Network Standard

NETWORK	Document No	: NW000-S0039
	Amendment No	: 0
	Approved By	: Chief Engineer
	Approval Date	: 26/06/2015

NW000-S0039 **NS257 CONTROL AND PROTECTION CABINETS AND MINOR PANEL HARDWARE**

ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the Control and Protection Cabinets and Minor Panel Hardware, and is for reference by field, technical and engineering staff.

Ausgrid maintains a copy of this and other Network Standards together with updates and amendments on www.ausgrid.com.au.

Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document

DISCLAIMER

As Ausgrid's standards are subject to ongoing review, the information contained in this document may be amended by Ausgrid at any time. It is possible that conflict may exist between standard documents. In this event, the most recent standard shall prevail.

This document has been developed using information available from field and other sources and is suitable for most situations encountered in Ausgrid. Particular conditions, projects or localities may require special or different practices. It is the responsibility of the local manager, supervisor, assured quality contractor and the individuals involved to make sure that a safe system of work is employed and that statutory requirements are met.

Ausgrid disclaims any and all liability to any person or persons for any procedure, process or any other thing done or not done, as a result of this Standard.

All design work, and the associated supply of materials and equipment, must be undertaken in accordance with and consideration of relevant legislative and regulatory requirements, latest revision of Ausgrid's Network Standards and specifications and Australian Standards. Designs submitted shall be declared as fit for purpose. Where the designer wishes to include a variation to a network standard or an alternative material or equipment to that currently approved the designer must obtain authorisation from the Network Standard owner before incorporating a variation to a Network Standard in a design.

External designers including those authorised as Accredited Service Providers will seek approval through the approved process as outlined in NS181 Approval of Materials and Equipment and Network Standard Variations. Seeking approval will ensure Network Standards are appropriately updated and that a consistent interpretation of the legislative framework is employed.

Notes: 1. Compliance with this Network Standard does not automatically satisfy the requirements of a Designer Safety Report. The designer must comply with the provisions of the Workplace Health and Safety Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report which must also be presented to Ausgrid. Further information is provided in Network Standard (NS) 212 Integrated Support Requirements for Ausgrid Network Assets.

2. Where the procedural requirements of this document conflict with contestable project procedures, the contestable project procedures shall take precedent for the whole project or part thereof which is classified as contestable. Any external contact with Ausgrid for contestable works projects is to be made via the Ausgrid officer responsible for facilitating the contestable project. The Contestable Ausgrid officer will liaise with Ausgrid internal departments and specialists as necessary to fulfil the requirements of this standard. All other technical aspects of this document which are not procedural in nature shall apply to contestable works projects.

INTERPRETATION

In the event that any user of this Standard considers that any of its provisions is uncertain, ambiguous or otherwise in need of interpretation, the user should request Ausgrid to clarify the provision. Ausgrid's interpretation shall then apply as though it was included in the Standard, and is final and binding. No correspondence will be entered into with any person disputing the meaning of the provision published in the Standard or the accuracy of Ausgrid's interpretation.

KEYPOINTS

This standard has a summary of content labelled "KEYPOINTS FOR THIS STANDARD". The inclusion or omission of items in this summary does not signify any specific importance or criticality to the items described. It is meant to simply provide the reader with a quick assessment of some of the major issues addressed by the standard. To fully appreciate the content and the requirements of the standard it must be read in its entirety.

AMENDMENTS TO THIS STANDARD

Where there are changes to this standard from the previously approved version, any previous shading is removed and the newly affected paragraphs are shaded with a grey background. Where the document changes exceed 25% of the document content, any grey background in the document is to be removed and the following words should be shown below the title block on the right hand side of the page in bold and italic, for example, Supersedes – document details (for example, "Supersedes Document Type (Category) Document No. Amendment No.").

KEY POINTS OF THIS STANDARD

Scope and Risks Addressed

This standard is limited to scope identified below and provides controls for associated risks as listed below:

- ☐ Control and protection cabinets in substations
- ☐ Minor hardware used in control and protection cabinets.

Where to for more information?

Section 2-4

Cabinet construction

There are 6 major classes of cabinet described:

- ☐ Generic rack cabinets (Item 1 and 2)
- ☐ Special rack cabinets (Item 3a and 3b)
- ☐ Communications cabinets (Item 4)
- ☐ Swing frame cabinets (Item 5 and 6)

Where to for more information?

