Australian Essential Services Group

CARBON NEUTRAL

BH&S Reference Material

1.1 Asbestos (information notes)

AESG are not qualified to assess specific risks posed by asbestos. However, if the building is more than 20 years old there is likelihood that asbestos is present in the building.
Asbestos presents a risk when particles are airborne. Particles can become a risk if the material is friable, exposed or contained. This is most likely when works are being undertaken or parts of the building, for example when eaves are damaged.
If requested AESG will provide the names of reputable, qualified auditors to carry out the required audit

Areas to watch:

- Millboard (behind electrical switchboards)
- Vinyl flooring
- Wall joining compound (mastic)
- External eaves
- Internal walls, ceilings or partitions
- External joining compound (mastic)
- Lagging
- Insulation
- Hot water services
- Flues
- Fire rated panels (e.g. behind stoves, heaters)
- Fire doors

Remember: Only licensed, qualified personnel may carry out audits and remove asbestos

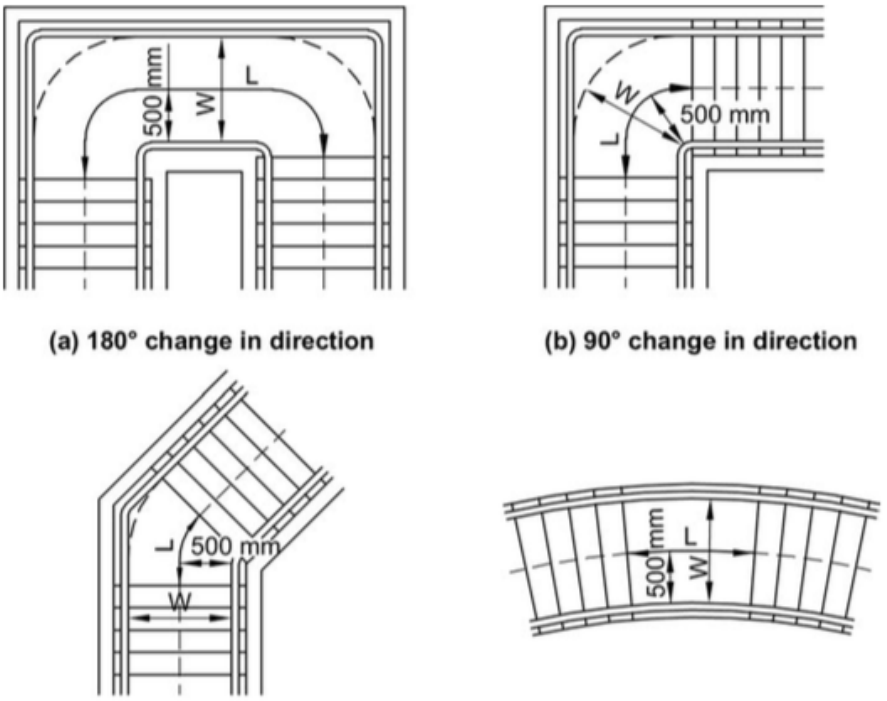
A commercial building built prior to 1990 may have asbestos. Therefore these buildings require:

1. Asbestos audit
2. Register created
3. Notification to occupier
4. Revue every five years
5. Occupier must notify contractors coming on site
6. Owners responsible for audit, register and notification to occupier.
7. Occupier to notify workers on site

1.0 Building Hazards
1.0 Balustrades, Handrails, Landings & Stairs

Figure D2.14

METHOD OF MEASURING THE LENGTH OF LANDINGS AS REQUIRED BY D2.14



(a) 180° change in direction

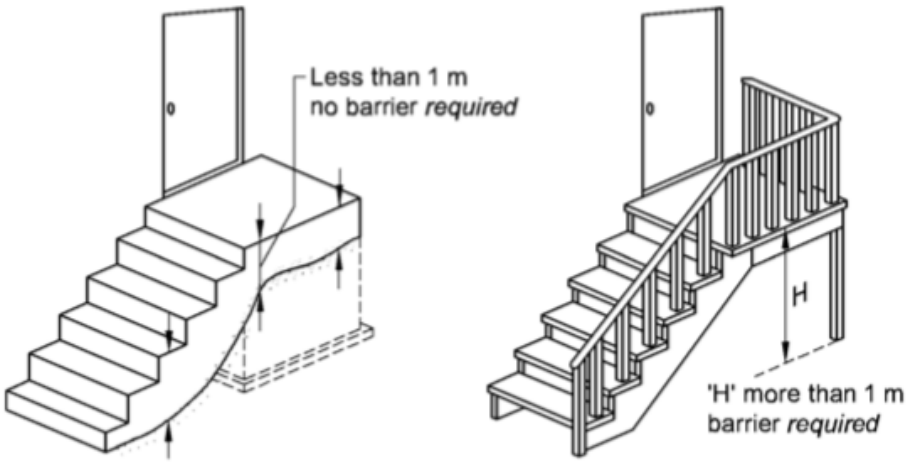
(b) 90° change in direction

(c) 45° change in direction

(d) Curved stairway

Figure D2.16(2)

