

Australian/New Zealand Standard

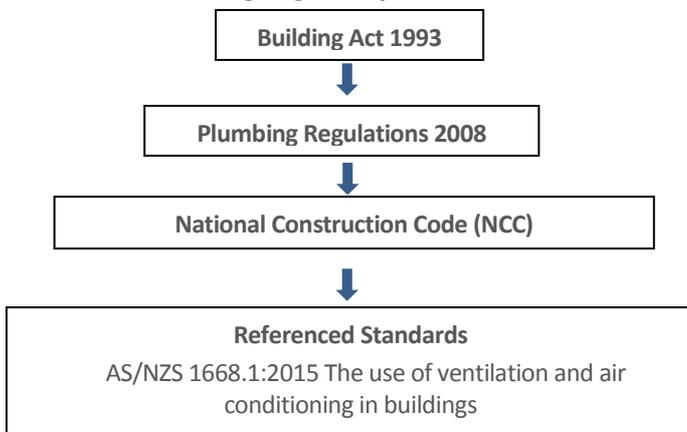
The use of ventilation and air conditioning in buildings - Part 1: Fire and smoke control in buildings

UPDATED AS/NZS 1668.1:2015

What is the scope of this Standard?

The objective of **AS/NZS 1668.1:2015** is “to provide standardized minimum requirements for mechanical air-handling and mechanical smoke control systems for use by designers, installers, inspectors and regulators of these systems”. This Standard does not include the requirements for the maintenance of smoke control systems.

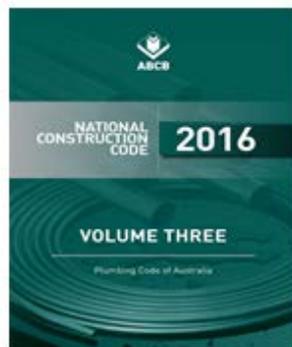
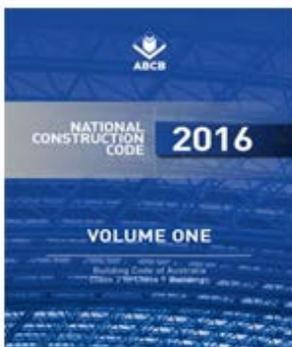
Victorian Plumbing Regulatory Framework



Where is AS/NZS 1668.1:2015 called up?

National Construction Code (NCC) 2016

- *Volume 1 - Class 2 to Class 9 Buildings (BCA)*
- *Volume 3 - Plumbing Code of Australia (PCA)*



NOTE: Practitioners should be aware that they are required by the PCA to comply with relevant sections in the NCC Volumes 1 and 2 when undertaking mechanical, ventilation and air-conditioning work.

Volume 1 - Class 2 to Class 9 Buildings (BCA)

- *Specification A1.3 Schedule of referenced documents.*
- *Part C2 Compartmentation and Separation - C2.12 Separation of equipment*
- *Part C3 Protection of Openings - C3.15 Openings for service installations*
- *Specification C2.5 Smoke-proof walls in healthcare and aged care Buildings – 4 Doorways in smoke-proof walls*
- *Section D Access and Egress - D1.7 Travel via fire-isolated exits*
- *Specification E1.8 Fire and Control Centres – 10 Ventilation and power supply for a fire control room*
- *Part E2 Smoke Hazard Management – E2.2 General Requirements*
- *Specification E2.2b Smoke Exhaust Systems – 7 Control*
- *Part F4 Light and Ventilation - F4.12 Kitchen local exhaust ventilation*
- *Specification G3.8 Fire and smoke control systems in buildings containing atriums – 3.1 General Requirements.*

Volume 3 - Plumbing Code of Australia (PCA)

- *Part A3.1: Schedule of referenced documents. AS/NZS 1668.1:2015 is automatically adopted under Plumbing Regulations 2008, Regulation 9 (2) Modifications to the PCA¹.*
- *Part E1 Heating, Ventilation and Air Conditioning Systems – E1.2 Deemed-to-Satisfy Provisions General Requirements*

