

Network Standard

NETWORK	Document No	: NW000-S0036
	Amendment No	: 2
	Approved By	: Head of AEP&S
	Approval Date	: 18/06/2018

(Supersedes Network Standard NW000-S0036 Amendment No1)

NW000-S0036

NS188 DESIGN FOR SUBSTATION OVERPRESSURE



ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the design of substation enclosures.

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Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document.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

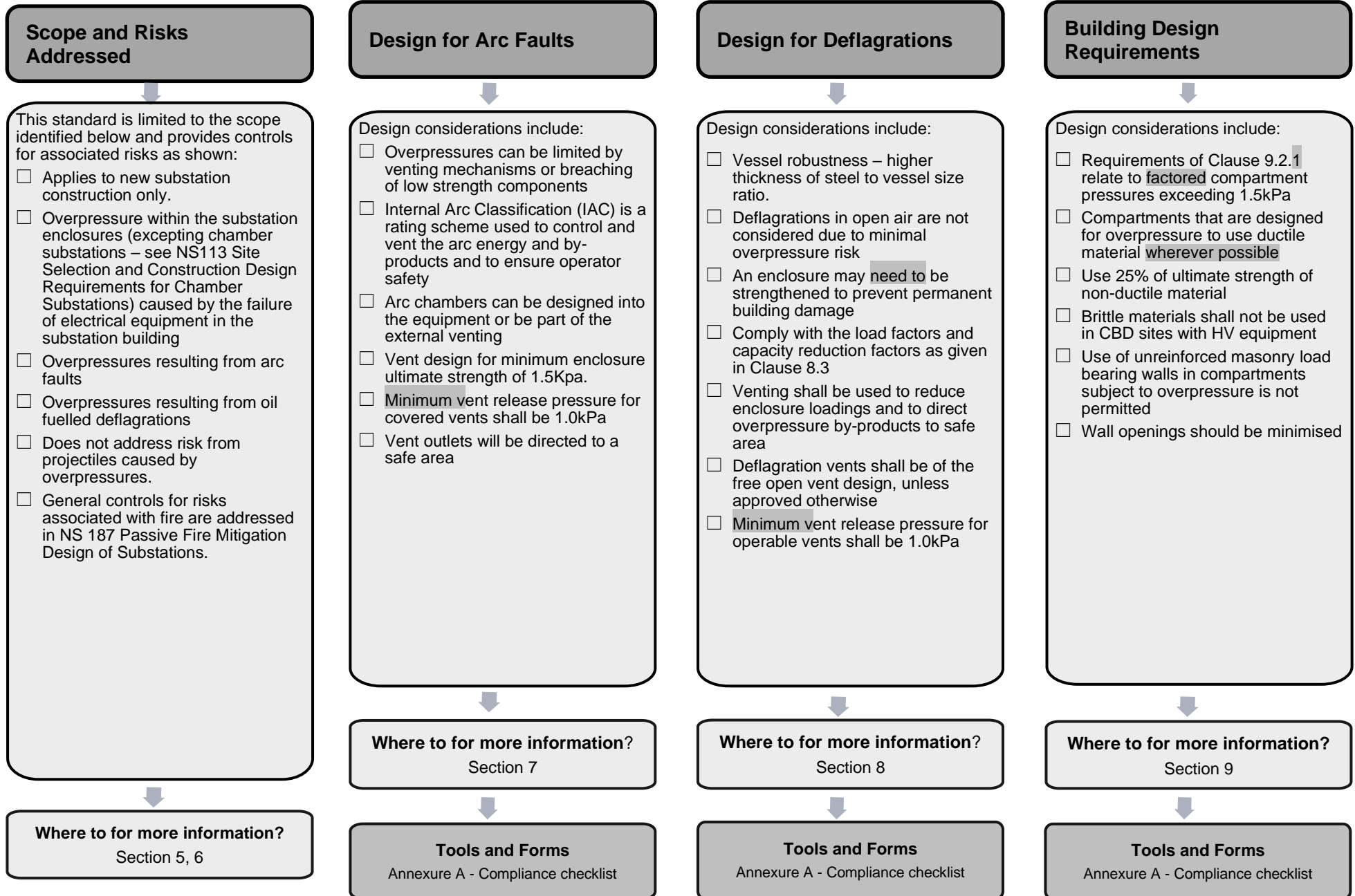
KEYPOINTS

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



Network Standard NS188 Design for Substation Overpressure

Contents

1.0	PURPOSE	6
2.0	SCOPE	6
3.0	REFERENCES	6
3.1	General.....	6
3.2	Ausgrid documents	6
3.3	Standards and other documents	6
3.4	Acts and regulations.....	6
4.0	DEFINITIONS	7
5.0	INTRODUCTION	9
6.0	DETERMINATION OF APPLICATION	9
7.0	DESIGN FOR ARC INDUCED OVERPRESSURES	10
7.1	The development of an arc induced overpressure in an enclosure.....	10
7.1.1	Venting.....	10
7.1.2	Vessel robustness	10
7.1.3	Internal arc classification (IAC)	10
7.2	The development of an arc fault in the open	10
7.3	Vent sizing and compartment strengthening for vented enclosure.....	10
7.4	General requirements for arc fault venting.....	11
7.4.1	Physical requirements.....	11
7.4.2	Vent release pressure	11
7.5	Vented gases	11
8.0	DESIGN FOR DEFLAGRATIONS	12
8.1	The development of a deflagration in enclosures	12
8.1.1	Development factors	12
8.1.2	Vessel robustness	12
8.2	The development of a deflagration in the open	12
8.3	Vent sizing and compartment strengthening for vented enclosure.....	12
8.4	General requirements for deflagration vents	13
8.4.1	Physical requirements.....	13
8.4.2	Vent release pressure	13
8.5	Vented by-products	14
9.0	BUILDING DESIGN FOR DEFLAGRATIONS AND ARC FAULT INDUCED OVERPRESSURES	14
9.1	General.....	14
9.2	Building elements.....	14
9.2.1	Requirements.....	14
9.2.2	Columns	14
9.2.3	Walls	15
9.3	Building ventilation	15
9.4	Openings in walls	15

9.5 Free open vent 15

9.6 Testing and proving vents 15

9.7 Strengthening for overpressures..... 15

