

Assets Planning and Delivery Group

Engineering

DESIGN STANDARD DS 26-10

Type Specifications – Electrical

Type Specification for Minor Low Voltage Switchboards

> 100 Amps ≤ 220 Amps

|  |
| --- |
| version 2revision 2 |
| 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, Advisory 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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DESIGN STANDARD DS 26-10

Type Specifications – Electrical

Type Specification for Minor Low Voltage Switchboards

> 100 Amps ≤ 220 Amps

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# GENERAL

## Scope

This Specification covers the requirements for the design, construction, workshop testing and as-constructed drawings of a low voltage switchgear and control gear assembly (now referred to as switchboard) having a rated full load capacity in the range > 100 Amps, ≤ 220 Amps.

Switchboards supplied in accordance with this Specification shall be installed only in installations where either: -

1. the short circuit fault level is not more than 10 kA, or
2. the incoming supply to the installation is protected by a current limiting device which limits the cut off peak current to 17 kA.

For the purposes of this Specification, the switchboard rated current shall be taken to whichever is the least of either:

(i) the long time over current setting of the switchboard incoming supply overload protective device, or

(ii) the sum of the current ratings of all of the switchboard outgoing circuit overload protective devices.

## General Requirements

In addition to the requirements of this Specification, the switchboards shall be constructed in accordance with the requirements of the Water Corporation’s MN01 and LX\*\* drawings along with Type Specification for L.V. Switchboards – General Requirements DS26.9.

Except as specified otherwise in this specification, the switchboards shall be designed and constructed in accordance with AS/NZS61439.1.

## 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 1319 Safety signs for the occupational environment

SA/SNZ TR 61439.0 Low-voltage switchgear and control assemblies – Guide to specifying assemblies

AS/NZS 61439.1 Low-voltage switchgear and control assemblies – Part 1: General Rules

AS/NZS 61439.2 Low –voltage switchgear and control assemblies – Part 2: Power switchgear and control assemblies

AS/NZS IEC 60947.1 Low voltage switchgear and control gear – General rules

AS/NZS IEC 60947.2 Low voltage switchgear and control gear – Circuit breakers

IEC 60643-11 Low voltage surge protective devices – Surge protective devices connected to Low Voltage power systems – Requirements and test methods

IEC 60643-12 Low voltage surge protective devices – Surge protective devices connected to Low Voltage power systems – Selection and application principles

AS 60044.1 Instrument transformers – Current transformers

AS/NZS ISO 9001 Quality Management Systems – Requirements

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

## Technology Licence Agreement

The process for the supply of switchboards having a rated capacity of more than 100 Amps and not more than 220 Amps is covered under ‘Technology Licence Agreements’

The Corporation is responsible for the standard switchboards design and its development summarized on the MN01 drawings, along with design verification and maintenance of the drawings and associated standards.

Only approved switchboard manufactures with a signed Licence Agreement with the Water Corporation are permitted to design and construct these switchboards and cubicles based on the standard MN01 drawings.

## Supervising Engineer

Supervising Engineer shall mean the engineer who approved the relevant drawings, or an engineer authorised to act on their behalf.

## Conformance with the Drawings

The switchboard design shall be based principally on the Corporation’s ‘Small Pump Station Standard Electrical Drawings’ ‘MN01’ designs. The project’s Primary Design Drawings shall specify arrangements and equipment based upon these drawings.

Switchboards shall be constructed strictly in accordance with the Drawings and with this Specification. Type or rating of equipment shall be as shown on the Drawings and shall not be modified unless by written variation from the Supervising Engineer.

In the event of a discrepancy between the Drawings and this Specification, the matter shall be referred to the Supervising Engineer for resolution.

## Quality Assurance

The switchboard shall be manufactured under a quality system certified by an accredited authority in accordance with AS/NZS/ISO 9001 or an approved equivalent.

## Contractor’s Drawings

1. All drawings provided by the Contractor shall be in accordance with the latest issue of the Water Corporation Design Standard DS24 – Electrical Drafting
2. All drawings shall be prepared in AutoCAD format, Release 2018 or later software
3. Drawings shall be prepared on the “Electrical” A1 metric drawing sheet and title block provided in the Water Corporation eXternal (WCX) package (available for download) in accordance with the Water Corporations Design Standard DS80
4. The drawings shall provide within the title block, the details to identify the drawing, including but not limited to its title, plan number, revision status, date of issue, Corporate project number, contractor’s name and reference number (if applicable)
5. Drawings detail shall include, but not limited to, the general arrangement, panel layout, power and control circuit diagrams and equipment specifications, as required
6. The contractor shall submit drawings in both AutoCAD and PDF formats in accordance with the Drawing Submission Process. Adequate contrast within the PDF image shall be maintained between drawing content and background to ensure the clarity and quality of the drawings

## As-Constructed Drawings

The Contractor shall provide as-constructed information on all drawings detailing all changes and modifications made during the construction and installation phases of the project.