¹ The Victorian Plumbing Regulations 2008 can be found on the VBA website:

<http://www.vba.vic.gov.au/practitioners/legislation>

AS/NZS 1668.1: Fire and smoke control in buildings

Australian/New Zealand Standard™

The use of ventilation and air conditioning in buildings

Part 1: Fire and smoke control in buildings

Publication Date

14 December 2015 (supersedes **AS/NZS 1668.1:1998**)

Class of work affected

- Mechanical Services
- Fire Protection Work

Changes and Impact

The Standards Australia Committee has updated **AS/NZS 1668.1**. Major changes from contained in the updated 2015 version include but are not limited to, the following:

- A hot layer smoke control arrangement has been added.
- The function of car park ventilation systems has been revised.
- The requirements for detection and initiation of smoke control systems have been transferred to AS 1670.1.
- The requirements for construction and installation of fire dampers, smoke dampers and air dampers have been transferred to AS 1682 series.
- Improved diagrams and greater clarity of the mandatory requirements.
- Mandatory minimum levels of documentation (baseline data) to be prepared and remain available on site.

NOTE: To avoid confusion over which Clause is discussed below, the version of AS/NZS 1668.1 that each Clause is taken from is indicated in brackets: (1998) or (2015).

SECTION 1 GENERAL

1.4 Definitions (2015)

Several new definitions have been added to this section to reflect the changes in the rest of the Standards.

SECTION 2 AIR-HANDLING SYSTEMS – GENERAL REQUIREMENTS

Clause 2.2 Interaction (2015)

It is now an explicit requirement that no fire or smoke control system can be allowed to adversely impact on the “performance” of another required fire and smoke control system.

Clause 2.4 Air Dampers (1998)

This Clause has been rewritten and simplified. All types of dampers must now comply with AS 1682 (the revised damper Standard). The requirements for combinations of dampers and response times for motorised dampers are retained. There is no longer a requirement for latching non-return discharge dampers.

Clause 2.3.2 Combustibility and Temperature of Fusion (2015)

This Clause has been rewritten and simplified. Concessions now apply to all forms of insulation where the insulation is:

“Faced with sheet metal (perforated or non-perforated), and having a temperature of fusion more than 500°C.”

Concessions also apply to Duct Sealants if they comply with the requirements of **AS/NZS 4254.2:2012** and to acoustic attenuators not longer than 3m.

Clause 2.8 Electrical Installation (2015)

All electrical components must now comply with AS/NZS 3000 in addition to all relevant regulations.

Clause 2.9 Support and Isolation (2015)

In a new clause, practitioners are reminded of the requirement to design smoke control systems to resist the effects of fire or earthquake, with systems remaining capable during these events

SECTION 3 FIRE PROTECTION OF OPENINGS

Clause 3.2.1 General Requirements (2015)

The requirements for the maintenance of a building’s Fire Resistance Levels (FRL) have been clarified. All openings are required to be protected with fire dampers and the FRL of the building maintained according the following:

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- a) The structural adequacy component of the FRL for the building element shall be maintained by the building element, independent of the fire damper.
- b) The integrity component of the FRL for the building element shall be maintained by providing a fire damper that has an integrity performance equal to that required of the building element.
- c) The insulation component of the FRL for the building element shall comply with Clause 3.2.3."

This highlights the need for coordination with the building trade and the fact that some dampers provide no insulation performance.

Clause 3.2.3 Insulation (2015)

Previous clauses relating to wall and floor dampers have been reworked into insulation and overall method of protection requirements (Clause 3.3). Insulation requirements have been refined.

A significant change is the requirement for a minimum of 2m sheetmetal ductwork connected to wall mounted dampers that do not provide sufficient insulation performance for the wall's FRL.

