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| Assets Planning and Delivery Group  Engineering |

DESIGN STANDARD DS 26-26

Type Specifications – Electrical

Type Specification for Area Control Cubicle

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|  |
| version 1  revision 5 |
| september 2024 |

**FOREWORD**

The intent of Design Standards is to specify requirements that assure effective design and delivery of fit for purpose Water Corporation infrastructure assets for best whole-of-life value with least risk to Corporation service standards and safety. Design standards are also intended to promote uniformity of approach by asset designers, drafters and constructors to the design, construction, commissioning and delivery of water infrastructure and to the compatibility of new infrastructure with existing like infrastructure.

Design Standards draw on the asset design, management and field operational experience gained and documented by the Corporation and by the water industry generally over time. They are intended for application by Corporation staff, designers, constructors and land developers to the planning, design, construction and commissioning of Corporation infrastructure including water services provided by land developers for takeover by the Corporation.

Nothing in this Design Standard diminishes the responsibility of designers and constructors for applying the requirements of the Western Australia's Work Health and Safety (General) Regulations 2022 to the delivery of Corporation assets. Information on these statutory requirements may be viewed at the following web site location:

[Overview of Western Australia’s Work Health and Safety (General) Regulations 2022 (dmirs.wa.gov.au)](https://www.dmirs.wa.gov.au/sites/default/files/atoms/files/overview_general_regulations.pdf)

Enquiries relating to the technical content of a Design Standard should be directed to the Senior Principal Engineer, Electrical Engineering, Engineering Standards Section, Engineering. Future Design Standard changes, if any, will be issued to registered Design Standard users as and when published.

**Head of Engineering**

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**REVISION STATUS**

**The revision status of this standard is shown section by section below**.

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Type Specifications – Electrical

Type Specification for Area Control Cubicle

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# SCOPE

This Specification covers the requirements for the design, construction and testing of a switchboard controlling system designated as a Area Control Cubicle and arranged to interface with a major water or wastewater treatment plant motor control centre switchboard so as to control the monitoring, protection and operation of electric motor drives and other electro-mechanical output devices in a particular area of the treatment plant.

This Specification covers the requirements for an Area Control Cubicle to be located indoors and controlling a relatively large motor control centre switchboard and/or a number of relatively small motor control centre switchboards.

This Specification shall be read in conjunction with the accompanying Annexure and Principal’s drawings.

# DEFINITIONS

Throughout this Specification the following abbreviations shall have the meaning listed hereunder.

(a) PLC shall mean Programmable Logic Controller

(b) RTU shall mean Remote Terminal Unit

(c) PCS shall mean Plant Control System.

(d) LAN shall mean Local Area Network

# SITE

The location of and access to the site for the installation of the Area Control Cubicle shall be as described in the Annexure.

# WORK BY THE PRINCIPAL

The Work to be performed by the Principal shall be as detailed in the Annexure.

# SUPERVISING ENGINEER

Supervising Engineer shall mean the engineer who approved the relevant drawings or an engineer authorized to act on his/her behalf.

# INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

Within the number of calendar days after the receipt of the Principal’s order stated hereunder, the Contractor shall submit to the Principal the following Area Control Cubicle documentation for approval.

(a) General Arrangement including

Equipment Layout 21 days

(b) Equipment List 21 days

(c) Other Drawings 28 days

(d) Inspection and Test Plan 21 days

(e) Test Certificates Within 14 days after delivery

(f) Operating and Maintenance Manual Within 14 days after delivery

(g) As Constructed Drawings Within 14 days after delivery

The Principal shall be entitled to a period of 14 calendar days to review each submission of the above documentation in order to verify that the Contractor's proposals are in accordance with the Contract.

No Contract Extension of Time shall be allowed for such periods.

The Contractor shall not proceed with any work which is subject to the above approval process until the Principal's approval in writing has been received.

Within 28 calendar days of the Supervising Engineer's acceptance of the Area Control Cubicle the, Contractor shall supply 3 sets of A1 sized prints of "as constructed" drawings for the Area Control Cubicle. Such drawings shall show a detailed dimensioned general arrangement, equipment schedules, terminations diagram and all operator interface screen display layouts.