Section 5.1 to 5.3

Cabinet internals

Construction requirements including references to safety and construction management processes:

- ☐ General equipment types
- ☐

Where to for more information?

Section 5.4

Network Standard
NS257
Control and Protection Cabinets and Minor Panel Hardware

Contents

1.0 PURPOSE

This Standard provides for the specification of substation cabinets or panels styles and certain minor hardware they contain.

Ausgrid employs rack and swing frame cabinets for the purpose of housing control, protection and communications hardware and associated copper and fibre wiring.

Cabinets are generally of 19" (45RU) or 24" (45RU) format for indoor use only and are generally installed in ventilated rooms with no climate control.

2.0 SCOPE

The standard applies to the cabinets used for control and protection equipment within zone and sub-transmission substations.

It covers the panel specifications and the minor hardware such as lamps, door locks and similar hardware not directly associated with the design of the control equipment that will be installed in the cabinets.

Not included is the interconnecting wiring between equipment, the wiring terminations nor the wiring between cabinets, as covered under NS251, NS252 and NS253.

3.0 REFERENCES

3.1 General

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards. Current Network Standards are available on Ausgrid's Internet site at www.ausgrid.com.au.

3.2 Ausgrid documents

- Company Form (Governance) - Network Document Endorsement and Approval
- Company Procedure (Governance) - Network Document Endorsement and Approval
- Company Procedure (Network) - Production / Review of Network Standards
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- NS158 Labelling of Mains and apparatus.
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS208.2.2 Telecommunications Substations Communications Cabinet Interconnectivity Design Work Instruction
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- NS251 Secondary Systems – Requirements for cables between panels.
- NS252 Secondary Systems - Requirements for wiring within panels.
- NS253 Secondary Systems – Termination of wiring in substation protection and control equipment.
- Ausgrid Drawings

Drawing Number	Drawing Title
169174	Illuminated control and push button lamp holder
169175	Idec RH series general purpose auxiliary relays
151744	Substations rack cabinet support frames and horizontal support struts and spacer details
231255	Cabinet specification drawings
185413	Typical earth bar arrangement in cabinets
038841, 050996, 121506	Moulded type link assemblies layouts and drilling details

3.3 Other standards and documents

- AS 2700-2011 Colour Standards for General Purposes

3.4 Acts and regulations

- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014
- Work Health and Safety Act 2011 and Regulation 2011

4.0 DEFINITIONS

Business Management System (BMS)	An Ausgrid internal integrated policy and procedure framework that contains the approved version of documents.
Cage Nut	A nut consisting of a square nut contained in a winged steel cage. When the wings are compressed, the nut assembly is inserted into a square hole, so holding the nut in place. Also known as captive nuts or clip nuts.
Document control	Ausgrid employees who work with printed copies of document must check the BMS regularly to monitor version control. Documents are considered "UNCONTROLLED IF PRINTED", as indicated in the footer.
HDHC	Hard Drawn High Conductivity Copper.
Network Standard	A document, including Network Planning Standards, that describes the Company's minimum requirements for planning, design, construction, maintenance, technical specification, environmental, property and metering activities on the distribution and transmission network. These documents are stored in the Network Category of the BMS repository.
Review date	The review date displayed in the header of the document is the future date for review of a document. The default period is three years from the date of approval however a review may be mandated at any time where a need is identified. Potential needs for a review include changes in legislation, organisational changes, restructures, occurrence of an incident or changes in technology or work practice and/or identification of efficiency improvements.

5.0 CABINET TYPES

5.1 Generic rack cabinets (Items 1 and Item 2)

Generic rack cabinets shall be 600 mm wide to fit 19" (45RU) racks (Item 1) or 725mm wide to fit 24" (45RU) racks. Both are 600 mm deep. The cabinets have bolted front panels, removable side panels and a hinged/removable rear door, with the cabinet roof and rear door capable of being vented if required.

5.2 Special rack cabinets (Items 3a and 3b)

Special rack cabinets 1000m wide (45RU) (Item 3a) and 685mm wide (45RU) (Item 3b) will be required. These cabinets have similar requirements to Item 1 and Item 2 except that they require front metal framed clear glass or polycarbonate doors and additional front cross frames (refer Ausgrid drawing 151744).