Clause 3.3.2 Exemptions (2015)

This Clause has been added to clarify instances where fire dampers need not be installed to openings, or identify solutions to eliminate fire dampers from a design.

The existing exemptions have been maintained with several additions:

- Where an opening is protected with "enclosing construction in accordance with Clause 3.4"
- If an opening is "protected by construction equivalent to a prototype test specimen in accordance with Clause 3.5"
- If the opening is "located at the entry to a shaft where the FRL of the shaft is maintained through all other fire compartments traversed by that shaft", a clause that effectively permits an opening to a fire rated shaft from any single fire compartment in a building.

Clause 3.3.3 Exclusions (2015)

This Clause also aims to clarify where fire dampers shall not be installed. In addition to providing more detail about the existing requirements in relation to

openings in kitchens and lift shafts **AS/NZS 1668.1:2015** now also excludes opening which are:

- associated with a diesel fire pump room ventilation system, which shall be configured in accordance with Clause 3.4;
- associated with a dedicated fire-isolated exit pressurization system, which shall be configured in accordance with Section 10;
- associated with a fume cupboard exhaust system where—
 - (i) accelerated corrosion of the fire damper resulting in failure in less than 5 years;
 - (ii) exposure of maintenance personnel to toxic substances during inspection; or
 - (iii) exposure of laboratory staff to toxic substances in the event of faulty fire damper closure

This clause effectively highlights the need to ensure the use of fire dampers will not render vital services ineffective. Protection is still required, but must be achieved by other means.

Clause 3.4 Fire Resistant Enclosing Construction (2015)

This new clause aims to clarify the FRL requirements of a duct that:

- a) passes from a single fire compartment to the exterior of the building; or
- b) passes back into the same fire compartment through other fire compartments without fire dampers at any of the openings in the compartment boundary.

Where this occurs the duct must have an FRL equal to the firewall separating one fire compartment from another. This clause better accommodates the use of wrapping, cladding and spraying of ductwork requiring an FRL.

Clause 3.5 Fire Resistant Lightweight Structures (2015)

Where lightweight construction systems are used in walls or floors that require an FRL or ceilings that require a resistance to incipient spread of fire, ducts or openings must not be incorporated in that construction unless they have been tested as part of that system to maintain the required FRL.

Clause 3.6 Subducts (2015)

Greater clarity around the function and arrangement

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of subducts is provided (along with a new informative appendix). In particular, the arrangement of the outlet projection is clarified to identify the importance of a 500mm height difference between the top of an inlet and the bottom of an outlet.

SECTION 4 SMOKE CONTROL SYSTEMS – GENERAL REQUIREMENTS

Clauses 4.10 Automatic Smoke Detection for System Control (1998) & 4.11 Control and Indication (1998) have been deleted, with revised requirements transferred to AS 1670.1.

Practitioners are required to refer to **AS 1670.1:2015: Fire detection, warning, control and intercom systems - System design, installation and commissioning – Fire.**

Clause 4.10.2.2 Wiring Systems (2015) - Exceptions

This clause provides circumstances where the requirements of **AS/NZS 3013 2005: Electrical installations - Classification of the fire and mechanical performance of wiring system elements** do not apply:

- a) When installed entirely within a plantroom that is fire-isolated from the occupied spaces by construction having FRL not less than -/120/120. In these instances, the plantroom itself provides the necessary protection from other fire compartments.
- b) Where loss of voltage cannot adversely affect the operation of the smoke-control system, such as might be the case for the power supply to an air handling unit that is only required to supply air in a non-fire-affected compartment.

Clause 4.10.6 Variable Speed Drives (VSD) (2015)

Practitioners are required to attach the following label to any VSD that services a fan designed to operate during a fire:

WARNING: THIS VARIABLE SPEED DRIVE SHALL REMAIN ENABLED AS THE FAN IS REQUIRED TO OPERATE DURING A FIRE

Table 4.1 Equipment/System wiring, control, indication and labelling schedule (2015)

A new Table has been added to consolidate all wiring, control, indication and labelling requirements of mechanical fire and smoke control items of equipment.