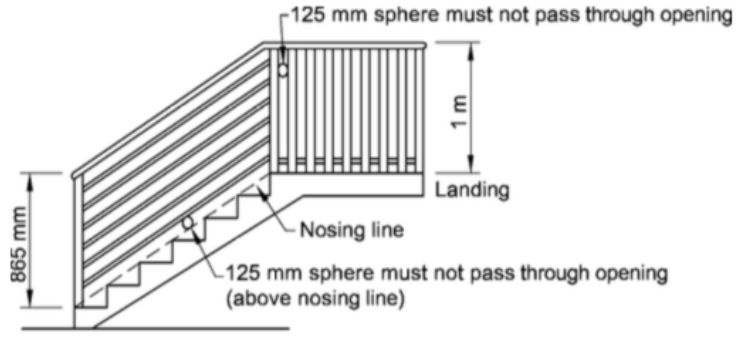
ILLUSTRATION SHOWING WHEN BARRIERS ARE REQUIRED BY THE BCA



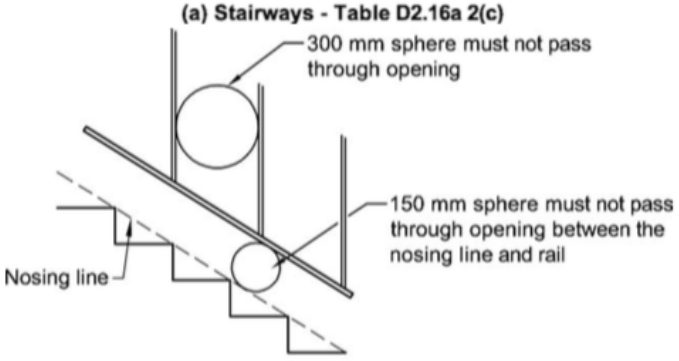
(a) Barrier not required

(b) Barrier required

Figure D2.16(1)
ILLUSTRATION OF BARRIER HEIGHTS AND SPACINGS



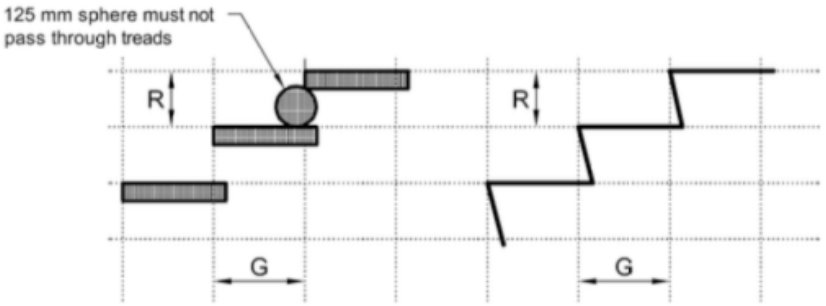
(a) Stairways - Table D2.16a 2(c)



(b) Fire-isolated stairways - Table D2.16a 2(a)

Table D2.13 RISER AND GOING DIMENSIONS (mm)

	Riser (R)		Going (G) [2]		Quantity (2R+G)	
	Max	Min	Max	Min	Max	Min
Public stairways	190	115	355	250	700	550
Private stairways[1]	190	115	355	240	700	550



Notes:

1. Private stairways are—
   (a) stairways in a *sole-occupancy unit* in a Class 2 building or Class 4 part of a building; and
   (b) in any building, stairways which are not part of a *required exit* and to which the public do not normally have access.
2. The going in tapered treads (except winders in lieu of a quarter or half landing) in a curved or spiral stairway is measured—
   (a) 270 mm in from the outer side of the unobstructed width of the stairway if the stairway is less than 1 m wide (applicable to a non-*required* stairway only); and
   (b) 270 mm from each side of the unobstructed width of the stairway if the stairway is 1 m wide or more.

1.0 Building Conditions

Building Condition

BCA Relevant AS

General Condition of the Building:

The inspection makes no comment on the actual condition of the building and issues that would create a hazard that is visible on the day of the inspection. This report does not comment or report on asbestos or any other soil contamination hazard.

1.0 Glass Hazards

Scope
Where any glazing is within 2000mm above the ground level of all buildings it is considered likely to be subjected to human impact and hence, shall comply with the human impact safety requirements of this section. Where reference is made to floor or ground level this shall mean the highest abutting finished floor or ground level.

Doors

Glazing in doors shall be grade A safety glass that complies with the maximum areas of safety glazing as set out in Table 5.1

Side Panels

Glazing in side panels, with the nearest vertical slightness less than 300mm from the nearest edge of the doorway opening shall be glazed in accordance with the following:

- Fully framed side panels: All fully framed glazing in side panels, wholly or partially within 1200mm from the floor or ground level, shall be of Grade A safety glass in accordance with Table 5.1.

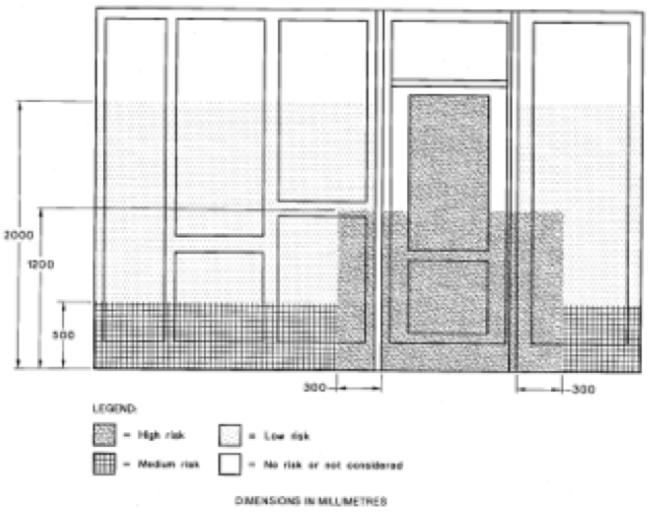


FIGURE 5.1 CRITICAL LOCATIONS

Glazing capable of being mistaken for a doorway or opening

Glazing, excluding doors and side panels glazed in accordance with Clauses 5.2 and 5.3, which may be capable of being mistaken for:

1. a doorway;
2. an opening that could provide access to, or egress from, one part of a building to another; or
3. an opening between inside and outside of a building, and can result in human impact, shall be Grade A safety glass in accordance with- Table 5.1 for framed glazing or Table 5.3 for unframed glazing.

