

SECTION 3 NATURAL VENTILATION

3.1 SCOPE OF SECTION

This Section specifies the means of achieving the quantity of outdoor air required in a naturally ventilated enclosure. The provisions described include ventilation openings for the amenity of occupants. When the ventilation openings are open, general contaminants should be maintained at concentrations below exposures that have the potential to cause adverse health effects to a substantial majority of occupants. However, natural ventilation to this Standard may not ensure that specific contaminants are maintained at concentrations below exposures that have the potential to cause adverse health effects under all atmospheric conditions. Requirements for the natural ventilation of enclosures used by vehicles with combustion engines are given in Section 7. Figure 3.1 provides a flow chart on the application of this Section.

3.2 SYSTEM REQUIREMENTS

System requirements shall be achieved by providing natural ventilation openings determined by one of the following methods:

- (a) The prescriptive opening size and location approach as given in Clause 3.4.
- (b) Empirical calculations.
- (c) Computer modelling.

NOTE: Some guidance on a performance approach to natural ventilation systems design is provided in the Supplement to this Standard.

Where a Dilution Index is calculated for a natural ventilation system it shall be based on the outdoor airflow rates achieved within the following design criteria:

- (i) The mean wind speed for the location that is expected 50% of the time.
- (ii) A temperature differential (outdoor/indoor) no greater than 6°C.

OR

- (iii) A combination of Items (i) and (ii).

C3.2 It is intended that outdoor airflow rates resulting from natural ventilation systems are capable of achieving the minimum outdoor airflow requirements of Clause 4.7.2 for the majority of the time. Prevailing atmospheric conditions will vary ventilation rates. However, the provisions of this Section are considered appropriate under most conditions for general contaminants. Guidance on the use of empirical calculations and computer modelling is given in the Supplement to this Standard. Where a source of contamination has the potential to create an unsafe condition, the particular requirements need to be determined and where continuity of ventilation is required, mechanical ventilation may be necessary.

3.3 VENTILATION PROVISIONS

3.3.1 General

Natural ventilation shall be by systems, or a combination of systems, complying with Clauses 3.3.2 to 3.3.5.

3.3.2 Direct ventilation

Systems that ventilate individual enclosures with one or more openings in the external envelope of the enclosure are direct ventilation systems (see Figure 3.2).

Where the following and similar enclosures are naturally ventilated, they shall be designed as direct ventilation systems:

- (a) Bathrooms, showers and the like.
- (b) Enclosures containing sanitary fixtures.
- (c) Laundries.
- (d) Enclosures containing unflued gas appliances.

NOTE: Requirements for unflued gas appliances may be the subject of state and territory government legislation.