10.0 RECORDKEEPING 17

11.0 AUTHORITIES AND RESPONSIBILITIES 17

12.0 DOCUMENT CONTROL..... 17

ANNEXURE A – SAMPLE COMPLIANCE CHECKLIST 18

1.0 PURPOSE

This standard states the performance requirements for the design of substations to withstand or manage a substation overpressure caused by the failure of electrical equipment housed within the substation building.

This standard applies where there is a safety risk from substation overpressure or where loss of the facility or supply is considered unacceptable by Ausgrid following receipt of technical advice.

2.0 SCOPE

The intention of this standard is to provide requirements to manage overpressure for new installations only.

Refer also to NS113 Site Selection and Construction Design Requirements for Chamber Substations for specific requirements relating to overpressure and vent design in chamber substations.

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
- NS113 Site Selection and Construction Design Requirements for Chamber Substations
- NS181 Approval of Materials and Equipment, and Network Standard Variations
- NS187 Passive Fire Mitigation Design of Substations
- NS212 Integrated Support Requirements for Ausgrid Network Assets

3.3 Standards and other documents

- AS/NZS 1170.0 Structural design actions - General principles
- AS/NZS 1170.1 Structural design actions – Permanent, imposed and other actions
- AS/NZS 1170.2 Structural design actions - Wind actions
- AS 1530.4 Methods of fire tests on building materials and structures - Fire-resistance tests of elements of building construction
- AS 1940 The storage and handling of flammable and combustible liquids
- AS 3600 Concrete structures
- AS 3700 Masonry structures
- AS 4072.1 Components for the protection of openings in fire-resistant separating elements - Service penetrations and control joints
- AS 4100 Steel structures
- ENA Doc 001-2008 National Electricity Network Safety Code

3.4 Acts and regulations

- **National Construction Code Series** - Building Code of Australia
- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014
- Work Health and Safety Act 2011 and Regulation 2017