Low-Level glazing in residential Buildings

Low-level glazing, where the lowest sightline is less than 500mm from the floor or ground level, shall be:

1. Grade A safety glass in accordance with Table 5.1; or
2. For fully framed glazing, ordinary annealed glass not less that 5mm minimum thickness up to a maximum area of 1.2m2. Larger areas of ordinary annealed glass are not permitted regardless of glass thickness.

Schools and Early Childhood Centres

Glazing within 1000mm of the floor level or ground level shall be Grade A safety glass in accordance with Table 5.1. for fully framed glazing or Table 5.3 for unframed glazing.

NOTE: Schools refers to primary and secondary education facilities.

Aged care buildings, Retirement villages and Nursing homes

Fully framed glazing:

- Framed glazing within 1500mm of ground or floor level shall be Grade A safety glass in accordance with Table 5.1.

Partly unframed glazing:

- Partly unframed glazing within 1500mm of ground level shall be Grade A safety glass in accordance with Table 5.3.

Curved glass

Curved glass shall be acceptable if a flat panel of the same type and thickness conforms to the human impact requirements of the section.

Making glass visible

In the presence of glass in a door, side panel or a panel capable of being mistaken for a doorway or opening is not made apparent by transoms, colonial bars, other components of glazing system, or other decorative treatment, such as being opaque, or patterned, the glass shall be marked to make it visible.

Making shall be in the form of an opaque band not less that 20mm in height and located so that the vertical distance from the floor level is:

1. not less than 700mm from the upper edge of the band; and
2. not more than 1200mm to the lower edge of the band.

The band shall be readily apparent. This may be achieved either by ensuring that the band contrasts with the background or by increasing the height of the band. Making glass visible by marking is not a substitute for the use of safety glazing where it is a requirement of this section.

Stairway glazing:

Glazing, including mirrors, in stairways:

1. Within 2000mm horizontally and at right angles to the bottom riser of each stair flight (See figure 5.2 - area 1), and
2. Within 1000mm and a parallel to any part of the stair flight or landing (See figure 5.2 - area 2)

Shall be grade a safety glass in accordance with Table 5.1.

Safety glass is not required where the glazing is protected by a solid barrier not less than 1000mm in height

Notes:

1. Barriers that do not comply with the BCA are not to be regarded as barriers for glazing
2. Stairways includes stairwells, landings and porches
3. For the purpose of this clause, a stair flight is defined as having a minimum of two risers

Identification of Safety Glass

Each original panel of safety glazing material shall be legible marked in accordance with AS/NZS 2208. Marking may be by either a label of a type that cannot be removed and re-used or a permanent mark on the glass surface.

Areas subject to High Risk of Breakage

In all those parts of buildings where the planned activity can generate a high risk of breakage from human impact, such as in or about gymnasiums, swimming pools and spa pools and enclosures, parts of schools, halls, public viewing galleries, stadiums and the like, Grade A safety glazing material in accordance with Table 5.1 or Table 5.3 shall be used.

Note:
Parts of schools referred to in the requirements of this clause include glazing situated within 5000mm of areas where activities such as those in relation to playgrounds, courts or marked out playing fields occur, unless otherwise protected by a permanent barrier.

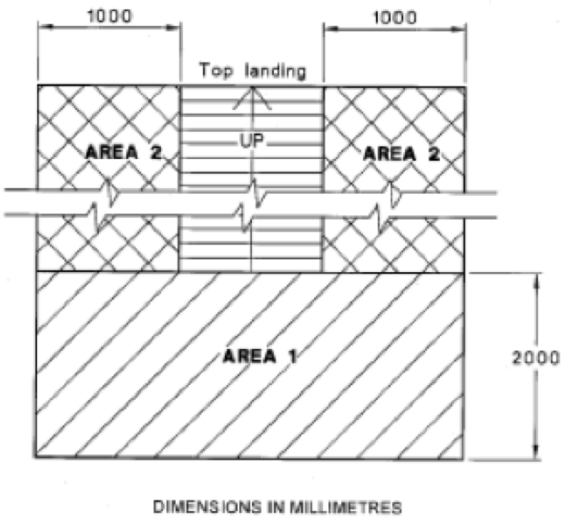


FIGURE 5.2 PLAN FOR STAIRWAY GLAZING ZONE

Table 5.1 Maximum Areas of Grade A Safety Glass	
Type of Glazing	Nom (mm

Toughened and toughened laminated glass	3	1
	4	2.2
	5	3
	6	4
	8	6
	10	8
	12	10.0[2]
	>12	Extrapolate
Laminated glass[3]	5	2.2
	6	3
	8	5
	10	7
	12	9.0[2]
	> 12	Extrapolate

Table 5.2
Maximum Areas of Annealed Glass

Nominal thickness (mm)	Maximum areas (m2)		
	Column 1	Column 2	Column 3
6	0.9	2.1	3.3
8	1.8	3.2	4.5
10	2.7	4.4	6
12	4.5	6.3	8
15	6.3	8.2	10
19	8.5	10.3	12
25	12	15.5	15

1 Safety Glazing material Grade A to AS/NZS 2208.
2 This area may not be readily available.
3 Based on total glass thickness only (interlayer not included and should not be added)

1.2 Air conditioners

Air conditioner equipment

Installation of Air Conditioner equipment:

The installation of air conditioner systems are in accordance with the Australian Standard including plumbing installation practices. This inspection is based on any visible failure of any existing system and does not make any comment on the legality of the installations.