5.3 Communications cabinets (Item 4)

Communications cabinets shall be of the 19" 45RU rack format 600 mm wide and 800 mm deep with removable side panels and hinged/removable front and rear doors, with the cabinet roof and/or doors being vented by a forced filtered system.

5.4 Swing frame cabinets (Items 5 and 6)

Swing frame cabinets shall be of the 19" (45RU) or 24" (45RU) rack formats 800 mm wide and 600 mm deep with bolted front panels, removable side panels and a swing frame front door. The increased width is to allow the opening of the swing frame without installed equipment fouling the sides.

6.0 CABINET CONSTRUCTION

6.1 Cabinet frame

All cabinets should be approximately 2100mm high.

All cabinets shall have four (4) fixing points for attachment to the floor or support structure.

Swing frame cabinets shall have at least two (2) fixing points at the rear of the cabinet for attachment to a wall or support structure.

Provision shall be made for the installation of four (4) removable lifting eyes on the top of the cabinet.

All panels shall have a plinth/kick plate at the bottom of the cabinet and the cabinet frame will preferably be of welded construction.

6.2 Rail mounting frames (all cabinets)

Five (5) equally spaced horizontal braces shall be provided on each side of the cabinet for securing admiralty tray and terminal rails. In addition, for swing frame cabinets, five (5) equally spaced horizontal braces shall be provided on the inside of the rear of the cabinet.

6.3 Front panels

The front panels for Items 1, 2, 3a, 3b, 5 and 6 shall be punched in accordance with particular requirements as specified by the Engineering Brief for the application.

6.4 Side panels (all cabinets)

Removable steel panels which extend from the top to the bottom of the cabinet and occupy at least 50 percent of the side area of the cabinet shall be provided as required.

6.5 Cabinet roof (all cabinets)

The cabinet roof shall be flat and comprise of a removable panel in four 150mm deep sections running across the top from left to right with capacity to interchange each of the four sections independently with a brush panel entry plate.

6.6 Cabinet doors

6.6.1 Door locks (optional)

Doors may require locks to be fitted to door handles for both rack and swing frame cabinets. The locks shall be capable of accepting an Euro tumbler and key. The tumbler and key will be supplied and fitted after cabinet delivery.

6.6.2 Rack cabinets only

All cabinets shall have rear doors. Some cabinets may require front doors in special circumstances as requested by Ausgrid.

All doors shall be of steel construction and may be right or left hinged as required.

All doors shall be capable of being removed without the need for tools and provided with a suitable door handle and three-point latching mechanism.

All doors are to be provided with a suitable stiffener to limit door flexion and an earthing stud on the inside of the lower hinge-side corner.

6.6.3 Plan holder (option)

Installation of a plan holder may be required for non-standard or special design panels. The plan holder shall be capable of holding an A0 sized drawing folded to A3 size. Plan holders shall be mounted inside the rear cabinet door.

6.6.4 Transparent doors (option)

Transparent front doors shall be fitted on 1000mm and 685mm special rack cabinets (Item 3a, 3b). The doors shall be metal framed and of transparent “shatterproof” glass or polycarbonate construction.

Transparent doors shall be capable of being removed without the need for tools. Magnetic latches shall be fitted at the top and bottom of each door.

6.6.5 Swing frame cabinet doors

All doors shall be of steel construction and may be right or left hinged as required.

All doors shall be provided with a suitable door handle and three-point latching mechanism.

All doors are to be provided with a suitable stiffener to limit door flexion and provision for an earthing stud on the inside of the lower hinge-side corner.

6.7 Standard front panels (all cabinets)

Standard front panels shall be of appropriate width to suit the relevant rack format and shall be constructed of 3mm thick mild steel.

An 8 mm deep return shall be provided at the top and bottom edge of each panel. The return width shall be 80mm narrower than the required panel width and centrally located.

Panel heights will be specified by Ausgrid in the cut-out file, but will generally be in multiples of RU.

Panels shall be supplied with the relevant number of mounting screws and cage nuts.

For a typical 19” front panel refer to Ausgrid drawing 231255. For a typical 24” front panel refer to Ausgrid drawing 231255.

6.8 Hinged front panels (rack cabinets only)

In circumstances in which there is a requirement for hinged front panels the hinged front panels shall be constructed as per standard front panels, except that they shall be provided with hinges on one side and knurled finger screws on the other side. They shall have a “D” type chrome plated or stainless steel handle. For a typical 19” hinged front panel refer to Ausgrid drawing 231255.