4.0 DEFINITIONS

Accredited Service Provider (ASP)	An individual or entity accredited by the NSW Department of Planning and Environment, Energy, Water and Portfolio Strategy Division, in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW).
Ancillary components	Refers to parts of a transformer external to the main tank which includes bushings, end boxes, link boxes, tap changers.
Arc fault	A high energy release caused by an electrical fault.
BCA	The Building Code of Australia (BCA) is Volume One and Volume Two of the National Construction Code Series (NCC).
Business Management System (BMS)	An Ausgrid internal integrated policy and procedure framework that contains the approved version of documents.
By products	Can be combustion gases, unburnt insulating mineral oil, flame, heat, molten or vaporised metals, smoke and other debris that may become a projectile during a deflagration or arc fault overpressure.
Covered vent	A vent that has a cover over the opening that blows out to release the vented by-products.
Deflagration	A propagating flame front at a speed less than the speed of sound fuelled by insulating mineral oil and expelled in a mist form after being forced from a high voltage vessel rupturing as a result of an internal arc fault.
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.
Ductile	A material that, when overstressed, has the ability to deform (dimensional change) rather than fail in a brittle manner.
Electrical equipment	Any equipment, including overhead lines and underground cables, the conductors of which are live or can be made live.
Enclosure	An area housing high voltage electrical equipment.
Free open vent	A vent that does not have a cover over the opening.
High voltage	Voltages above 1,000 volts alternating or 1500 volts direct current.
Mist	A cloud of insulating mineral oil forced through an opening under pressure to form a cloud consisting of minute insulating mineral oil droplets, vapour and degradation gases.
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.
Overpressure	A rapid rise in the enclosure pressure caused by either a deflagration and/or an arc fault.
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.

Safe area	An area where there is minimal risk of causing injury to bystanders, personnel or damage to property when vents release gases.
Substation	Any installation where there is high voltage equipment.
Substation overpressure	A generic term in this document used to describe an overpressure caused by either an arc fault only, or an arc fault with subsequent deflagration.
Tap changer	Load variation control on a transformer.
Transformer	A static piece of apparatus with one or more windings which, by electromagnetic induction, transforms a system of alternating voltage and current into another system of voltage and current usually of different values but with the same frequency, for the purpose of transmitting electrical power.
Uncontrolled arc	An electric arc under abnormal conditions that is not deliberate and not contained, and is exposed to fuel and/or air.
Vent	An uncovered or covered opening that is for the release of overpressure by-products to manage the effects of a deflagration or an arc fault overpressure.
Venting	The application of vents to a compartment.
Vessel	A sealed or vented high voltage electrical casing.

5.0 INTRODUCTION

High voltage electrical equipment has the potential to cause overpressures under failure conditions. Where this occurs indoors there is a risk of damaging the building.

Generally, arc fault overpressures are dependent on room volume, available venting, fault level, time of the electrical fault and type of equipment. The effect of arc fault overpressures reduce as the room volume increases as the energy released is more uniform and not subject to as many variables.

Oil fuelled deflagrations can increase in effect with room volume increase. Peak pressures are much greater for any given volume and occur over a shorter duration, but are subject to many variables. Because the most likely peak pressure in a deflagration is much greater than the peak pressure of an arc fault and occurs over a shorter duration, vents must be larger and, wherever possible, should be uncovered.

Venting for both arc fault induced overpressures and deflagrations may reduce the risk of damage to buildings and persons in the vicinity.

This document does not take into account the effect of projectiles resulting from an overpressure event.

Where electrical equipment is located outdoors, the risk of damage to elements other than the electrical apparatus from overpressure is minimal.

The failure however may result in a fire. The recommended separation distances to protect against fire are specified in NS187 Passive Fire Mitigation Design of Substations.

6.0 DETERMINATION OF APPLICATION

The application of this standard is intended for substations housing high voltage equipment in an enclosed building and its application is dependent on a risk assessment. The risk assessment shall consider the following:

- Significant risk to life and safety.
- Possible damage to Ausgrid or other surrounding property.
- The present and potential future uses of neighbouring properties.
- The importance of the substation and substation building within the network with regards to loss of supply, redundancy and other issues as determined and advised by **Ausgrid's Asset Management & Operations**.
- The consequence of losing fire segregation through overpressures
- As otherwise determined by **Ausgrid's Asset Management & Operations**.

Ausgrid's Asset Management & Operations shall advise when, and which, sections of this Network Standard are applicable to a substation design.

7.0 DESIGN FOR ARC INDUCED OVERPRESSURES

7.1 The development of an arc induced overpressure in an enclosure

7.1.1 Venting

Arc induced overpressure can occur as a result of an uncontrolled arc.