1.4 Drainage (Storm water)

Installation of drainage and Storm water systems:

The installation of drainage and storm water systems are in accordance with any Australian Standard including plumbing installation practices. This inspection is based on any visible failure of any existing system and does not make any comment on the legality of the installation. This report assumes that the drainage is to legal point of discharge. Note general maintenance of the drainage system is critical to its performance. ENSURE that all pits and pipes are regularly cleaned and serviced

1.5 Fence and Retaining Walls

Retaining walls and fences

Installation of retaining walls and fences:

This report assumes that all retaining walls and fences have been built in accordance with the BCA, manufacturers instructions and local authority rules and regulations

2.0 Essential Safety Measures

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1. The Building Act and Building Regulations came into force July 1994.
2. The Regulations included the concept of Maintenance of 'Essential Services' which require the nomination of Essential Fire Safety Services including:

    1. The level of performance of these services
    2. Annual reporting of the maintenance
3. Buildings built on or AFTER 1st July 1994 require the Building Surveyor to:
    1. List the required Essential Safety Measures on the issuing of occupancy permit
    2. List the level of performance to which the service is to be maintained must also be specified on occupancy permit.
4. The Owner must:
    1. Maintain records of maintenance checks
    2. Complete an Essential Safety Measures Report before each anniversary of occupancy permit
    3. Keep all such reports and records of maintenance checks on the premises, for inspection by the Municipal Building Surveyor or Chief Officer at any time on request.
    4. The complexity of service and experience of persons carrying out inspection determine who should carry out the inspection, i.e. owner; service installer; maintenance contractor or internal maintenance personnel.
5. The Owner must:
    1. Maintain records of maintenance checks
    2. Complete an Essential Safety Measures Report before each anniversary of occupancy permit
    3. Keep all such reports and records of maintenance checks on the premises, for inspection by the Municipal Building Surveyor or Chief Officer at any time on request.
    4. The complexity of service and experience of persons carrying out inspection determine who should carry out the inspection, i.e. owner; service installer; maintenance contractor or internal maintenance personnel.
6. Building built BEFORE 1st July 1994:
    1. Owner is responsible for ensuring safety equipment, safety fittings and safety measures are maintained in a state which enables them to fulfil their purpose.
    2. These safety measures are those required by regulation to have been fitted at the time of the building's construction.
    3. These also include exits and paths of travel to exits, fire indices and penetrations in fire rated structures.
    4. Since 2005 these buildings require an annual report listing all essential safety measures, inspections and repairs carried out throughout the year.
    5. It is recommended that the Maintenance Logs be kept in a secure metal container.

Building Regulations 1994 S.R. No. 81/1994 Part 11 – Maintenance

Division 1 - Maintenance of Essential Services

11.1 Application and Interpretation.

This Division applies to Class 1b, 2, 3, 5, 6, 7, 8 and 9 Buildings.

11.2 Essential Safety Measures

In this Division "Essential Service" means:

1. an item listed in Table 11.2 required by these Regulations to be provided in relation to a building or place of public entertainment; or
2. any other item which is required by or under these Regulations or the Act to be provided in relation to a building or place of public entertainment for the safety of the people in the event of fire and which is designated by the relevant building surveyor as an essential service.

11.3 Nomination of Essential Safety Measures in occupancy permit

An occupancy permit issued in respect of a building or place of public entertainment must include a condition which:

1. lists all the Essential Safety Measures referred to under regulation 11.2 pertaining to that building or place of public entertainment; and
2. specifies the level of performance determined by the relevant building surveyor for each essential service referred to in paragraph (a)

11.4 Requirement to maintain Essential Safety Measures

1) If an essential service is provided in a building or place of public entertainment as a consequence of an emergency order or a building order or the carrying out of building work where an occupancy permit is not required to be issued the relevant building surveyor must determine the level of performance to which each essential service is to be maintained.
2) A determination under sub-regulation (a) must
    1. be in writing; and
    2. be given to the owner of the building or place or public entertainment without delay after it is made.
3) The owner of the building or place of public entertainment must comply with a determination uder sub-regulation (a).

* Penalty: 10 Penalty Units

11.5 Owner's Responsibility

An owner of a building or place of public entertainment who is required under an occupancy permit or regulation 11.4 to maintain an Essential Service must:

1. maintain records of maintenance checks; and
2. complete an Essential Safety Measures report in accordance with regulation 11.6 before each anniversary of the date of occupancy permit or determination under regulation 11.4; and
3. keep all essential service reports and records of maintenance checks on the premises for inspection by the municipal building surveyor or chief officer within 24 hours of request.

