

|  |
| --- |
| Assets Planning and Delivery Group  Engineering |

DESIGN STANDARD DS 26-42

Type Specifications – Electrical

Type Specification for Kiosk enclosure

for HV Switchgear and/or Transformer

|  |
| --- |
|  |
|  |
| version 1  revision 2 |
| NOVEMBER 2023 |

**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 Principal Engineer, Electrical (Power) Section, Infrastructure Design Branch. Future Design Standard changes, if any, will be issued to registered Design Standard users as and when published.

Head of Engineering

*This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.*

*It is the responsibility of the user to ensure they are using the current version of this document.*

© Copyright – Water Corporation: This standard and software is copyright. With the exception of use permitted by the Copyright Act 1968, no part may be reproduced without the written permission of the Water Corporation.

DISCLAIMER

This Standard is intended solely for application to the acquisition of water infrastructure in Operating Areas in Western Australia where the Water Corporation has been licensed to provide water services subject to the terms and conditions of its Operating License.

This Standard is provided for use only by a suitably qualified professional design engineer who shall apply the skill, knowledge and experience necessary to understand the risks involved and undertake all infrastructure design and installation specification preparation work.

Any interpretation of anything in this Standard that deviates from the requirements specified in the project design drawings and construction specifications shall be resolved by reference to and determination by the design engineer.

The Corporation accepts no liability for any loss or damage that arises from anything in the Standard including loss or damage that may arise due to the errors and omissions of any person.

REVISION STATUS

The revision status of this standard is shown section by section below:

| **REVISION STATUS** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **SECT.** | **VER./REV.** | **DATE** | **PAGES REVISED** | **REVISION DESCRIPTION**  **(Section, Clause, Sub-Clause)** | **RVWD.** | **APRV.** |
| **1** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **2** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **3** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **4** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **5** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **6** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **7** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **8** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **9** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
| **9** | **1/2** | **06.11.23** | **9** | **Section 9 revised** | **SWG** | **EDG** |
|  |  |  |  |  |  |  |
| **10** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
| **10** | **1/2** | **06.11.23** | **9** | **Section 10 revised** | **SWG** | **EDG** |
|  |  |  |  |  |  |  |
| **11** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
| **11** | **1/2** | **06.11.23** | **10** | **Section 11 revised** | **SWG** | **EDG** |
|  |  |  |  |  |  |  |
| **12** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
|  |  |  |  |  |  |  |
| **13** | **1/0** | **01.11.15** | **All** | **New version** | **NHJ** | **MSP** |
| **14** | **1/0** | **31.10.19** | **All** | **New version** | **EDG** | **NHJ** |
| **15** | **1/0** | **31.10.20** | **All** | **New version** | **EDG** | **NHJ** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

DESIGN STANDARD DS 26-42

Type Specifications – Electrical

Type Specification for Kiosk Enclosure for HV Switchgear and/or Transformer

**CONTENTS**

*Section Page*

[1. General 6](#_Toc151992357)

[2. Standards 6](#_Toc151992358)

[3. Compartments 6](#_Toc151992359)

[4. Operator Access 7](#_Toc151992360)

[5. Safety Interlocks 7](#_Toc151992361)

[6. Layout 7](#_Toc151992362)

[*7.* Transformer Fixings 7](#_Toc151992363)

[8. Degree of Protection 8](#_Toc151992364)

[9. Rated Class 8](#_Toc151992365)

[10. Construction 8](#_Toc151992366)

[11. Corrosion Protection 9](#_Toc151992367)

[12. Earthing 9](#_Toc151992368)

[12.1 Earth Bars 9](#_Toc151992369)

[12.2 Earth Connections 9](#_Toc151992370)

[13. Cable Entries 10](#_Toc151992371)

[14. Routine Tests 10](#_Toc151992372)

# General

(a) This Specification covers the technical requirements for a prefabricated kiosk enclosure to be provided as part of a contract for:

(i) A complete High Voltage/Low Voltage prefabricated substation

(ii) A separate kiosk enclosed transformer, or

(iii) A separate kiosk enclosed High Voltage switchgear

(b) This Specification is intended to be incorporated into specification and contract documents for the above equipment.