In the majority of substations venting for arc faults is required as the pressures developed in an arc fault, which is unvented, can reach unmanageable levels if the fault is not cleared adequately given the volume of the area.

Where there are no purpose-installed arc fault vents provided, some nominal inadvertent venting may be provided through breaching of doors and windows or other low strength systems.

7.1.2 Vessel robustness

The vessel robustness can play a part in reducing the risk of the vessel breaching in arc fault conditions. Generally smaller vessels which offer a higher steel thickness to size ratio are more resistant to rupture.

7.1.3 Internal arc classification (IAC)

An uncontrolled arc originating in a compartment of indoor high voltage switchgear will create arc induced overpressure within the vessel which defines that compartment of the switchgear. Where the switchgear has an IAC rating, the purpose of that rating is to control and vent the arc energy and by-products in such a manner as to provide a safe area for operators in the vicinity of the switchgear.

Depending on the specific IAC rating, the arc energy and by-products may be either:

- Vented into the switchroom which forms the enclosure for the switchgear, or
- Collected into and dissipated within an arc chamber which forms part of the switchgear for the purposes of the switchgear IAC rating, or
- Collected into and directed through an arc chamber and vented, via the arc chamber, through the switchroom wall to a safe area external to the switchroom which forms the enclosure for the switchgear. The arc chamber forms part of the switchgear for the purposes of the switchgear IAC rating.

7.2 The development of an arc fault in the open

Where an equipment failure occurs in the open air, the potential for local overpressure effects to cause damage on adjoining elements is minimal and therefore, there are no additional design requirements.

Fire ratings do however need to be applied as detailed in NS187 Passive Fire Mitigation Design of Substations.

Flying debris such as fragments of insulators, ancillary components or vessel access covers may also be a hazard. However, mitigation measures for flying debris are not addressed in this document.

7.3 Vent sizing and compartment strengthening for vented enclosure

Vent design shall generally be based on the use of a minimum enclosure ultimate strength of 1.5 kPa.

Where the enclosure ultimate strength is required to exceed 1.5 kPa, due to restricted vent area, the enclosure shall be designed to resist the expected resulting design overpressures. In this case, the required enclosure ultimate strength shall be based on the calculated design overpressure multiplied by the following factors;

- Overpressure imposed loads – a load factor of 1.5
- Other imposed loads – the appropriate combination load factor for fire from AS/NZS 1170.0
- Permanent loads – a load factor of 1.0 applicable for fire from AS/NZS 1170.0
- Capacity reduction factor – the appropriate material based capacity reduction factor.

Vent design for high voltage enclosures shall consider:

- The maximum potential arc energy within the enclosure.
- The location of the high voltage arc source in relation to the vent.
- Compartment ultimate strength (which shall be a minimum of 1.5 kPa for new sites).
- Compartment size.
- Available vent space.
- Other services in the compartment.

Refer to Section 9 for details and requirements relating to the enclosure, venting and building fabric.

7.4 General requirements for arc fault venting

7.4.1 Physical requirements

In many cases, uncovered vents that are used primarily for natural ventilation will also suffice for arc fault venting. However, where additional dedicated arc fault vents are required, these should be covered wherever possible to minimise the ingress of dust and other contaminants. At locations where dust ingress and contamination are not an issue, the use of uncovered vents is acceptable.

Where covered vents are used, the physical requirements for vents can be summarised as follows to ensure they work efficiently and safely:

- Vents shall not become projectiles.
- Vents shall be secure against unauthorised access.
- Vents shall be restricted in weight to 12.0 kg/m².
- Vents shall be non-combustible or fire rated as required.
- Vent operation shall be proven as directed in Clause 9.6.
- Vents shall not contravene fire rating requirements.
- Location of vents shall comply with safe egress requirements of the BCA.
- Vents are to be maintained to ensure they remain operable.

It is preferable that covered vents are designed to operate (open/close) during an overpressure event, as opposed to failing under pressure loads (i.e. vents which break away and cannot be re-closed).

However, where noise attenuation is required, the use of standard lightweight covered vents or free open vents may not be feasible. Where this occurs, sacrificial weak masonry infill panels (or similar approaches) should be considered, and these should be designed to fail before the building structure is significantly damaged.

7.4.2 Vent release pressure

The minimum actual vent release pressure for covered vents for arc fault induced overpressures shall be 1.0kPa.