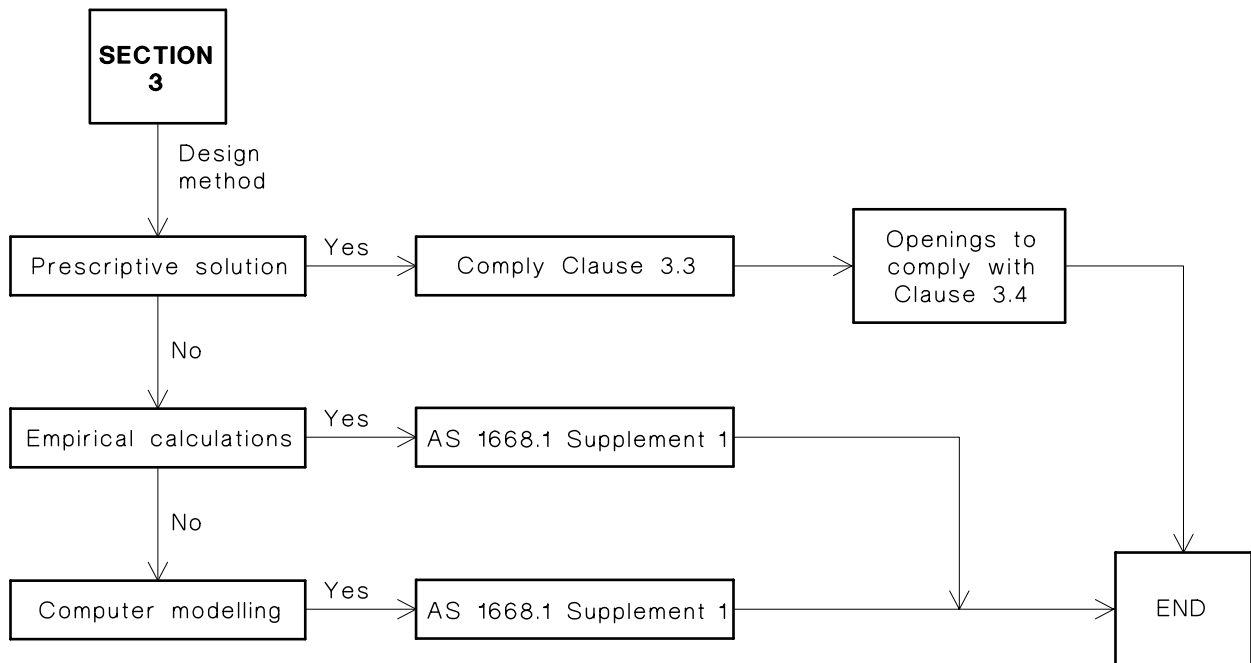


FIGURE 3.1 GENERAL GUIDE FOR APPLICATION OF SECTION 3

3.3.3 Borrowed ventilation

Borrowed ventilation (see Figure 3.2) may be applied to a particular enclosure by considering it as part of a second adjoining enclosure and so borrow air from, and return it to that adjoining enclosure provided that—

- (a) the area of the openings between the enclosures are twice the requirements for external openings based on the area of the particular enclosure; and
- (b) the adjoining enclosure has an external opening area based on the total areas of both enclosures.

The enclosures listed in Clause 3.3.2 shall not be used as the source for borrowed ventilation.

3.3.4 Flowthrough ventilation

Flowthrough ventilation (see Figure 3.2) may be applied to a series of enclosures and is designed to enter by one enclosure and leave by a different enclosure.

Flowthrough ventilation systems may be applied to enclosures provided that—

- (a) the area of external openings is based on the total floor area of all enclosures and they are proportionately distributed;
- (b) the flowthrough air does not pass through more than two enclosures and a corridor;
- (c) the internal openings comply with Clause 3.4.4; and
- (d) all parts of the enclosure being naturally ventilated shall be either—
 - (i) within 7 m; or
 - (ii) within a distance of twice the enclosure height of the shortest path between any two natural ventilation openings.

3.4 OPENINGS

3.4.1 General

Openings for natural ventilation shall be of a type, location and size as detailed in this Section. Where a combination of methods are used, the area of openings shall be determined on a proportional basis.

3.4.2 Type of openings

Openings shall either be fixed, such as wall or roof ventilators (with ducting where needed), or adjustable, such as windows or other openable devices including doors. Adjustable ventilation openings shall be operable by or on behalf of the enclosure occupants.

3.4.3 External openings

External openings shall be appropriately positioned to provide a reasonably even distribution of outdoor air. They shall also be positioned to minimize the entry of objectionable or noxious discharges. Obstacles shall not substantially reduce the minimum outdoor airflow through the openings.

The minimum total area of unobstructed openings, including natural ventilators, shall be proportional to the floor area and shall be in accordance with that required for occupant- and building-related contaminants as given Table 3.1.

For enclosures for which Table 3.1 requires an area of openable areas greater than 5% of floor area, and where the distribution of openable openings within the enclosure provides substantial cross ventilation (i.e., a minimum ratio of 1:4 opposite distribution of openings), then the required percentage of openable openings may be reduced to 5% of the floor area.

The unobstructed opening area of natural ventilators shall be taken as the effective aerodynamic area. Where the airflow is reduced by ducting being installed to a natural ventilator, the minimum area shall be increased appropriately unless it can be demonstrated that the performance requirements of Clause 3.2 can be achieved with a lesser area.

C3.4.3 Positioning external openings on opposite or adjacent sides of the building should maximize the cross-ventilation benefit of wind effects. Positioning external openings at both high and low levels maximizes the benefits of thermal effects.

Where concentrations of people are high, specific contaminants are present, hazardous gases are present or where combustion air is needed for plant, then larger openings or mechanical ventilation systems may be needed. Such enclosures may need to be analysed on a case-by-case basis.

3.4.4 Internal openings

All internal openings along the air path shall be no less in effective area than the total area required for external openings based on the floor area of the enclosures along the air path.