(c) This Specification is not intended for use as a stand alone document.

(d) The following requirements shall apply regardless of whether the kiosk is being supplied for a complete prefabricated substation, for a separate kiosk enclosed transformer, or for separate kiosk enclosed High Voltage switchgear.

# Standards

In particular the kiosk shall comply with the requirements of AS 62271.202 as further detailed in this Specification,

Specific reference is made within this Specification to the following Australian Standards:

AS 2067 Substations and High Voltage installations exceeding 1 kV

AS 1627.4 Metal-Finishing - Preparation and Pre-treatment of Surfaces Abrasive Blast Cleaning

AS 2700 Colour standard for general purposes

AS 60529 Degree of Protection Provided by Enclosures for Electrical Equipment

AS/NZS 2312 Guide to the Protection of Iron and Steel Against Exterior Atmosphere Corrosion

AS/NZS 3750 Paints for Steel Structures

AS 62271.202 High Voltage switchgear and control gear - High Voltage/Low Voltage prefabricated substations

ISO 9223 Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation

# Compartments

(a) Separate compartments shall be provided for primary circuit High Voltage switchgear and for the transformer, however, if the kiosk is being provided for a prefabricated substation, it shall be a single structure on a single bed plate.

(b) This Specification does not cover kiosks including main circuit Low Voltage switchgear. Main circuit Low Voltage switchgear shall not be housed in kiosks complying only with this Specification.

(c) Requirements specified herein in respect to the switchgear compartment shall have no relevance to a kiosk being provided without switchgear. Similarly, requirements specified herein in respect to the transformer compartment shall have no relevance to a kiosk being provided solely to house switchgear.

# Operator Access

(a) Separate external access doors shall be provided to the High Voltage switchgear compartment and to the transformer compartment.

(b) Operator access to High Voltage switchgear shall be from outside the kiosk or from inside the kiosk switchgear compartment as specified in the Annexure.

Kiosks providing outside operator access shall not be used in applications requiring all weather access to switchgear

(c) A warning notice shall be fitted to the doors allowing access to the High Voltage switchgear and to the High Voltage side of the transformer as follows:

**DANGER HIGH VOLTAGE**

(d) Access doors shall open outwards at an angle of at least 90o and shall be equipped with a device to enable them to be maintained in the open position.

(e) If the transformer is a oil filled transformer, access door(s) to the transformer compartment shall provide ready access to the transformer tapping switch, oil level indicator, earthing terminal, oil thermometer, transformer pressure relief valve, rating plate, terminal marking plate, transformer primary cable terminations, transformer primary surge diverters, secondary cable terminations, the transformer mounted secondary star point current transformer (if specified), the capacitor tripping supply Low Voltage HRC fuse and associated terminals (if specified)

(f) Similarly if the transformer is a dry type transformer, access door(s) to the transformer compartment shall provide ready access to the transformer tapping links, earthing terminal, PT sensor terminals, rating plate, terminal rating plate, primary cable connections, transformer primary surge diverters, cooling fans, secondary cable terminations, the transformer mounted secondary star point current transformer (if specified), the capacitor tripping supply Low Voltage HRC fuse and associated terminals (if specified).

# Safety Interlocks

(a) Ronis key interlocks shall be provided on all access doors to the transformer compartment so as to ensure that the door cannot be opened unless the transformer is isolated from all possible sources of electrical supply.

(b) Final key patterns shall be confirmed by the Principal within 14 days of the date of issue of the Principal’s order.

# Layout

(a) Adequate space shall be provided in the transformer compartment adjacent to transformer terminals to allow convenient cable termination.

(b) Sufficient space shall be provided around the transformer High Voltage terminals to allow the fitting of cable connector mounted surge diverters.

(c) Adequate cable entries shall be provided in the kiosk base in such a manner and in such locations as to allow convenient cable installation and termination.

# Transformer Fixings

(a) Adequate fixings shall be provided in the base of the kiosk transformer compartment to allow the transformer base frame to be bolted down to the kiosk base.