Clause 4.3 Documentation (2015)

Minimum mandatory levels of documentation to be developed during the design, installation and commissioning of systems have been expanded.

Clause 4.13.4 Documentation - Smoke control schematic diagram (2015)

The clause covering schematic diagrams has been expanded to include mandatory minimum requirements that must be included:

- a) all zone smoke control;
- b) stair pressurization;
- c) car park ventilation;
- d) kitchen exhaust; and
- e) any other mechanical systems required to operate in fire mode.

Clause 4.14.4 Testing and Commissioning - Subsystem testing (2015)

It is now mandatory that every subsystem of a smoke control installation must be “tested to verify that it functions” in accordance with **AS/NZS 1668.1:2015.**

Clause 4.14.5 Testing and Commissioning - Systems interface testing (2015)

This Clause has been expanded. The required tests must now confirm:

- a) “the automatic ‘end-to-end’ operation of all smoke control system components;
- b) the correct operation of manual override switches in each required mode; and
- c) the correct indication of operation.”

Clause 4.14.6 Performance validation (2015)

Each component for the smoke control system must now be designed to enable repeatable performance validation throughout the life of the system. This reminds designers to consider components that are not accessible following construction and will be of benefit to annual performance testing.

Clause 4.15 Baseline data, test results and documentation (2015)

This new Clause requires that the following data and documents must be prepared according to the requirements of Section 4 and “be readily available at site”:

- a) Design documentation;
- b) Operating and maintenance instructions;

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- c) Smoke control operating instructions;
- d) Smoke control schematic diagram;
- e) Results from testing and commissioning including the procedures used; and
- f) Fire and smoke damper schedule.

All information documentation must be “clear concise and appropriate for use” by emergency services personnel.

SECTION 5 MISCELLANEOUS SYSTEMS (2015)

Clause 5.2.3 Single Enclosures (2015)

The requirement in this section has been rewritten:

“Individual air-handling systems serving a single enclosure...are not required to shut down, provided they comply with Clauses 4.2 and 4.6”. The previous 1,000 L/s limitation is no longer applicable.

Clause 5.3.1 Minor exhaust systems (2015)

The requirements have been clarified to address multiple minor exhaust systems “where the aggregate opening area for multiple openings between fire compartments exceeds 0.1 m², each opening shall be protected with either—

- a) a fire damper in combination with a smoke damper and the associated fan(s) shall stop running in fire mode; or
- b) a subduct and the associated fan(s) shall run in fire mode.”

Clause 5.5.1 Carparks Ventilation Systems – General (2015)

This clause has been significantly expanded to include “fans that are not required to be shut down shall be provided with electrical supply from a clearly labelled dedicated main switch.”

New requirements have also been included for additional “air moving devices” referenced in AS 1668.2 – which may include jet fans.

Clause 5.5.3 Carparks Ventilation Systems – Override Control (2015)

This Clause has been expanded to include override control requirements for additional air moving devices.

All installations must comply with **AS 1670.1:2015 Fire detection, warning, control and intercom**

systems - System design, installation and commissioning – Fire.

Clause 5.5.5 Operation in Fire Mode (2015)

Clarification has been provided to ensure car park ventilation systems operate at full ventilation rate in the event of a fire.

SECTION 6 KITCHEN EXHAUST HOOD SYSTEMS (2015)

The contents of this section have been moved from Section 11 in **AS/NZS 1668.1:1998** version.

Clause 6.2.6 Kitchen exhaust system – operation in fire mode (2015)

This clause has been clarified. Where an exhaust system is already functioning at the outbreak of a fire “it shall not shut down”. This does not require an idle ventilation system to start.

Clause 6.2.2 Common Exhaust (2015)

This Clause has been rewritten prohibiting more than one kitchen exhaust per shaft:

“Shafts containing a kitchen exhaust duct serving one fire compartment shall not contain a kitchen exhaust duct serving another fire compartment.”