# CONTRACTOR’S DRAWINGS

## General

The Contractor shall submit the Contractor’s drawings for approval either in electronic form or as two A3 paper copies.

All drawings provided by the Contractor to the Principal under the Contract shall be in accordance with the latest issue of the relevant Australian Standard and the Contractor’s standard drafting practice and shall be prepared electronically using either Autocad or Microstation software, preferably the former.

Adequate contrast shall be maintained between drawing and background, and the clarity and quality of the drawings shall enable the Principal to microfilm the prints and to reproduce by photographic processes clear and legible A3 copies for records purposes.

Contractor’s drawings to be provided to the Principal under the Contract shall be provided in electronic form as Autocad or Microsoft files incorporating the Principal’s standard drawing sheet border and title block.

## The Content of Contractor’s Drawings

The Contractor shall provide the Principal with the following drawings:

(a) Project specific cubicle layout.

(b) Project specific equipment and materials list.

(c) Project specific logic diagrams as per para 25.3 (e)

(d) Project specific power diagram similar to drawing no. FS00-8-1.

(e) Project specific serial communication connection diagram similar to drawing no. FS00-8-2.

(f) Unit control operator interface display diagram.

## Marked Up Principal’s Drawings

Except for minor variations approved in writing by the Supervising Engineer, the work shall be constructed strictly in accordance with the Principal’s drawings. Any approved variations to the Principal’s drawings shall be marked up in red on a paper copy of the drawings and submitted to the Supervising Engineer for course to the Principal’s Infrastructure Design Branch.

## Ownership

Drawings provided by the Contractor to the Principal under the Contract shall become the intellectual property of the Principal.

# STANDARDS

## Water Corporation Type Specification

In addition to the requirements of this Specification, the Area Control Cubicle shall be constructed in accordance with the requirements of Water Corporation Standard DS26-9 Type Specification for L.V. Switchboards – General Requirements.

## Australian Standards

In addition to the Australian Standards specified in the Water Corporation’s Type Specification for L.V. Switchboards – General Requirements, the following Australian Standards are referred to in this Specification.

AS 60529 Degrees of Protection Provided by Enclosures for (IP Code)

## International Standards

The following International Standards are referred to in this specification.

(a) IEC 61000-6-2 Electromagnetic compatibility (EMC) – Part 6.2 Generic standards – Immunity for industrial environments

(b) IEC 6100-6-4 Electromagnetic compatibility (EMC). Part 6.4 Generic standards – Emission standard for industrial environments.

# CONFORMANCE WITH THE DRAWINGS

The Area Control Cubicle shall be constructed and configured strictly in accordance with the Principal’s drawings and with this Specification. In the event of a discrepancy between the Principal’s drawings and this Specification, the matter shall be referred to the Supervising Engineer for resolution.

# PREFERRED EQUIPMENT

Where practical, equipment supplied shall be selected from the Water Corporation’s list of preferred equipment.

# OPERATING MODE

The Area Control Cubicle will be required to control and monitor the associated part of the treatment plant unattended and on a continuous basis. The Area Control Cubicle will be interfaced with the PCS equipment via a communications link described in the Annexure. In the event of a failure of the communication link between the Area Control Cubicle and the PCS, the Area Control Cubicle will be required to operate independently to the extent specified in the Annexure.

# SERVICE CONDITIONS

The Area Control Cubicle shall be suitable for continuous operation in the location and under the ambient conditions specified in the Annexure. Local operation of the Area Control Cubicle will be by authorized non-electrical staff.

# POWER SUPPLY

The power supply to the Area Control Cubicle shall be either 240 VAC + 10% - 15%, 50 Hz ± 5% with a total harmonic distortion content of less than 8%, or 24 VDC ± 20%, as specified in the Annexure.

# CONSTRUCTION

## Type of Enclosure

The Area Control Cubicle shall be of the floor mounted cubicle type with front access door only.

Operator interface equipment including the Area Control Cubicle main switch shall be mounted on the front door.