7.5 Vented gases

Vented gases shall be directed to a safe area.

8.0 DESIGN FOR DEFLAGRATIONS

8.1 The development of a deflagration in enclosures

8.1.1 Development factors

The development of a destructive deflagration caused by oil filled electrical equipment is rare as it is dependent on many factors. Such factors include the robustness of the oil filled vessel, the reliability of the equipment, the mode of failure and the enclosure conditions.

8.1.2 Vessel robustness

The vessel robustness can play a part in reducing the risk of the vessel breaching in arc fault conditions. Generally smaller vessels which offer a higher steel thickness to size ratio are more resistant to rupture.

8.2 The development of a deflagration in the open

Where an equipment failure occurs in the open air, the potential for local overpressure effects to cause damage on adjoining elements is minimal. Therefore, there are no additional design requirements for equipment in open spaces. Fire ratings do however need to be applied as required in NS187 Passive Fire Mitigation Design of Substations.

Flying debris such as fragments of insulators, ancillary components or vessel access covers may also be a hazard. However, mitigation measures for flying debris are not addressed in this document.

8.3 Vent sizing and compartment strengthening for vented enclosure

The design of enclosures, associated vents and mitigation measures for deflagration events shall be based on one of the following design approaches;

- Empirical Methods – for major and minor assets where the consequences of failure are not likely to cause injury.
- Computational Fluid Dynamics (CFD) – for approved major assets (e.g. CBD Zone Subs.) and for locations where the consequences of failure are likely to cause injury or fatalities.

The use of a CFD analysis to assess potential deflagration events will be subject to the approval of **Ausgrid's Asset Management & Operations**.

For both major and minor assets, the enclosure may need to be strengthened to allow for a vented deflagration to prevent permanent building structural damage or a catastrophic failure of the structure.

As the deflagration begins to vent, the pressure in the enclosure will continue to rise until the maximum pressure is reached as the flame front continues to propagate through unburnt fuel.

Where additional strengthening of the enclosure is required, the enclosure shall be designed for the expected overpressures that may be developed in a deflagration. The design shall use appropriate load factors for the applied loads together with suitable capacity reduction factors, both as indicated below, or as otherwise approved by **Ausgrid's Asset Management & Operations**;

- Overpressure imposed loads – a load factor of 1.5 for designs using Empirical Methods
- Overpressure imposed loads – a load factor of 1.0 for designs using Computational Fluid Dynamics
- Other imposed loads – the appropriate combination load factor for fire from AS/NZS 1170.0
- Permanent loads – a load factor of 1.0 applicable for fire from AS/NZS 1170.0
- Capacity reduction factor – the appropriate material based capacity reduction factor.

Venting, when designed correctly, reduces the maximum pressure that would be expected if there were no venting by releasing the overpressure by-products to a safe area.

The enclosure strength and vent size design shall consider:

- The fuel source type (normally insulating mineral oil with a deflagration index of 100 Bar.m/sec).
- The reasonably achievable compartment ultimate strength.
- The compartment size.
- Available vent space.
- Other services in the compartment (such as deluge systems and ventilation ducts).
- The compartment aspect ratio.
- The proximity and type of adjoining property and the likelihood of the property receiving shock waves or unburnt fuel. For adjoining properties at high risk, a CFD analysis may be required.
- The likelihood of the presence of pedestrian traffic. For a high likelihood of pedestrian traffic, a CFD analysis may be required.

For locations where venting upwards is viable, the risk exposure to neighbouring properties and pedestrian traffic will be lower than venting towards the adjoining property.

For specific major assets and high risk locations approved by Ausgrid's Asset Management & Operations, the design shall utilise a CFD analysis with a range of fuel mixtures. The CFD analysis shall be undertaken by suitably qualified persons experienced with oil filled equipment failures and CFD analysis.

Any compartments designed to manage overpressures shall be constructed from ductile material such as reinforced concrete.

Refer to Section 9 for other details and requirements relating to the enclosure, venting and the building elements.

8.4 General requirements for deflagration vents

8.4.1 Physical requirements

Once the vent size and release pressures (if applicable) have been determined, the physical requirements for vents to ensure they work efficiently and safely can be summarised as follows:

- Vents shall be of the free open vent design (unless approved otherwise) in order to most effectively vent the deflagration event (based on the potentially high proportion of hydrogen in the cracked oil by-products).
- Vent components (e.g. louvres) shall not become projectiles.
- Vents shall be secure against unauthorised access.
- Vents shall be non-combustible or fire-rated as required.
- Vents shall not contravene fire rating requirements.
- Location of vents shall comply with safe egress requirements of the BCA.