Minor supply and exhaust ducts are however permitted to share the shaft, provided all openings in the shaft are suitably protected.

Clause 6.2.9 Flame and spark arrestance (2015)

This new clause requires that where a building contains an open flame and an exhaust duct exceeding 10 m within the building “devices that prevent the spread of flames...shall be incorporated into kitchen exhaust hoods.”

Appliances producing sparks must also include spark arresting device.

SECTION 7 SHUTDOWN SYSTEMS (2015)

This Section has been renumbered from **AS/NZS 1668.1:1998**.

This section is not referenced in the NCC Volume 1, but may be applied as part of an alternative solution strategy.

Clause 7.2.3 Smoke Dampers (2015)

The requirements in this Clause have been revised in line with the requirements for smoke dampers in the

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NCC. Smoke dampers shall be installed over duct penetrations where there is more than 0.1m² between fire compartments, where:

- a) "an air-handling system does not form part of a smoke control system and recycles air from one fire compartment to another fire compartment; or
- b) an air-handling system unduly contributes to the spread of smoke from one fire compartment to another fire compartment."

SECTION 8 ZONE PRESSURISATION SYSTEMS

This section specifies the requirements for systems that are required to provide zone smoke control via pressurisation, where this is required by the NCC.

Requirements are similar to the previous edition of the Standard, with the pressure difference between compartments amended to between 20 to 80 Pa below non-fire-affected compartments.

SECTION 9 HOT LAYER SMOKE CONTROL SYSTEMS (2015)

This new section replaces **AS 1668.3:2001 - Smoke control systems for large single compartments or smoke reservoirs**, (mechanical smoke control only)

This section is not referenced by the NCC V1.

The content has been condensed into the following:

- 9.1 General
- 9.2 Hot Layer Smoker Control System Arrangement
- 9.3 Performance Criteria
- 9.4 Smoke Exhaust Fans
- 9.5 Smoke Exhaust Intakes
- 9.6 Smoke Reservoirs
- 9.7 Ceilings and Plenums
- 9.8 Automatic Smoke Curtains
- 9.9 Make-up Air
- 9.10 Electrical Installation
- 9.11 Operation of Smoke Control

A number of useful appendices have also been introduced to guide practitioners in the application of these systems.

SECTION 10 PROTECTION OF FIRE-ISOLATED EXITS

Clauses 9.3.1 Vertical fire isolated exits (1998) and Clause 9.3.2 Horizontal fire isolated exits (1998)

These clauses have been combined. The Standard no longer has separate requirements for vertical and horizontal fire isolated exits.

Clause 10.2.3 Zone pressurization dependent systems (2015)

Previously labelled *Clause 9.4.2 Combination Systems (1998)* this clause provides clarification for the use of Fire-isolated exit pressurization via leakage from the pressurized compartments.

SECTION 11 AIR PURGE SYSTEMS (2015)

This section has been renumbered from *Section 7 Air Purge Systems (1998)*.

This section is not referenced by the NCC Volume 1.

SECTION 12 LIFT SHAFT PRESSURISATION (2015)

This section has been renumbered from *Section 10 Lift Shaft Pressurization (1998)*.

This section is not referenced by the NCC Volume 1.

APPENDIX H HOT LAYER INLET REQUIREMENTS (2015)

This new Normative Appendix has been added to outline the requirements for calculating the minimum effective exhaust opening perimeter.

The VBA would like to acknowledge the technical advice received from the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) in the preparation of this Standards Update.

This Information Sheet does not cover all the changes and updates to AS/NZS 1668.1. The VBA strongly encourages practitioners to consult the complete Standard in order to ensure they comply with all Deemed-to-Satisfy requirements.

The full text of AS/NZS 1668.1:2015 can be found at the SAI Global website:

<http://www.saiglobal.com/>