Opening the front door shall provide access to all other equipment and wiring.

The Area Control Cubicle shall be arranged for bottom or top cable entry as shown in the Annexure and shall be mounted on a 100mm high plinth.

## Placement of Equipment

Controls, meters and screen displays shall not be mounted greater than 1.8 metres above floor level, not less than 0.6 metres above floor level.

## Door Locks

Door locks shall be fitted with cylinders suitable for the Lockwood EL-2 key system.

## Form of Separation

The Area Control Cubicle shall be designed and constructed to that all live conductors on the line side of the Area Control Cubicle main switch shall be either:

(a) fully insulated, or

(b) finger protected by barriers which do not restrict access to any equipment or wiring which is connected to the load side of the main switch.

## Electronic Equipment Separation

A separation of not less that 100 mm shall be maintained between the case of any piece of equipment which contains electronic repetitive switching devices and any other piece of equipment which contains electronic circuitry, except where both pieces of equipment are of the same manufacture and the manufacturer advises that a lesser clearance will be acceptable.

Similarly, a separation of not less than 100 mm shall be maintained between the power supply cable running to any piece of equipment which contains electronic circuitry and the case of any other piece of equipment which contains electronic repetitive switching devices, except where both pieces of equipment are of the same manufacture and the manufacturer advises hat a lesser clearance will be acceptable.

Wherever practical a minimum clearance of 100mm shall be maintained between Low Voltage and Extra Low Voltage cables.

## Terminals

(a) Terminal rails shall be mounted vertically.

(b) All terminals shall be numbered sequentially in accordance with terminal numbers indicated on the Contractor’s drawings.

(c) Terminals shall be mounted so as to allow cable marker ferrule numbers to be read easily.

(d) All internal connections shall be made on one side of the terminal strip and all field connections shall be made on the other side of the terminal strip.

(e) Where it is necessary to mount terminal strips side by side, at least 100 mm clearance shall be provided between terminals on adjacent terminal strips.

(f) Field signal cable marshalling terminals shall be provided and connected so as to provide a means of terminating all field cables carrying PLC input/output signals. The field signal cable marshalling terminals shall be additional to and separate from the terminals integral to the PLC input/output cards.

(g) Marshalling terminals shall be single layer type.

# PAINT SYSTEMS

The paint systems used shall be as described in the Water Corporation Standard DS26-9 Type Specification for L.V. Switchboards – General Requirements, unless otherwise approved by the Supervising Engineer.

# DEGREE OF PROTECTION

The design of the Area Control Cubicle shall be such that:

(a) with the front door closed the degree of protection provided shall be IP52 in accordance with AS 60529, and

(b) with the front door open the degree of protection provided shall be IP2X in accordance with AS 60529.

# RATED MAXIMUM OPERATING VOLTAGE

The Area Control Cubicle rated maximum continuous input supply operating voltage shall be 265 VAC.

# RATED INSULATION VOLTAGE

The rated insulation voltage of 240 VAC circuit equipment shall be 500 volt.

# CREEPAGE DISTANCES

The Area Control Cubicle shall be rated for operating in a micro-environment with atmospheric pollution to degree 4 in accordance with AS 3439.1

# RATED IMPULSE WITHSTAND VOLTAGE

The Area Control Cubicle 240 VAC circuits shall have a rated withstand voltage rating of 4 kV.

# PROGRAMMABLE LOGIC CONTROLLERS

## Compatibility with Other PLC’s

Programmable Logic Controllers (PLC’s) provided shall be compatible with the preferred PLC nominated in the Annexure and shall have a performance and functionality generally equivalent to the preferred PLC.

## Electromagnetic Compatibility

Programmable logic controllers (PLC’s) and all other electronic equipment shall be rated for industrial use and shall comply with International Standard IEC 61000-6-4 and IEC 61000-6-2 for electromagnetic emissions and immunity respectively. In addition, such equipment shall be of a type approved by the Australian Communications Authority in respect to electromagnetic compatibility.