The hinged front panels shall be capable of being removed without the use of tools.

6.9 Ventilation (option)

6.9.1 Standard door ventilation

Doors may require ventilation in special circumstances as required in consideration of the equipment to be installed. The ventilation shall consist of at least five (5) 400mm wide slots at both the top and bottom of the door.

6.9.2 Communication cabinet forced door ventilation

Positive pressure, redundant, filtered forced ventilation systems are required for communication cabinets (Item 4) only.

The ventilation system shall consist of two (2) 360 m^3/hr fans installed in the lower portion of the front door, with a cable terminated with a 240 V ac 10 A plug and of sufficient length to reach the

upper rear of the enclosure. One fan shall be wired to run continuously, and the second fan shall be wired through an adjustable thermostat with a range of 30 to 50 degree Celsius .

6.10 Panel cut-out details

Panel cut-out details are contingent on the details and purposes to which the panels will be put to use. Panel cut-out details will be determined based on site specific design information.

6.11 Infill panels

Infill panels are required on 1000mm and 685mm rack cabinets only. They consist of painted metal strips 45RU high x 100mm wide x 2mm thick mounted between the front of the cabinet and a recessed front panel.

There are two (2) required per cabinet.

For reference drawing showing infill panels refer 191060.

6.12 Horizontal support struts

Horizontal support struts are required for 1000mm and 685mm rack cabinets to support front fuse panels. There are four (4) required per cabinet.

The struts are detailed on Ausgrid drawing 151744.

6.13 Surface protection and painting

Cabinets/panels shall be powder coated (inside and out) to AS 2700 colour “Cloud Grey” N22 over zinc-coated annealed steel. Alternative equivalent protection and painting processes may be used.

6.14 Vermin barriers

A means of preventing access by vermin should be made available in communications cabinets, around entry points other than the doors. This vermin control measures must be removable to allow addition or removal of cables to the cabinet.

7.0 EARTHING ARRANGEMENTS

7.1 General

Doors, racks, movable items, fixed items, screw mounted internal fittings, and all metallic parts must be connected to the earth bar in the cabinet.

Connection to and from the earth bar is specified in NS253 Termination of Wiring in Substation Protection and Control Equipment.

7.2 Earth bars

A 25mm x 3mm HDHC flat copper earth bar is to be provided at the bottom/front of the 19” and 24” rack cabinets.

The earth bar is to be provided with two (2) 12mm holes and twelve (12) 5.5mm holes for the termination of earth wires.

The earth bar is to extend the width of the rack cabinet opening and is to be secured to the metal frame of the cabinets at both ends using metal bolts, nuts and locking washers.

For a typical earth bar arrangement refer to Ausgrid drawing 185413. Alternative equivalent earth bars may be used by agreement with Ausgrid.

8.0 INTERNAL COMPONENTS

8.1 General

Standard internal fittings such as 35mm DIN rail, 100mm wide form cable tray, 40mm x 60mm slotted duct, fibre management rings and sliding shelves are will be fitted as part of the cabinet fitout. They will be specified at the time of project design as appropriate for the use of the cabinet.

8.2 Terminal mountings and rails

The standard hardware for containing wiring and wiring looms in the cabinets is 40x60mm slotted duct and 100mm wide-form trays. Miscellaneous hardware such as terminals, auxiliary relay bases and the like are fixed using 35mm DIN rail.

8.3 Test links

Test links and the wiring of test links are described in NS253 Termination of Wiring in Substation Protection and Control Equipment.

8.4 Cabinet and panel labelling

Refer to NS158 Labelling of Mains and Apparatus for details. Wording of labels must be in accordance with specific requirements for the site.

8.5 Lugs and wire terminations

Refer to NS253 Termination of Wiring in Substation Protection and Control Equipment. All lugs, bootlace connections and other wire terminations are to be crimped. No soldered lugs or soldered terminations are allowed.

The barrels of lugs must be of solid tubular construction. Split / rolled or U-shaped barrels on lugs must not be used.

8.6 Passive optical components

Refer to NS208.2.2 Telecommunications Substations Communications Cabinet Interconnectivity Design Work Instruction for fixed and sliding shelves (for fibre management), wingbacks and other components and details for mounting optical components.