Each vent system proposed must be submitted to Ausgrid's Asset Management & Operations for approval with proof provided to demonstrate each point above has been addressed. Final approval shall be required from Ausgrid's Asset Management & Operations following receipt of advice.

8.4.2 Vent release pressure

Where a free open vent design cannot be used, an alternative vent design proposal shall be submitted to Ausgrid's Asset Management & Operations for review and approval. The additional physical requirements for operable vents to ensure they work efficiently and safely can be summarised as follows;

- Vents shall be designed to operate (open/close) during a deflagration event
- Vents shall be restricted in weight to 12.0 kg/m².

- Vent panels shall not be mechanically hinged.
- Vent operation shall be proven as directed in Clause 9.6.
- Vents are to be maintained to ensure they remain operable

The minimum actual vent release pressure for operable vents shall be 1.0 kPa. The minimum release pressure may need to be increased due to local wind loading conditions which will change where wind terrain categories change.

Irrespective of local wind conditions, the maximum actual vent release pressure shall be 1.5 kPa unless special circumstances require higher release pressures. Notify Ausgrid's Asset Management & Operations if wind terrain categories affect the design of vents.

8.5 Vented by-products

Vented by-products shall be directed to a safe area.

9.0 BUILDING DESIGN FOR DEFLAGRATIONS AND ARC FAULT INDUCED OVERPRESSURES

9.1 General

This Section describes the building provisions required where the building is to be designed for managing the effects of an overpressure event. Generally, the building should withstand the effects of deflagration and arc fault overpressures without permanent deformation in accordance with this document.

For each new major substation design, a report shall be provided to Ausgrid's Asset Management & Operations outlining all the recommendations for managing overpressures. The detailed design will not be undertaken until Ausgrid's Asset Management & Operations reviews and approves the recommendations of the report.

9.2 Building elements

9.2.1 Requirements

Where adequate pressure relief venting maintains the factored compartment overpressures below the minimum enclosure ultimate strength of 1.5 kPa in arc fault or a deflagration, the requirements of this Clause do not apply.

Building compartments designed to withstand factored overpressures greater than 1.5 kPa (ultimate) shall comply with the following requirements:

- Be made from materials which fail in a ductile manner wherever possible.
- Use 25% of the ultimate strength of the non-ductile material, where brittle materials must be used.
- Brittle elements shall not be used in rooms of CBD sites which house high voltage equipment.
- A capacity reduction factor of 0.75 shall be applied to the prescribed design in AS 3700 Masonry Structures for reinforced concrete block construction.

9.2.2 Columns

Where columns are incorporated into the walls of compartments that are designed to withstand overpressures, the direct connection of the walls to the columns is not recommended, and shall be subject to the approval of Ausgrid's Asset Management & Operations.

Where connection of walls to columns is unavoidable, the columns shall be designed to withstand four (4) times the connection capacity.

9.2.3 Walls

Where unreinforced masonry walls are subject to overpressures, the walls shall not have any vertical load bearing function or be relied upon for overall lateral stability of the building.

This Clause does not apply to wall construction of reinforced concrete or reinforced core filled concrete block.

9.3 Building ventilation

Ventilation for substation buildings shall comply with NS 200 Major Substations Ventilation Design Standard.

The requirements for overpressure design shall be assessed separately from the building ventilation requirements. However, any permanent openings that are provided primarily for building ventilation shall be included as part of the vent area available for overpressure relief.

For arc fault events, any additional dedicated overpressure relief openings should be normally closed to minimise infiltration and dust entry. Wherever possible, overpressure relief panels shall be suitably located, designed and insulated so as to minimise the thermal load from the panels into the building.

For deflagration events, any additional dedicated overpressure relief openings should be of the free open vent design (unless approved otherwise) in accordance with this Network Standard.

9.4 Openings in walls

Openings for windows should be avoided wherever possible, and openings for other purposes should generally be minimised.

Where openings are necessary and are required to be fire rated, the relevant fire seals or closures for the openings shall be designed to withstand the expected overpressures.