* Penalty: 5 Penalty Units

11.6 Contents of Essential Safety Measures Report
An Essential Safety Measures report must include:

1. the owner's name and address and the address of the building or place of public entertainment concerned; and

2. the Essential Safety Measures to be maintained and the level of performance required for each essential service; and
3. the dates on which any maintenance checks were carried out; and
4. the name and address of the person who carried out any maintenance checks; and
5. the details of any inspection report made under regulation 11.7; and
6. a statement signed by the owner or agent of the owner stating that:
    1. the Essential Safety Measures are operating at the required level of performance; and
    2. to his or her knowledge there have been no penetrations to required fire-resisting construction, smoke curtains and the like in the building since the last Essential Safety Measures report other than those for which a building permit has been issued; and
    3. that he or she has taken reasonable steps to ensure that the information contained in the report is correct.

11.7 Inspection procedures

1. The chief officer and the municipal building surveyor may either jointly or separately inspect the Essential Safety Measures in a building or place of public entertainment to determine whether they are being maintained in accordance with this Division or the occupancy permit.
2. After an inspection by the chief officer he or she must provide the municipal building surveyor with a report of that inspection within 7 days.
3. The municipal building surveyor must ensure that the owner of a building or place of public entertainment which has been inspected in accordance with sub-regulation (a) is provided within 14 days of that inspection with an inspection report signed by the municipal building surveyor.

Division 2 - Maintenance Generally

11.8 Application of Division

This Division applies to all Class 1b, 2, 3, 5, 6, 7, 8 and 9 buildings and places of public entertainment constructed before 1 July 1994.

11.9 Safety equipment, fittings and other safety measures

The owner of a building or place of public entertainment to which this Division applies must ensure that any safety equipment, safety fitting or safety measure required in relation to that building or place under the Act or these Regulations or any corresponding previous Act or Regulations:

1. is maintained in a state which enables the safety equipment, safety fitting or safety measure to fulfil its purpose;
2. the Essential Safety Measures to be maintained and the level of performance required for each essential service; and
3. is not removed from its approved location except:
    1. for the purpose of maintenance; or
    2. in accordance with these Regulations.

* Penalty: 10 Penalty Units

11.10 Maintenance of Exits

The owner of a building or place of public entertainment to which this Division applies must ensure that all exits and paths of travel to exits are maintained in an efficient condition and kept readily accessible, functional and clear of obstruction so that egress from the building or place is maintained.

* Penalty: 10 Penalty Units
* One Penalty Unit is equivalent to $100.00

Table 11.2. List of Essential Safety Measures

Air Conditioning Systems	Fire Hose Reels	Lightweight Construction

Emergency lifts	Fire Hydrants	Mechanical Ventilation Systems
Emergency lighting	Fire indices for materials	Paths of travel to exits
Emergency Power Supply	Fire Isolated Lift Shafts	Penetrations in fire-rated structures
Fire Isolated Passageways	Emergency warning and intercommunication systems	Smoke alarms
Exit doors	Fire Isolated Ramps	Smoke Control Measures
Exit signs	Fire Isolated Stairs	Smoke Doors
Fire Brigade Connections	Fire Mains	Smoke Vents
Fire Control Centres	Fire Protective Coverings	Sprinkler Systems
Fire Control Panels	Fire Rated Access Panels	Stairwell pressurisation systems
Fire Curtains	Fire Rated Control Joints	Static Water Storage
Fire Dampers	Fire Rated Materials applied to Building Elements	Fire Windows
Fire Detectors and Alarm Systems	Fire Resisting Shafts	Warning Systems associated with lifts.
Fire Doors	Fire Shutters	
Fire Extinguishers (Portable)	Vehicular Access for large Isolated Buildings	

2.0 Access & Egress Hazards

For further information refer to the Australian Standard AS 4663 and AS 3661

Exit Doors

BCA 1990: Section D, BCA 1996: DP4 (Section D)

Purpose:

To provide a means of egress from any part of a building.

Requirements of the equipment:

To provide sufficient and safe egress from a building, with a minimum of effort and delay and to present a minimum of obstruction in an exit path.

Method of operation:

An exit door must be capable of simple operation to fulfill its designed purpose.

It must be able to opened readily without a key, from the side facing a person seeking their way out, by a single handed downward or pushing action, on a single device located between 900mm and 1.2 from the floor.

It could be fitted with a fail-safe device which unlocks the door automatically when any sprinkler, smoke or heat detector system in the building is activated.

Maintenance checks:

Maintenance checks should be carried out to ensure the exit door is:

1. Intact
2. Operational
3. Fitted with hardware that conforms to the requirements of the Building Code Australia, Section D (the hardware necessary to enable its operation as outlined above).

Paths of Travel to Exits

BCA 1990: Section D, BCA 1996: DP6 (Section D), Building regulations: regulation 11.10

Purpose:

Paths of travel to exits are to provide an unobstructed pathway for occupants travelling to an exit.

Requirements of the equipment:

To provide a passage to an exit that is of a width and height as specified by the Building Code of Australia.

Method of operation:

To ensure paths of travel to exits are operational and effective, they must not be obstructed or altered in any way. It is the responsibility of the owner to ensure that all paths of travel to exits are maintained in an efficient condition and kept functional and clear of obstruction.

Maintenance checks:

The regulations require a 3 monthly inspection of this facility be carried out by the owner. The owner may delegate this function to another person or body where necessary or appropriate. It is recommended that in carrying out the required inspections, the following points be covered:

1. Ensure no obstruction of any nature has encroached on or into the designated paths of travel.
2. Check the integrity of the fire isolation requirements on or in the relevant sections of the path of travel have not been breached or compromised.
3. Check that no unauthorised alteration has been carried out on these sections.