The contractor shall submit drawings in both AutoCAD and PDF formats in accordance with the Drawing Submission Process. Adequate contrast within the PDF image shall be maintained between drawing content and background to ensure the clarity and quality of the drawings.

# CONSTRUCTION

## Form of Separation

The switchboard shall be Form 1

The enclosures shall be constructed in accordance with the requirements of the ‘Technology Licence Agreement’.

## Type of Mounting

The switchboard shall be of the floor standing cubicle type assembly in accordance with AS/NZS 61439.1 Clause 3.3.4. which may comprise of several sections.

# STARTERS

Approved starter designs include Direct On Line, Autotransformer, Electronic Soft Starter and Variable Speed Controller.

Autotransformer voltage tapping, starting time, maximum starting current, number of starts (starter duty), starter control and monitoring shall be as defined in the standard MN01 and LX\*\* series of drawings.

# POWER SYSTEM INTERFACE

The Control Cubicle no longer forms part of this standard and is the responsibility of Operations Technology.

The requirement is now for a Power System Interface (PSI) to martial all control and monitoring from the power cubicles and commands from the control cubicle via a remote IO. This is connected via the gland plate at the bottom of the control cubicle and the Electrical Switchboards Incomer Cubicle.

The PSI forms part of the Electrical Switchboard and shall be as per the Corporations MN01 and LX\*\* drawings.

# DEGREE OF PROTECTION

For non VSC applications the switchboard shall have a degree of protection rating of IP56 for all compartments.

For VSC applications the Electrical Switchboard may have a combination of IP56 and IP20 rated cubicles. All cubicles shall be IP56 except for those housing suitably IP rated equipment as per the MN01 and LX\*\* drawings.

The switchboard shall be mounted on a fabricated plinth.

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# RATED POWER-FREQUENCY WITHSTAND VOLTAGE

The switchboard rated power-frequency withstand voltage for the main circuits as well as auxiliary and control circuits that are connected to the main circuits shall be as specified in AS/NZS 61439.1, Table 8.

Auxiliary and control circuits, that are not connected to the main circuit shall be subjected to the test voltage according to AS/NZS 61439.1, Table 9.

# CREEPAGE DISTANCES

The switchboard shall be rated for operating in a micro-environment with an atmospheric pollution level to degree 4 in accordance with AS/NZS 61439.1, Table 2

# RATED IMPULSE WITHSTAND VOLTAGE

Switchboards have a withstand voltage rating of 6 kV in accordance with AS/NZS 61439.1, considering altitude during test, as presented in Table 10. .

# ROUTINE VERIFICATION

1. The Contractor shall subject the switchboard to routine the verification in accordance with section 11 of AS/NZS 61439.1 and shall provide appropriate test certificates detailing the routine verification results obtained.
2. The cost of all routine verification shall be to the Contractor’s account.
3. All routine verification shall be carried out in the presence of, and to the satisfaction of, the Supervising Engineer or his authorised representative.

**Annexure to Specification**

**For**

**Low Voltage Switchboard > 100 Amps ≤ 220 Amps**

**Project:**

Type of Installation (pump station or treatment plant):

Switchboard Location and altitude (indoors or outdoors):

Switchboard Title:

**Function** (e.g. Main switchboard, Pump Station Switchboard or Distribution-board):

**Nominal Operating Voltage:** ………………………………………………………………….. Volts

**Nominal Operating Frequency:** …………………………………………………………………. Hz

**Single Line Diagram,**

*detailing all main circuit equipment and the type, ratings and arrangement thereof,*

*shown on drawing number(s)*

**Earthing & Protection Diagrams**

*shown on drawing(s)*:

**Sundry Schematic Diagrams**

*(including details of all auxiliary contacts required) show on drawing(s)*:

Project Specific Requirements (Additional to Part 1):

|  |
| --- |
| **Type Specification for Minor LV Switchboards >100 Amps ≤** **220 AmpsTender Technical Response Schedule** |
| **Clause No.** |  |  | **Yes** | **No** |  |
| **1.** | **General** |  |  |  |  |
| 1.1 | Scope |  |  |  |  |
| 1.2 | General Requirements |  |  |  |  |
| 1.3 | Standards  |  |  |  |  |
| 1.4 | Technology License Agreement |  |  |  |  |
| 1.5 | Supervising Engineer |  |  |  |  |
| 1.6 | Conformance with Drawings  |  |  |  |  |
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| 1.8 | Contractor’s Drawings |  |  |  |  |
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| 2.2 | Type of Mounting  |  |  |  |  |
| **3.** | **Starters** |  |  |  |  |
| **4** | **Power System Interface** |  |  |  |  |
| **5.** | **Degree of Protection** |  |  |  | IP rating = |
| **6.** | **Rated Power Frequency Withstand Voltage** |  |  |  | Impulse Withstand Volts = |
| **7** | **Creepage Distances** |  |  |  | Min. creepage mm = |
| **8** | **Rated Impulse Withstand Voltage** |  |  |  | Impulse Withstand Volts = |
| **9** | **Routine Verification** |  |  |  |  |

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