(b) The transformer shall be provided bolted down securely within the kiosk transformer compartment.

# Degree of Protection

(a) The High Voltage switchgear compartment shall be weatherproof with a degree of protection of not less than IP24DW providing mechanical, sun and driving rain protection to the switchgear.

(b) The transformer compartment shall be weatherproof with a degree of protection of not less than IP23DW providing mechanical, sun and driving rain protection to the transformer.

The transformer compartment shall be provided with adequate drainage for any water entering the compartment during heavy storms.

# Rated Class

(a) The Rated class rating of the transformer compartment shall be not greater than 15 K in accordance with AS 62271.202.

(b) The Rated class rating of the switchgear compartment shall be not greater than 5 K in accordance with AS 62271.202.

# Construction

(a) The kiosk shall be suitable for mounting onto concrete footing at, or slightly above, ground level.

(b) The base of the kiosk shall be hot dipped galvanised steel or reinforced concrete construction.

(c) For a kiosk enclosed an oil type transformer an oil catchment tray capable of retaining all of the transformer oil in the event of an oil leak from the tank or the radiators shall be incorporated into the transformer kiosk design.

(d) The design of the kiosk shall be sufficiently strong and rigid to allow lifting and transport of the kiosk complete with specified switchgear and transformer.

(e) Fixings shall be provided on the external of the kiosk base to allow the kiosk to be bolted down to the concrete footings.

(f) The kiosk, apart from the base, shall be of stainless steel grade 316L or marine grade aluminium 5005 construction and shall be bolted onto the kiosk base.

(g) The kiosk shall be vermin and vandal proof.

(h) The kiosk shall be equipped with appropriate document and operating handle storage facilities.

1. The kiosk shall be provided with a stainless steel clearly legible nameplate which shall contain the information specified in section 5.10 ‘Nameplate’ of AS 62271.202.

# Corrosion Protection

(a) If the enclosure apart from the base is stainless steel, it shall be painted after construction. The stainless steel shall be treated in accordance with the Water Corporations surface preparation specification A2. Etch primer and two or more coats of acrylic enamel shall then be applied to form a total dry film thickness of not less than 75 microns.

(b) If the enclosure apart from the base is marine grade aluminium the enclosure shall be treated in accordance with the Water Corporations coating specification G1. The corrosivity category the paint system shall protect against shall be specified in the annexure.

(c) The external and internal paint or powder coated surfaces shall be coloured Serpentine Green to AS 2700.

# Earthing

## 12.1 Earth Bars

Separate properly mounted copper earth bars shall be provided in convenient locations in the High Voltage switchgear compartment and in the transformer compartment.

## 12.2 Earth Connections

(a) Flexible electrical bonding straps shall be installed bonding kiosk access doors to the kiosk frame.

(b) Earthing connections within the kiosk shall be generally consistent with those shown in Fig. B2 of AS 2067.

(c) The relevant Fig. B2 AS 2067 cable types and sizes are as indicated in parentheses hereunder:

- Earth bonding cables shall be connected between the High Voltage switchgear compartment earth bar and the following:

1. Kiosk frame (cable type **a\***)
2. Kiosk base including reinforcing steel if the kiosk base is of reinforced concrete construction (cable type **a\***)
3. Associated transformer compartment earth bar if the kiosk incorporates both a High Voltage switchgear compartment and a transformer compartment - dual connections required (cable type **a\***)

- Once High Voltage switchgear is installed in the kiosk, earth bonding cables shall be connected between the High Voltage switchgear compartment earth bar and the following:

1. High Voltage switchgear frame (cable type **a\***)
2. High Voltage surge diverters if such devices are provided in the High Voltage switchgear (cable type **a\***)
3. Incoming and outgoing High Voltage cable screens (cable type **a\***)

- The High Voltage compartment earth bar shall include provision for:

1. Dual connections to an external grading ring
2. Dual connections to other High Voltage earth bars

- If the kiosk incorporates a High Voltage compartment only (i.e. without a transformer compartment) the High Voltage compartment earth bar shall include provision for dual connections to an external earthing system