Maintenance records:

A logbook must be kept to record:

1. The date the inspection was carried out; and
2. Any problems encountered during the inspection

Fire isolated passageways, ramps and stairs

BCA 1990: Section, Section D, BCA 1996: DP5, CP8 (Section C, Section D), Building Regulations 1994: Regulation 11.10

Purpose:

Fire isolated passageways, ramps and stairs are to provide occupants with safe egress from a building.

Requirements:

These elements must be of fire resistant construction at a level specified in the Building Code Australia. At the entrance point to these elements, fire doors are to be provided. Fire doors are to be of a specified fire resistance level, that are either self-closing or have automatic closing facilities linked to smoke or heat detectors, or to a fire alarm or sprinkler system installed in the building.

Maintenance checks:

The regulations require a 3 monthly inspection of this facility be carried out. It is essential to ensure:

1. No unauthorised alterations have been made that could compromise the integrity of their fire resistance level.
2. No obstruction has occurred by stacking goods or equipment in these areas.
3. No tampering or interference with the self-closing or automatic operation of the fire doors

Maintenance records:

The following information must be recorded:

1. The dates yearly inspections were carried out; and
2. The name of the person conducting inspections; and
3. Any problems identified in the inspection; and
4. Date rectification occurred.

Smoke doors

BCA 1990: C2.5, Spec C3.4, BCA 1996: CP3 (C2.5, Spec C3.4), Reference: AS 1851.8

Purpose:

Smoke doors are constructed in smoke walls to restrict the passage of smoke between smoke compartments or walls, or from within a smoke lobby.

Requirements of the equipment:

Smoke doors must be constructed so that smoke will not pass from one side of the doorway to the other. Smoke doors can be one of two leaves and must:

1. Be side-hung to in the direction of egress or in both directions; and
2. Be capable of resisting smoke at 200°C for 30 minutes; and
3. Have the leaves fitted with smoke seals; and
4. Have the leaves normally closed or close automatically, with the closing initiated by smoke detector power failure; and
5. Have the leaves close fully after each manual opening; and
6. If made of glass, have the glazing identifiable by opaque construction.

Maintenance checks:

Maintenance to be carried out annually to AS 1851.7. To ensure smoke doors fulfill their designed function, the following is recommended to be carried out:

1. The doors and associated equipment are in working order. (Seals undamaged, etc.)
2. No unauthorised means have been incorporated to retain the doors open (wedges, cabin hooks, etc.)
3. The automatic closing facilities work, i.e. When the smoke detectors operate, or when power failure occurs.

These checks may be carried out in conjunction with the testing of your fire alarm system, as per AS 1851.8.

Maintenance records:

A log books must be maintained to record the inspection, including:

1. The date of each annual inspection
2. Any problems identified
3. Date problems rectified

Fire doors

BCA 1990: Spec C3.4, BCA 1996: CP8 (Spec C3.4), Reference: AS 1905.1, AS 1851.7

Purpose:

A fire door is installed across an opening in a fire wall to maintain the fire resistance rating of that fire wall.

Requirements of the equipment:

An approved fire-resistant doorset is one that is identical in assembly, construction and installation to a prototype of this door that has been submitted to the standard fire resistant test, and has fulfilled all the relevant test requirements.

A fire door must be self closing or close automatically on the operation of an approved sensing device or on the loss of power supply.

Each fire door must have a metal tag attached as required by AS 1905.1, and latchsets and closers should also be marked as required.

Method of operation

On receipt of a signal through the fire alarm system, the hold-open device of automatic closing door sets must release the door. Alternatively, when electrical power to that area fails, the electro-magnetic hold-open device must then release the door. Once released the door must close cleanly, and be unimpaired in its operation. It is essential that no unauthorised means is used to hold open a fire door.

Maintenance checks:

1. 3 Monthly
    1. A visual and physical inspection of the door and its functions. This inspection must be carried out by the owner or occupier of your premises, or by a suitably qualified representative (i.e. Maintenance Manager)
2. Yearly
    1. The routine required for the 3 monthly inspections.
    2. Comparison of each fire door set with the appropriate specification in the installation logbook supplied with the door.
    3. The inspection items specified. This inspection shall be carried out or supervised by a person acceptable to the regulatory authority (building surveyor) as being competent and experienced in the field of fire doors.

It is recommended that where any corrective action involves repairs to the door leaf, such repairs should be carried out by the original manufacturer. The procedures for yearly inspections are contained in AS 1851.7.

Before a fire door is rendered unserviceable for maintenance, the following precautions shall be taken by the repairer:

1. Advise the owner or occupier, so that any necessary precautions can be taken; and
2. Where the door is to be removed and cannot be re-installed within 3 hours, the fire brigade nearest to you, and the fire station to which your alarm is connected, shall be advised; and
3. If the door protects an opening in a fire-isolated escape route or in a wall required to have 4 hour fire resistance, permission shall be obtained from the regulatory authority (building surveyor) as well as notice given to the fire brigade as in (b); and
4. A fire door shall not be rendered unserviceable for maintenance while any fire alarm or fire suppression system in the building is operative.

It is essential all fire doors are maintained in the operational condition at all times.