8.7 Fuses and fuse-links

Removable fuse carriers with twin blade connections, 2-stud back connected of the style known as “Red Spot” carriers are to be used. (“Red Spot” was a trade-mark of the former GEC England).

Black carriers are used for fuses, white carriers for links.

8.8 Auxiliary relays

Auxiliary relays must have integral free-wheel diodes on DC coils.

The relays are to be plug-in relays, with the capability to lock down in the socket and mounting on finger safe DIN rail mount sockets.

Contact ratings 10A AC, 1100VA / 225W inductive

Dielectric strength 2 kV: from all live to dead parts, between poles and from, poles or contacts to the coil.

8.9 Push-buttons and switches

Illuminated push button switches and panel lamps must accept BA 9s form factor LED lamps, as specified in drawing 169174.

8.10 Indicating panel meters

Panel mounted meters for indication of analogue quantities such as primary current and voltage will be specified from the Crompton Instruments range or equivalent as part of the detailed design specification for the particular site or function.

8.11 Voltage transformer test terminals

Voltage transformer test terminals are to be 4mm shrouded safety stud terminal test sockets in red, white, blue and black, similar to Multi-contact type SLB4-G.

9.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Table 1 – Recordkeeping

Type of Record	Storage Location	Retention Period*
Approved copy of the network standard	BMS Network sub process Standard – Company	Unlimited
Draft Copies of the network standard during amendment/creation	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/24)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/24)	Unlimited

The retention periods are subject to change e.g. if the records are required for legal matters or legislative changes. Before disposal, retention periods should be checked and authorised by the Records Manager.

10.0 AUTHORITIES AND RESPONSIBILITIES

For this network standard the authorities and responsibilities of Ausgrid employees and managers in relation to content, management and document control of this network standard can be obtained from the Company Procedure (Network) – Production/Review of Network Standards. The responsibilities of persons for the design or construction work detailed in this network standard are identified throughout this standard in the context of the requirements to which they apply.

11.0 DOCUMENT CONTROL

Content Coordinator : Manager - Secondary Systems

Distribution Coordinator : Engineering Information & Services Manager

Annexure A – Sample Compliance Checklist

Network Standard Checklist Form

NS257 Control and Protection Cabinets and Minor Panel Hardware

Project Identification:	
Prepared by: <Name & Position Title>	Date:

This checklist is for internal Ausgrid use only and does not apply to ASPs or contractors who have specific compliance requirements in relation to Contestable project works. The checklist is unique for each network standard and is available within BALIN and the BMS as a separate form that can be amended as required, completed and saved in TRIM with the other project documentation.

This section is used to identify compliance checks that when applied to the work associated with this Network Standard will satisfy an audit process to establish that the requirements of the standard have been followed. It is expected that applicable items would normally be checked as Comply (Yes) as non-compliance is generally not tolerated.

Where non-compliance is the result of specific site conditions or design decisions this needs to be identified in the notes section of the form for each non-compliance and approval sought from an appropriately authorised Ausgrid manager responsible for design approval per NS261 Compliance Framework for Network Standards.

Should additional information be available to document non-compliance decisions, these can be attached to the checklist form. The checklist and any attached explanatory notes should be saved in the project document repository.

Item	Description	Refer Clause	Completed/ Actioned
	Scope		
	The standard applies to the cabinets used for control and protection equipment within zone and sub-transmission substations		
	Cabinet Types		
1	Dimensions and cabinet design comply with requirements.	5.0	Yes/No/NA
	Cabinet Construction and Earthing Arrangements		
2	Cabinet frame construction complies with requirements.	6.1	Yes/No/NA
3	Rail mounting frames comply with requirements.	6.2	Yes/No/NA
4	Cabinet panels, roof and doors comply with requirements.	6.3 - 6.8	Yes/No/NA
5	Ventilation provisions meet requirements (when used).	6.9	Yes/No/NA
6	Panel cutouts and infills meet requirements.	6.10, 6.11	Yes/No/NA
7	Horizontal support strut requirements are met.	6.12	Yes/No/NA
8	Surface protection, painting and vermin barriers comply with requirements.	6.13, 6.14	Yes/No/NA
9	Earthing requirements are met.	7.0	

Item	Description	Refer Clause	Completed/ Actioned
	Internal Components		
10	All internal components of cabinets meet requirements.	8.0	Yes/No/NA

Notes:

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Attachment: 1. Name of document attached