## Voltage Disturbances

The PLC(s) shall maintain normal operation during an interruption of A.C. power supply of up to 0.01 seconds. In addition, the PLC(s) shall maintain normal operation during an A.C. supply voltage drop of 30% for a period of 0.5 seconds.

## Control System Definitions

(a) A controlling system is defined as a system comprising the elements which control a controlled system.

(b) A superordinated controlling system is defined as a system which issues on/off commands and set points to a controlling system and which receives feedback information from the latter.

(c) A coordinating controlling system is defined as a system which coordinates the operation of one or more controlling systems.

(d) The Area Control Cubicle shall contain the controlling system for one or more motor control centre switchboards, variable speed drives and other electromechanical output devices in a particular area, as shown on the Principal's drawings.

(e) If so indicated on the Principal's drawings, the Area Control Cubicle shall also contain the coordinating controlling systems for other Area Control Cubicles.

(f) The Supervisory Control System consisting of the overall plant supervisory equipment will be located in the plant central control room and will provide the superordinated controlling system for the specified Area Control Cubicle. The Supervisory Control System will communicate with the Area Control Cubicle via the plant local area network (LAN) as shown on the Principal's drawings.

(g) For the purposes of this Specification Plant Control System (PCS) shall be taken to mean the Supervisory Control System together with all area controlling systems in the plant.

## Allocation and Numbering of I/O

PLC inputs and outputs shall be numbered and allocated to various input and output cards in accordance with the Principal’s drawings if such detail is shown on the latter. If the numbering and allocation of PLC inputs and outputs is not shown on the Principal’s drawings and is thus left to the Contractor’s discretion, numbering and allocation shall follow a logical and consistent pattern and shall be such as to minimise the impact of the failure of any one card on overall plant operation.

## Spare I/O Capacity

As a minimum 20% spare inputs and outputs of each type shall be provided.

Rack space shall be provided for an additional 25% more input and output cards.

## Power Sources

(a) If the Area Control Cubicle is specified on the Principal’s drawings as requiring a battery backed power supply, the battery bank shall be 24 volt and the power supply for all equipment within the Area Control Cubicle shall be derived from the single battery bank. The battery bank shall have the capacity to operate all of the connected equipment for not less than the period specified in the Annexure. As far as is practical, all equipment within the Area Control Cubicle shall be rated for a 24 VDC power supply.

(b) If the Area Control Cubicle is specified on the Principal’s drawings as having a 240 VAC power supply (which may be from a separate battery backed UPS supply):

(i) the power source for the PLC’s remote control modules and associated display units shall be derived within each PLC from the PLC’s 240 VAC power supply and shall be used only for powering the internal operation of these units and the associated communication links, and

(ii) the Area Control Cubicle shall include a suitable separate 240 VAC/24 VDC power supply having its negative side earthed and being capable of driving all analogue and digital I/O.

## Memory

PLC memory shall be non-volatile and at least 20% spare memory shall be provided. If batteries are used to maintain memory, these shall have a rated life of not less than 5 years and the PLC shall incorporate a “low battery” warning indication which shall be arranged to trigger not less than 3 months before the end of battery life.

In the event of a Supervisory Control System failure, PLC functions so specified in the Annexure shall continue to operate on the last downloaded settings without the need for operator intervention.

## Communication with Supervisory Control System

The Area Control Cubicle shall be arranged to receive commands from the Supervisory Control System and to provide data to the latter to the extent indicated in the logic diagrams included in the Principal’s drawings.

In addition, provision shall be made to allow PLC programmes and configuration to be transmitted to and from the Supervisory Control System.

## Analogue Inputs

Analogue inputs shall be 4/20 mA with the negative side earthed unless the external signal loop is to be earthed at the associated transmitter, in which case the input shall be made fully floating, by the provision of a loop isolator if necessary. Analogue inputs required to be fully floating are listed in the Annexure. Analogue inputs shall have an input resistance not exceeding 250 ohm.

## Analogue Outputs

Analogue outputs shall be 4/20 mA fully isolated and individually fused.

Analogue outputs shall be configurable to generate a signal of 0%, 100% or “last state” in the event of a PLC shut down.