2.0 Fixed & Portable Fire Equipment

For further information refer to the Australian Standard AS 1670 AS 2118 AS 2444

Fire Control Centre

BCA 1990:E 1.8, Spec E1.8 BCA 1996: EP1.6 (E1.8, Spec E1.8)C

Purpose:

A fire control centre is provided as an area from which firefighting or emergency procedures can be directed or controlled.

Requirements

The fire control centre or room must:

1. Contain the controls, panels, telephones, furniture and equipment associated with the required fire services in the building; and
2. Only be used for fire fighting and other reasons concerning safety or security of the building occupants; and
3. Be accessible via two-ways:
    1. from the front entrance of the building or
    2. direct from outside the building; and
4. Have the following as detailed in Spec E1.8:
    1. Sufficient floor area for its proper functioning; and
    2. Adequate ventilation; and
    3. Suitable power supply; and
    4. Emergency lighting; and
    5. A sign on the outside of the door identifying it as the "Fire Control Centre"; and
    6. Low noise level with all fire safety equipment operating.

Maintenance check:

To ensure the fire control centre is operational, it is recommended that maintenance be carried out as follows:

1. The regulations require an annual inspection of this facility be carried out. It is also recommended that an exercise be held at least yearly, to ensure this facility is workable. This exercise could be held in conjunction with:
    1. The fire authority serving your area
    2. An evacuation exercise for your premises

Maintenance records

The following information must be recorded:

1. The dates the yearly inspections were carried out; and
2. The name of the person conducting inspections; and
3. Any problems identified in the inspection; and
4. Actions taken to rectify problems identified

Information relating to the conduct of an evacuation exercise could also be recorded.

Sprinkler System / Fire Mains

BCA 1990: E1.5, Part E1, BCA 1996: AS 2118, AS 2419.1, AS 1851.3, AS 1851.4

Purpose:

A sprinkler system is installed to provide a full-time automatic fire suppression system, with the ability to summon the fire brigade automatically.

Systems and equipment:

Automatic sprinkler systems may include:

1. Wet pipe systems and sprinklers
2. Valve installations
3. Electric motor and compression-ignition engines and pumpsets
4. Fire brigade booster connections
5. Pre-action systems
6. Water storage systems
7. Alarms and interface with automatic fire alarm and detection systems where installed

Requirements of the equipment

To provide the required protection, your sprinkler system must be:

1. An automatic fire sprinkler system complying with:
    1. AS 2118 subject to BCA Specification E1.5; or
    2. NFPA 13R type system; and
2. Maintained in accordance with AS 1851.3, wither by or under the direct supervision of personnel competent in sprinkler system maintenance.

Method of operation

To comply with AS 2118, your sprinkler system must have:

1. Provision for an adequate water supply; and
2. A pumping system to pressurise the sprinkler system; and
3. A distribution pipe system to deliver water to each sprinkler head; and
4. Sprinkler heads to perform according to the risk they are protecting; and
5. A local farm facility to alert the operation of a sprinkler system; and
6. A direct alarm connection to the fire brigade. (where required)

Your sprinkler system is activated by a sprinkler head or heads responding to a rise in temperature. Water flows through this head(s), lowering the residual water pressure, which causes the pump system to come into operation. Water flowing through the system drives the water-motor in the local alarm, sounding the bell. Where fitted, the direct alarm is transmitted to the fire brigade.

Maintenance checks:

BCC Practice Note 23 recommends that fire mains be maintained weekly, or monthly, depending on the type of system, to AS 1851.3. The sprinkler system maintenance program, specified in AS 1851.3, provides for inspection, testing and maintenance at the following frequencies:

- Level 1 routines – weekly/monthly
- Level 2 routines – quarterly
- Level 3 routines – Yearly
- Level 4 routines – at three-yearly intervals
- Level 5 routines – at six-yearly intervals

The detail for these routines is detailed in chart form in AS 1851.3.

When your system is rendered partially or fully disabled due to maintenance or modifications, the following precautions are mandatory:

1. The building owner or his representative must be notified; and
2. The fire station to which your system is connected, or the nearest fire station if there is no connection, must be notified before work commences and after work is completed.

The following additional precautions should be observed, as far as is practicable, whether your system is inoperative through an emergency or planned occurrence:

1. Under all circumstances, keep as much of the system fully operational as practicable. If the necessary work is to extend over several days or weeks, reinstate the system as far as practicable at the end of each working day.
2. Where your system has to be left disconnected outside working hours, consideration should be given to employing a watchman while the system is disconnected.
3. Whenever it is possible, disconnection of your system should be undertaken when production machinery is inoperative.
4. While the system is down, smoking should be banned in the affected areas.
5. Notify senior department personnel or tenants' representatives of the situation, so that fire extinguishing appliances can be kept immediately available, with trained personnel on hand to use them if necessary.
6. Notify your insurer or insurance broker of the situation.
7. Have all necessary equipment and material available and all the work possible prior to isolating your sprinklers.
8. Hot cutting or welding should be avoided, where possible, in an area where the sprinkler system is not operational. This includes work on the sprinkler system.
9. Avoid all sources of ignition.

Maintenance testing of these systems should be carried out in conjunction with the fire alarm system testing to assure that the systems are correctly interfaced. Prior to and following this test, it is essential that the fire brigade that receives your alarm shall be advised of the imminent test, check to see the test call was received, and advised when the system is reset and operational.

Maintenance records:

Records of all maintenance routines must be in a log book kept at the sprinkler control valves.