- Earth bonding cables shall be connected between the transformer compartment earth bar and the following:

1. Kiosk frame (cable type **a\*** or **b\*\***, whichever is the greater)
2. Kiosk base including reinforcing steel if the kiosk base is of reinforced concrete construction, (cable type **a\*** or **b\*\***, whichever is the greater)
3. associated High Voltage switchgear compartment earth bar if the kiosk incorporates both a High Voltage switchgear compartment and a transformer compartment - dual connections required ( cable type **a\*** or **b**\*\*, whichever is the greater)

- Once transformer is installed in the kiosk, earth bonding cables shall be connected between the transformer compartment earth bar and the following:

1. Transformer frame (cable type **a\*** or **b\*\***, whichever is the greater)
2. Transformer High Voltage cable connection surge diverters (cable type **a\***)

- Transformer Low Voltage neutral shall be connected to the substation main earth terminal bar (cable type b\*\*)

- Provision shall be made on the transformer compartment earth bar for the connection of dual cables connecting to the installation main earth system.

- If the kiosk incorporates a transformer compartment only (i.e. without a High Voltage compartment) the transformer compartment earth bar shall include provision for dual connections to an external grading ring.

Notes:

\* Cable type **a** shall be sized to HV fault current

\*\* Cable type **b** shall be sized to LV fault current

# Cable Entries

Adequate cable entries shall be provided in the prefabricated substation kiosk base in such a manner and location as to allow convenient cable installation and termination.

# Routine Tests

To prevent the occurrence of internal faults, evidence shall be submitted on delivery, indicating that the prefabricated kiosk enclosure passed successfully the routine tests and verifications stated in section 7 ‘Routine Tests’ of AS 62271.202

**Annexure to Specification**

**for**

**Kiosk Enclosure for HV Switchgear and/or Transformer**

**Type of Equipment to be housed**

(i.e. stand-alone HV switchgear, stand-alone transformer, or complete prefabricated substation):

**Type of HV Switchgear Operator Access**

(i.e. from inside or outside the kiosk)

Earthing cable type **a**: …………………………………………………………………………..

Earthing cable type **b**: ……………………………………………………………………………

HV clearance time: …………………………………………………………………………. sec

LV clearance time: …………………………………………………………………………. sec

HV Fault level: ……………………………………………………………………………………

LV Fault level: ……………………………………………………………………………………

**Corrosion Protection**

(For powder coated aluminium to specification G1)………………………………(C1-C3/C4-C5)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type Specification for Kiosk Enclosure  for HV Switchgear and/or Transformer  Tender Technical Response Schedule** | | | | | |
| Clause | **Subject** | **Noted** | Compliance | | **Comments** |
| **No.** |  |  | **Yes** | **No** |  |
| **1.** | **General** |  |  |  |  |
| **2.** | **Standards** |  |  |  |  |
| **3.** | **Compartments** |  |  |  |  |
| **4.** | **Operator Access** |  |  |  |  |
| **5.** | **Safety Interlocks** |  |  |  |  |
| **6.** | **Layout** |  |  |  |  |
| **7.** | **Transformer Fixings** |  |  |  |  |
| **8.** | **Degree of Protection** |  |  |  | HV switchgear compartment IP rating = |
|  |  |  |  |  | Transformer compartment IP rating = |
| **9.** | **Thermal Class** |  |  |  | HV switchgear compartment thermal class = |
|  |  |  |  |  | Transformer compartment thermal class = |
| **10.** | **Construction** |  |  |  |  |
| **11.** | **Corrosion Protection** |  |  |  |  |
| **12.** | **Earthing** |  |  |  |  |
| 12.1 | Earth Bars |  |  |  |  |
| 12.2 | Earth Connections |  |  |  | Type “**a**” cable rated Amps = |
|  |  |  |  |  | Type “**b**” cable rated Amps = |
| **13.** | **Cable Entries** |  |  |  |  |
| **14** | **Routine tests** |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**END OF DOCUMENT**