Analogue outputs shall be capable of working into a loop resistance of up to 1000 ohms.

## Digital Inputs

Digital inputs other than serial communications links shall be rated at 24 VDC and shall be opto isolated with the negative side grounded and with an input resistance not exceeding 5000 ohm.

Unless shown otherwise on the Principal’s drawings, digital inputs shall be powered from the PLC and shall be suitable for connection to voltage free field contacts. Digital input modules shall be provided with input state indicators.

## Digital Outputs

Digital outputs other than communications links shall be relay isolated voltage free normally open contacts, unless shown on the Principal’s drawings to be solid state switches.

Unless shown otherwise on the Principal’s drawings, relay contacts shall be rated for 108 switching operations at 24 VDC, 200 mA inductive.

Unless otherwise shown on the Principal’s drawings, solid state switches shall be rated at 24 VDC, 200 mA inductive.

Digital output modules shall be provided with output state indicators.

## Field Bus Inputs and Outputs

Field bus inputs and outputs to PLC’s shown on the Principal’s drawings shall be of the type indicated in the Annexure.

# SCREEN DISPLAYS

Screen displays will be developed by others and shall not form part of this Contract.

# CONNECTION INPUTS AND OUTPUTS TO PLC’S

Connections between PLC’s, motor control centre switchboard, separately mounted variable speed controllers, Display Units and Supervisory Control System shall be as shown on the Principal’s drawings (i.e. as shown on the control system block diagram).

# VOLTAGE SURGE PROTECTION

## Incoming Supply Surge Protection

The incoming supply circuit to the Area Control Cubicle shall be protected at the Area Control Cubicle against overvoltage surges by a MOV surge diverter with a rated continuous operating voltage or not less than 275 volts and a let through voltage of not more than 850 volts for a 3 kA 8/20 µs current pulse.

## Extra Low Voltage Circuit Surge Protection

All PLC switched contact input signals originating from transducers mounted on steel pipework or which are located outside the treatment plant building and all PLC 4/20 mA analogue input and output signals shall be protected against overvoltage surges at the Area Control Cubicle with combined gas arrestor and transient protection diode surge diverters having a rated continuous operating voltage of not less than 29 volts and a let through voltage of not more than 60 volts for a 3 kA 8/20 µs current pulse.

# PROGRAMME CODING

## General

(a) Electrically maintained latches shall be used for on/off control functions. Permanent memory latches shall be used only for protection and alarm functions.

(b) The convention shall be adopted that “set” overrides “reset”.

(c) Otherwise programme coding shall be such that it is scan sequence independent.

(d) PLC programme coding shall be developed on a Personal Computer based high level language programmer.

(e) Area Control Cubicle logic (including both the controlling system and the coordinating controlling systems if the latter exist) shall be coded precisely as defined by the logic module internal logic diagrams and by the logic module connection diagrams, both of which are included in the Principal’s drawings.

(f) No attempt shall be made to optimise the logic or to otherwise change its format.

## Coding of Standard Logic Modules

Programmes including standard logic modules shall be programmed strictly in accordance with the Directions for Use shown on Water Corporation Drawings FS00-1-2 and FS01-1-2 as applicable.

## Logic Documentation

(a) Programme coding read out shall be provided directly from the PLC and shall be in either block logic or ladder logic format.

(b) If the PLC coding documentation is in ladder diagram format, the documentation shall:-

(i) include an introduction at the beginning of the ladder diagram documentation with a list of the logic modules and their functions as well as a list of the internal buses used,

(ii) provide annotation on both logic “contacts” and logic “coils”.

(iii) provide cross references between logic “contacts” and “coils” (to the extent allowed by the particular PLC),

(iv) show logic “coils” in coil order number within each logic module (wherever possible within the limits the PLC used), and

(v) show each latch reset function immediately before each associated latch set function.

(c) All inputs, outputs and internal buses shall be annotated with the same descriptions shown on the Principal’s drawings, i.e. on the standard module logic diagrams.

(d) Block logic diagrams shall mirror the logic diagrams shown on the Principal’s drawings i.e. on the standard module logic diagrams.

(e) Once the programme has been tested successfully, the Contractor shall produce a set of project specific logic diagrams based on the project specific logic diagrams provided under the contract, but showing the PLC address of each logic bus and logic function.

Such logic diagrams shall include the standard logic modules used and the module interconnection diagrams as well as any special logic. These logic diagram drawings shall be assigned a new drawing number in the project drawing set.

# AREA CONTROL CUBICLE POWER SYSTEM

The Area Control Cubicle power system shall be arranged in a manner similar to that shown on the typical Area Control Cubicle power diagram included in the Principal’s drawings. Each instrument loop, partial loop or instrument, which needs to operate separately shall be provided with separate circuit fusing. All such fusing shall be graded appropriately.

# LABELING

In addition to the special explanatory labels detailed in the Principal’s drawings, each panel and each item of equipment shall be labelled in accordance with the approved Contractor’s drawings.

# TESTS

(a) The Contractor shall subject the Area Control Cubicle to the following tests and provide appropriate test certificates detailing the test results obtained.

(i) Visual inspection to verify all equipment and wiring is in accordance with the approved drawings,

(ii) Insulation test of 240 VAC circuits,

(iii) Verification of logic coding by visual comparison of logic programme print outs against logic diagrams shown on the Principal’s drawings,

(iv) Verification of correct operation by use of simulated digital and analogue inputs and outputs.

(v) Inspection of all screen displays to verify conformance with the Principal’s drawings.

(b) The cost of all testing shall be to the Contractor’s account.

(c) All testing shall be carried out in the presence of, and to the satisfaction of, the Supervising Engineer or his authorized representative.

# INSTRUCTION MANUALS

## General

Instruction Manuals shall be bound in high grade A4 loose leaf 4 ring binders.

With the exception of “as constructed drawings” and electronic copies of logic programmes, the information included in instruction manuals shall be printed on high grade A4 size paper.

“As constructed drawings” included in instruction manuals shall be printed on high grade A3 sized paper.

Electronic copies of logic programmes shall be in block logic or ladder logic form.

The instruction manuals shall contain full documentation of the Area Control Cubicle and shall be in a form approved by the Supervising Engineer.

## Information Required

Each instruction manual shall contain the following information:

(a) full operating and maintenance instructions for the Area Control Cubicle including all equipment mounted thereon,

(b) a copy of the Area Control Cubicle test results,

(c) a full set of “as constructed drawings”,

(d) technical details, manufacturer’s name and catalogue number for all equipment used in the Area Control Cubicle,

(e) a fully annotated print out of all logic programmes,

(f) an electronic copy of all logic programmes on a Compact Disc Read Only Memory.Insert text here

**Annexure to Specification**

**for**

**Area Control Cubicle**

**A1. Project: ……………………………………………………………………………………**

**A2. Principal’s Drawings:**

A2.1 Single line power diagram for controlled plant *(similar to Dwg. FK80-4-1)*

Dwg No. ……………………………………………………………………………

A2.2 Principal’s standard logic diagrams Dwg. Nos. *(if any of these are to be used; to be selected from standard modules listed Dwg. FS01-1-1, include revision numbers)*

…………………………………………………………………………………………..

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A2.3 Project specific logic diagrams Dwg. Nos. ………………………………………….

………………………………………………………………………………………….

A2.4 Project specific logic module interconnection diagrams *(showing interconnections between logic modules both standard and project specific, diagrams to be similar to Dwgs. FS00-3-1))* Dwg. Nos.

…………………………………………………………………………………………

………………………………………………………………………………………….

A2.5 Project specific control system block diagram *(to be similar in level of detail to that indicated on Dwg. FK80-7-1))* Dwg. No.

…………………………………………………………………………………………

…………………………………………………………………………………………

A2.6 Project specific panel power diagram *(to be similar in level of detail to that indicated on Dwg No. FS00-8-1)* Dwg. No.

………………………………………………………………………………………….

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A2.7 Project specific serial communications connection diagram *(to be similar in level of detail to that indicated on Dwg. No. FS00-8-2)* Dwg. No.

……………………………………………………………………………………………

……………………………………………………………………………………………

A.2.8 Project specific special explanatory labels Dwg. No.

……………………………………………………………………………………………

…………………………………………………………………………………………..

**A3. Site Location …………………………………………………………………………….**

**…………………………………………………………………………………………………**

**…………………………………………………………………………………………………**

**A4. Type of access to Site ……………………………………………………………………..**

**…………………………………………………………………………………………………**

**A5. Type of LAN interface ……………………………………………………………………..**

**A6. Work to be done by the Principal ……………………………………………………….**

**…………………………………………………………………………………………………**

**…………………………………………………………………………………………………**

**…………………………………………………………………………………………………**

**A7. Service Conditions**

A7.1 Location air-conditioned, yes or no? ……………………………………….

A7.2 Maximum ambient air temperature …………………………………….oC

A7.3 Maximum ambient air humidity ……………………………………….%

A7.4 Air borne contaminants ………………………………………..

………………………………………………………………………………………..

**A8. Type of Cable Access to Cubicle**

Bottom or Top Entry ………………………………………………………………….

**Annexure to Specification**

**for**

**Area Control Cubicle**

**A9. Preferred PLC:** Make……………………Model ……………………………………

**A10. Power Supply** (240 VAC or 24 VDC) ………………………………………………….

**A11. Battery power only operating period** …………………………………………….. hrs

**A12. Functions to continue operating during SCS failure ……………………………..**

**……………………………………………………………………………………………**

**……………………………………………………………………………………………**

**……………………………………………………………………………………………**

**A13. Analogue inputs to be fully floating ………………………………………………….**

**……………………………………………………………………………………………**

**A14. Analogue outputs to be fully floating ……………………………………………**

**……………………………………………………………………………………………**

**A15. Type of Communications – Area Control Cubicle to Motor Control Centre Switchboard**

Direct wired or field bus ………………………………………………………………...

In field bus type i.e. Profibus or Devicenet ……………………………………………

**A16. Type of Communications – Area Control Cubicle to Separately Mounted Variable Speed Controllers**

Direct wired or field bus ………………………………………………………………..

In field bus type i.e. Profibus, Modbus or Devicenet ……………………………..