Smoke Alarms

BCA 1990: E1.7, Spec E1.7, Vic – H101.9, Vic – H103, BCA 1996:EP2.1, EP2.2, ,(Part E2, Spec E2, 2a), Reference: AS 3786, AS 1851.8

Purpose:

Smoke alarms are installed either singly or in an interconnected circuit, to detect and provide an early warning of the presence of fire. This early warning is designed to provide as much time as possible, to alert occupants of this threat.

Requirements of the equipment

To carry out its function, a smoke alarm must be:

1. A system designed in compliance with AS 3786, or listed in the SSL Register of accredited Products.
2. Connected to the consumer mains supply.
3. Located in accordance with AS 1670, or Specification E1.7 where applicable.
4. Must have an external or internal power source, or a combination of both.

Method of operation:

There are two basic types of smoke alarms:

1. The ionization type, where smoke entering the chamber causes a current flow.
2. The optical type, which operates by the scattering or absorption of light by smoke particles in a light beam.

An alarm system may be required by the BCA or building surveyor to also transmit an alarm signal to a fire station.

Maintenance checks:

BCC Practice Note 23 recommends that a smoke alarm be checked monthly by the owner. The owner may delegate this function to another person or body where necessary or appropriate.

1. Monthly:
    1. Perform the operational test of your alarms in accordance with the manufacturers instructions.
    2. Visibly check each unit for damage.

2. Yearly:
    1. Battery – if not rechargeable type, renew battery with a battery as specified on or in your alarm. If a rechargeable battery, check its voltage, using a voltmeter. If the voltage is as specified on the battery or alarm, re-install. If voltage is not satisfactory, renew the battery, and have the charging circuit tested by a qualified service provider.
    2. Using a vacuum cleaner, carefully clean the inside and cover of the alarm unit. Avoid physical damage.
    3. Where provided, turn off the external power supply to smoke alarm, and test as per manufacturers instructions. Restore power when completed.
    4. Carry out the monthly routine.

Maintenance Records

A log book must be kept to record:

1. The completion of the yearly routine
2. Any maintenance required on the system

<u>Fire Extinguishers – Portable</u>

BCA 1990: E1.6, BCA 1996: EP1.2 (E1.6), Reference: AS 24444, AS 1851.1

Purpose:

Portable fire extinguishers provide occupants with an appliance with which to attack a fire in its initial stages.

Requirement of the equipment

To provide fire extinguishers, containing extinguishing agent suitable for the fire hazard likely to be encountered. Each extinguisher must be located in a conspicuous and readily accessible position. The location and extinguisher type being indicated by the appropriate signage.

Method of operation:

A fire extinguisher is put into clear operation by transporting the extinguisher close to the fire and following operating instructions clearly displayed on the extinguisher. It is essential that all staff members in your premise are suitably trained in the correct use of fire extinguishers located in your premise.

Method checks:

BCC Practice Note 23 recommends that fire extinguishers be maintained six monthly to AS 1851.1. A five level inspection and service procedure is detailed in AS 1851.

1. Six monthly
2. Twelve monthly
3. Three yearly
4. Six yearly
5. "After use" of the extinguisher. A comprehensive maintenance schedule is detailed in AS 1851.1 for all types of fire extinguishers (attached). All maintenance work must be carried out by experienced personnel, observing recognised safety procedures (AS 1851.1, Section 2.1.5).

Maintenance records:

1. For the purpose of maintaining service records, each extinguisher in your premises must have a unique site identification mark. (AS 1851.1, Section 2.1.1.).
2. If more than ten extinguishers are located in or on your premises, a site plan showing the location of each extinguisher, and its identification type, size, and rating, must be provided. (AS 1851.1, Section 2.1.2.)
3. A maintenance record tag as per AS 1851.1, Section 2.3.2, must be attached to each extinguisher. A report on the correct position and location of extinguishers must be provided by your service agency or personnel (AS 1851.1, Section 2.1.4)

Fire Hose Reels / Fire Mains

BCA 1990: E1.4, BCA 1996: EP1.1 (E1.4), Reference: AS 2441, AS 2419.1, AS 1851.2, AS1851.4

Purpose:

Hose reels are to be provided to enable occupants to undertake initial fire extinguishment Requirements:

Hose reel systems must:

1. Provide sufficient hose reel length to enable every part of the floor or storey on which it is installed to be reached by laying the hose along normal lines of access throughout that floor; and
2. Be provided with a water supply rate of at least 0.33 litres/second. (AS 2441)
3. The location of each hose reel must be clearly indicated.

Method of Operation:

The occupants of the premise should be able to operate the system.

1. By locating any hose reel within the building.
2. By following the operating instructions displayed on the hose reel. It is essential that all staff personnel on your premises be trained in the safe and efficient operation of the fire hose reels.

Maintenance checks:

BCC Practice Note 23 recommends that fire hose reels be maintained at 6 monthly intervals to AS 1851.2. AS 1851.2 specifies the requirements for maintenance of hose reels, including requirements for six monthly and twelve monthly inspections. The maintenance and inspection may be carried out.

1. Six Monthly Inspections: (as per 1851.2, Section 3)
    1. Check that the operating instructions on both the hose reel and the manual valve stop assembly are clear and legible.
    2. Check that there is no leakage of water exceeding 5 ml in a 3 minute period from any point of the hose reel assembly, with the stop valve fully open, the nozzle closed, and the hose partially run out to at least five metres.
    3. