROTECTIVE BARRIERS/SHIELDS/SHROUDS				
11						42	DAMAGED/MISSING COMPONENTS				
12						43	EXPOSED CONDUCTIVE PARTS EARTHED				
13						44	UNUSED APERTURES SEALED				
	<i>EQUIPMENT AT INSTALLATION ORIGIN</i>					45	OVERCURRENT DEVICE BREAKING CAPACITY SUITABLE FOR FAULT LEVEL				
14	ADEQUATE ACCESS, SPACE AND LIGHTING AT MAIN SWITCHGEAR					46	ACCESS & SPACE				
15	MAIN SWITCHGEAR SUITABLY PLACED FOR READY OPERATION					47					
16	MAIN SWITCHGEAR SUITABLE FOR ISOLATION AND SWITCHING					48					
17	MAIN ISOLATING DEVICE(S) SECURABLE (LOCKABLE OFF)					49					
18	MAIN SWITCH/CB DOUBLE POLE FOR SINGLE PHASE (ANY SYSTEM)						<i>ASSEMBLIES PROVIDING ACCESS TO UNSKILLED PERSONS EG. DBs</i>				
19	MAIN SWITCH/CB THREE/FOUR POLE FOR THREE PHASE (TN SYSTEM)					50	INTERNAL NON-ISOLATED PHASE & NEUTRAL SHIELDED BY BARRIERS				
20	NEUTRAL LINK REMOVABLE ONLY BY USE OF TOOL OR HAS RESTRICTED ACCESS					51					
21	MAIN SWITCH/CB FOUR POLE FOR THREE PHASE (TT SYSTEM)						<i>CABLING AND WIRING</i>				
22	MAIN CB(S)/FUSE(S) BREAKING CAPACITY ADEQUATE FOR FAULT LEVEL					53	CABLES/CONDUCTORS SECURELY TERMINATED				
23	MAIN RCD CURRENT/TIME-DELAYED FOR DISCRIMINATION					54	PROTECTED AGAINST ABRASION AT ENTRIES				
24	RATING AND CONDITION OF INCOMING SUPPLY TAILS/CABLE(S)					55	CORRECT GLANDS AND GLAND PLATES USED				
25	INCOMING TT TAILS SEGREGATED FROM METAL ENCLOSURES UP TO RCD					56	EARTH TAGS CONNECTED TO EARTH				
26						57	EARTHING CONNECTION NOT VIA NON CONDUCTIVE COATING				
27						58	CONNECTIONS IDENTIFIED				
	<i>SYSTEM EARTHING AND BONDING</i>					59	SUPPORTS/FIXINGS SECURE				
28	MAIN EARTHING TERMINAL PROVIDED / ACCESSIBLE / IDENTIFIED					60	ROUTING OF CABLES/MECHANICAL PROTECTION				
29	PROVISION FOR DISCONNECTING EARTHING CONDUCTOR FOR TESTING					61	CONDUIT/TRUNKING COMPLETE & SECURE				
30	EARTHING CONDUCTOR PROTECTED AGAINST MECHANICAL DAMAGE/CORROSION					62	CONDUIT/TRUNKING CAPACITIES NOT EXCEEDED				

* Tick box as appropriate: S - Satisfactory U/S - Unsatisfactory N/A - Not Applicable N/V - Not Verified

Complete relevant sections only

Checklist continued overleaf

PIT REPORT :	* Delete as appropriate
Completed : YES*/NO*	Serial No.....

SCHEDULE COMPLETED BY :
Name.....Date.....

SCHEDULE FOR :

LOCATION	SUB-LOCATION	UNIT / CIRCUIT	ASSET REF

A13.4 NWG P.I.T. SHEET CONTINUATION OF INSPECTION AND FUNCTIONAL TESTS

SCHEDULE OF INSPECTION AND FUNCTIONAL TESTS

ITEM No.	DESCRIPTION	STATUS *				ITEM No.	DESCRIPTION	STATUS (TICK BOX)			
		S	U/S	N/A	N/V			S	U/S	N/A	N/V
	<i>CABLING AND WIRING (CONTINUED)</i>					103	- RCD				
63	METALLIC WIRING SYSTEMS EARTHED/ JOINTS SOUND					104	- OVERLOAD				
64	CATEGORY 1,2 AND 3 CIRCUIT SEGREGATED OR EQUIVALENT					105	-				
65	DUCT SEALING					106	-				
66	FIRE BARRIERS					107	-				
67						108	-				
68						109	-				
69						110	FUNCTIONAL- CONTROLS				
	<i>PROTECTIVE CONDUCTORS</i>					111	- START PB				
70	CIRCUIT PROTECTIVE CONDUCTORS					112	- STOP PB				
71	EXPOSED CONDUCTIVE PARTS EARTHED					113	- HOA				
72	EARTHING FIXINGS, BONDS ETC					114	- LOR				
73	SUPPLEMENTARY EQUIPOTENTIAL BONDS					115	- INTERLOCK(S)				
74						116	- REMOTE CONTROL				
75						117	- AUTO CONTROL				
76						118	- DUTY SELECTION				
	<i>MISC SYSTEMS - INSPECTION</i>					119	-				
77	LIGHTING - GENERAL					120	-				
78	EMERGENCY LIGHTING					121	-				
79	SECURITY AND EXTERNAL LIGHTING					122	FUNCTIONAL- FAULT ROUTINES				
80	FIRE DETECTION AND ALARM					123	- FAULT LOCKOUT				
81	SECURITY SYSTEMS INCLUDING INTRUDER ALARM					124	- FAULT RESET				
82	SOCKET OUTLETS					125	- OVERLOAD				
83	CENTRAL BATTERY AND UPS SYSTEMS					126	-				
84	STANDBY GENERATOR					127	-				
85	LIGHTNING PROTECTION SYSTEM					128	-				
86						129	-				
87						130	-				
88						131	FUNCTIONAL- INDICATING DEVICES				
89						132	- LAMPS (INCLUDING COLOURS)				
	<i>FUNCTIONAL TESTS</i>					133	- METERS				
90	MANUAL OPERATION OF SWITCHING AND ISOLATING DEVICES					134	-				
91	RCD TEST BUTTON (WHERE FITTED)					135	TELEMETRY/ SCADA				
92	SAFETY RELATED CONTROL SYSTEMS					136	- STATUS				
93	- TRIP DEVICES					137	- FAULTS				
94	- INTERLOCKS					138	- CONTROLS				
95	- EMERGENCY STOP CIRCUIT(S)					139	-				
96	- EM STOP LATCH/ RESET					140	STARTER FUNCTIONAL TEST				
97	-					141	FUNCTIONAL - MISC ITEMS 77-89				
98	-					142	- ITEM NO.				
99	-					143	- ITEM NO.				
100	-					144	- ITEM NO.				
101	SETTING OF PROTECTION AND MONITORING DEVICES					145	- ITEM NO.				
102	- OVERCURRENT DEVICE					146	- ITEM NO.				

* Tick box as appropriate: S - Satisfactory U/S - Unsatisfactory N/A - Not Applicable N/V - Not Verified

Complete relevant sections only