TABLE 3.1
PERCENTAGE FLOOR AREA REQUIRED AS OPENABLE OPENINGS FOR
OCCUPANT- AND BUILDING-RELATED CONTAMINANTS

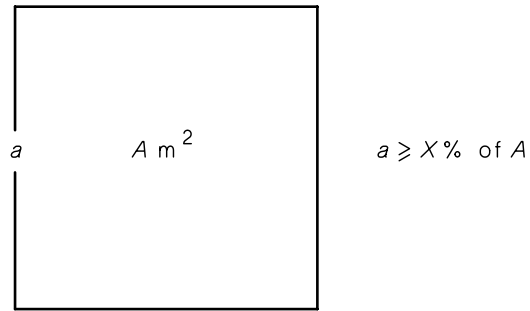
Use of enclosure	Average adjusted metabolic rate Watts/occupant	Net floor area per occupant (m ²) (use highest applicable value)			
		<2	2 to 5	Over 5 up to 15	>15
Low activity	Up to 160	7.5%	5%	5%	2.5%
Medium activity	161–200	7.5%	5%	5%	2.5%
High activity	201–340	10%	7.5%	5%	5%
Very high activity	Over 341	15%	10%	7.5%	5%
Class 1 Class 2 Class 4	Any	5%			
Classroom (students under 16 years old)	Any	Multiply the percentage floor area required by 1.25			
Smoking not prohibited	Any	Multiply the percentage floor area required by 2.0 (does not apply to Class 1, Class 2 and Class 4 buildings)			

NOTES:

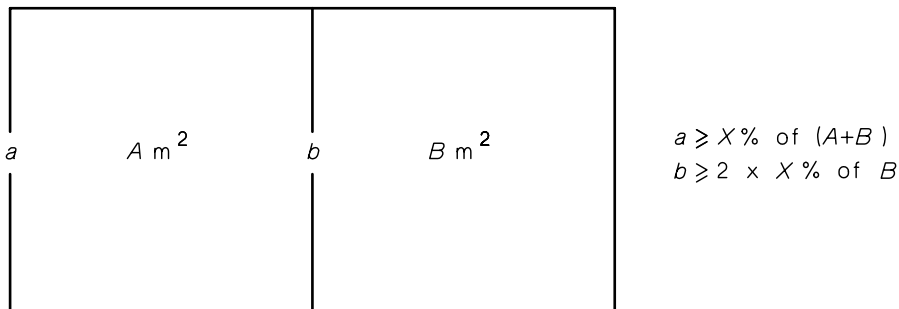
- 1 Information on metabolic rates/activity levels is given in Appendix A, Table A2.
- 2 A description of building class is given in the Building Code of Australia.

3.5 PROHIBITION OF TRANSFERRED OR BORROWED AIR

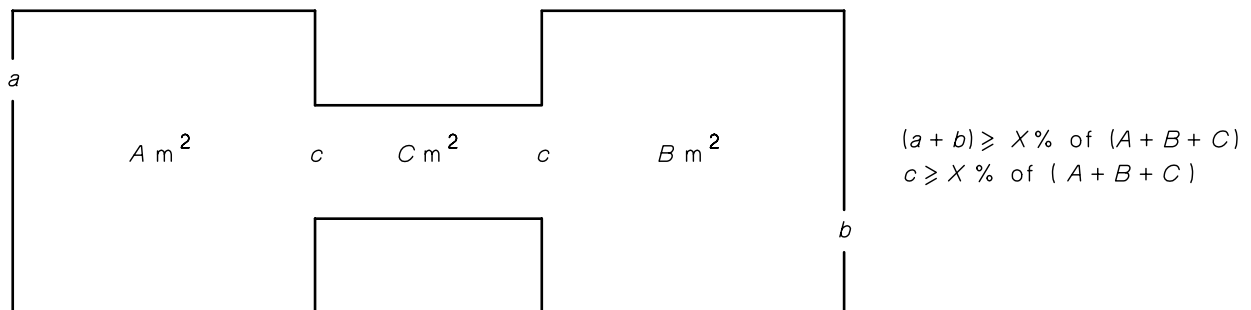
To the extent reasonably practicable, air shall not be transferred or borrowed from a smoking not prohibited enclosure to a smoking prohibited enclosure. This can be achieved by an appropriate barrier between enclosures or by the application of mechanical exhaust from the smoking not prohibited enclosure at a rate no less than 5 L/s per square metre of floor area.



(a) Direct ventilation



(b) Borrowed ventilation



(c) Flow through ventilation

Where:

- A, B, C = floor area of enclosures, in m^2
 a, b, c = area of openable opening(s) into enclosure, in m^2
 x = percentage floor area of enclosure required as openable openings, from Table 3.1

FIGURE 3.2 TYPES OF NATURAL VENTILATION