For other openings that are not required to be fire rated, the seals and closures do not need to be designed for overpressures. These items can be damaged and subsequently replaced following an overpressure event. However, measures should be taken secure against these items becoming projectiles, and to avoid major damage to the supporting framework or structure.

9.5 Free open vent

Where free open vents are provided, there shall be no adverse impact on the compartment's ventilation, or other substation design requirements.

9.6 Testing and proving vents

Each substation has a different shape and size and the vent requirements will vary greatly. Hence, it is acknowledged that testing of each vent would not be practical and therefore vent systems can be either tested or proven by other methods such as calculations.

Vent systems that are designed to fail under overpressure loads will require the approval of **Ausgrid's Asset Management & Operations**. Material properties can vary, and hence release pressures can also vary, resulting in vents that may not operate as intended by the designer.

All tests and calculations for proof of vent operation shall be submitted to **Ausgrid's Asset Management & Operations** for approval prior to detailed design.

9.7 Strengthening for overpressures

Additional or supplementary building elements may utilise steel or any other material specifically for strengthening or stiffening enclosures for overpressure loadings. These additional building elements are intended to support loads which are over and beyond normal building design loads, and hence they do not need to be fire rated.

However, where a fire rating is required for the building compartment, these exposed additional building elements shall not, during a credible fire, deform in way that adversely affects the main building structure.

10.0 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. 2014/21250/231)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/231)	Unlimited

* Content Coordinator must liaise with the Records Manager to validate the retention period is compliant with the relevant disposal authority.

11.0 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.

12.0 DOCUMENT CONTROL

Content Coordinator : Manager Transmission and Distribution Substations Engineering
 Distribution Coordinator : Snr Engineer - Guidelines Policies & Standards

Annexure A – Sample Compliance Checklist



Network Standard Checklist Form

NS188 Design for Substation Overpressure

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		
	Applies to new installations only	2.0	
	Does not consider effect of projectiles resulting from an overpressure	5.0	
	Arc-induced overpressure		
1	Venting of enclosure used to control overpressure	7.1.1	Yes/No/NA
2	Inadvertent venting considered for substation building	7.1.1	Yes/No/NA
3	Internal Arc Classification designed into equipment (IAC rating)	7.1.3	Yes/No/NA
4	Vented enclosures ultimate strength rated to minimum 1.5kPa	7.3	Yes/No/NA
5	Design load factors in accordance with Cl. 7.3	7.3	Yes/No/NA
6	Vent design compliant to Cl. 7.4	7.4	Yes/No/NA
7	Vent cover pressure release at 1.0kPa	7.4.2	Yes/No/NA
8	Vent gases directed to safe area	7.5	Yes/No/NA
	Deflagration induced overpressure		
9	Use of CFD analysis subject to the approval of Ausgrid's Asset Management & Operations	8.3	Yes/No/NA
10	Design load factors in accordance with Cl. 8.3	8.3	Yes/No/NA
11	Venting controls used to limit overpressure	8.3	Yes/No/NA
12	Vents design compliant to Cl. 8.4	8.4	Yes/No/NA
13	Vents shall be of the free open vent design (unless approved otherwise)	8.4.1	Yes/No/NA

14	Minimum vent release pressure shall be 1.0kPa for operable vents	8.4.2	Yes/No/NA
15	Vent gases directed to safe area	8.5	Yes/No/NA
Building Design Requirements			
16	Report outlining all recommendations for managing overpressures	9.1	Yes/No/NA
17	Where ultimate compartment pressures exceed 1.5kPa refer Cl.9.2.1	9.2.1	Yes/No/NA
18	Connections to columns in walls - allow 4 x connection capacity	9.2.2	Yes/No/NA
19	Unreinforced masonry walls subject to overpressures shall not have a load bearing function	9.1.3	Yes/No/NA
20	Openings in walls minimised	9.4	Yes/No/NA
21	Where fire rated openings in walls are required, shall be able to withstand expected overpressure.	9.4	Yes/No/NA
22	All tests and calculations submitted to Ausgrid's Asset Management & Operations for approval	9.6	Yes/No/NA
23	Additional building elements used to strengthen enclosures for overpressures do not need to be fire-rated.	9.7	Yes/No/NA

Notes:

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The signatures panel of this document has been removed for privacy considerations. The remainder of the document is unchanged.