**A17. Other field devices to be connected to a field bus ……………………………..**

**…………………………………………………………………………………………...**

**……………………………………………………………………………………………**

**A18. Type of Field Bus for Other Field Devices ……………………………………………**

**……………………………………………………………………………………………**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type Specification for Area Control Cubicle  Tender Technical Response Schedule** | | | | | |
| **Clause** | **Subject** | **Noted** | **Compliance** | | **Comments** |
| **No.** |  |  | **Yes** | **No** |  |
| **1** | **Scope** |  |  |  |  |
| **2** | **Definitions** |  |  |  |  |
| **3** | **Site** |  |  |  |  |
| **4** | **Work by the Principal** |  |  |  |  |
| **5** | **Supervising Engineer** |  |  |  |  |
| **6** | **Information from Contractor** |  |  |  |  |
| **7** | **Contractors’ Drawings** |  |  |  |  |
| 7.1 | **General** |  |  |  |  |
| 7.2 | Content of Contractor’s Drawings |  |  |  |  |
| 7.3 | Marked Up Principal’s Drawings |  |  |  |  |
| 7.4 | Ownership |  |  |  |  |
| **8** | **Standards** |  |  |  |  |
| 8.1 | Water Corporation Type Specification |  |  |  |  |
| 8.2 | Australian Standards |  |  |  |  |
| 8.3 | International Standards |  |  |  |  |
| **9** | **Conformance with Drawings** |  |  |  |  |
| **10** | **Preferred Equipment** |  |  |  |  |
| **11** | **Operating Mode** |  |  |  |  |
| **12** | **Service Conditions** |  |  |  | For lowest temperature rated equipment item |
|  |  |  |  |  | Ambient temperature rated, deg C = |
| **13** | **Power Supply** |  |  |  |  |
| **14** | **Construction** |  |  |  |  |
| 14.1 | Type of Enclosure |  |  |  | Steel or aluminium construction ? |
| 14.2 | Placement of Equipment |  |  |  |  |
| 14.3 | Door Locks |  |  |  |  |
| 14.4 | Form of Separation |  |  |  |  |
| 14.5 | Electronic Equipment Separation |  |  |  |  |
| 14.6 | Terminals |  |  |  |  |
| **15** | **Paint Systems** |  |  |  |  |
| 15.1 | Paint Colours |  |  |  |  |
| 15.2 | Paint systems for Steel |  |  |  |  |
| 15.3 | Paint Systems for Aluminium |  |  |  |  |
| **16** | **Degree of Protection** |  |  |  | Front door closed IP rating - |
|  |  |  |  |  | Front door open IP rating = |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type Specification for Area Control Cubicle  Tender Technical Response Schedule** | | | | | |
| **Clause** | **Subject** | **Noted** | **Compliance** | | **Comments** |
| **No.** |  |  | **Yes** | **No** |  |
| **17** | **Rated Maximum Operating Voltage** |  |  |  | Max operating volts = |
| **18** | **Rated Insulation Voltage** |  |  |  | Rated insulation volts = |
| **19** | **Creepage Distances** |  |  |  |  |
| **20** | **Rated Impulse Voltage** |  |  |  | For 240 V circuits, rated impulse kV = |
| **21** | **Programmable Logic Controllers** |  |  |  |  |
| 21.1 | Compatibility with Other PLC’s |  |  |  | Make of PLC offered = |
|  |  |  |  |  | Model of PLC offered = |
|  |  |  |  |  | Scan time millisec = |
|  | Resolution of Analogue Signals |  |  |  | Analogue signal repeatability bits = |
|  |  |  |  |  | Linearity bits = |
|  | Diagnostics |  |  |  | *Details to be provided separately* |
| 21.2 | Electromagnetic Compatibility |  |  |  |  |
| 21.3 | Voltage Disturbances |  |  |  |  |
| 21.4 | Control System Definitions |  |  |  |  |
| 21.5 | Allocation & Numbering of I/O |  |  |  |  |
| 21.6 | Spare I/O Capacity |  |  |  | Spare I/O % = |
| 21.7 | Power Sources |  |  |  | Battery only hrs = |
| 21.8 | Memory |  |  |  | Spare memory % = |
| 21.9 | Communication with SCS |  |  |  | LAN protocol = |
| 21.10 | Analogue Inputs |  |  |  | Input ohms = |
| 21.11 | Analogue Outputs |  |  |  | Output ohms = |
| 21.12 | Digital Inputs |  |  |  | Input ohms = |
| 21.13 | Digital Outputs |  |  |  | Rated inductive amps = |
| 21.14 | Field Bus I/O |  |  |  |  |
| **22** | **Screen Displays** |  |  |  |  |
| **23** | **Connection of I/O to PLC’s** |  |  |  |  |
| **24** | **Voltage Surge Protection** |  |  |  |  |
| 24.1 | Incoming Supply Surge Protection |  |  |  | Surge Diverter continuous volts = |
| 24.2 | ELV Circuit Surge Protection |  |  |  | 3 kA 8/20 microsec let through volts = |
| **25** | **Programme Coding** |  |  |  | Surge Diverter continuous volts = |
| 25.1 | General |  |  |  |  |
| 25.2 | Coding of Standard Logic Modules |  |  |  |  |
| 25.3 | Logic Documentation |  |  |  |  |
| **26** | **Area Control Cubicle Power System** |  |  |  |  |

|  |  |  |  |  |  |
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| **Type Specification for Area Control Cubicle  Tender Technical Response Schedule** | | | | | |
| **Clause** | **Subject** | **Noted** | **Compliance** | | **Comments** |
| **No.** |  |  | **Yes** | **No** |  |
| **27** | **Labelling** |  |  |  |  |
| **28** | **Tests** |  |  |  |  |
| **29** | **Instruction Manuals** |  |  |  |  |
| 29.1 | General |  |  |  |  |
| 29.2 | Information Required |  |  |  |  |

END OF DOCUMENT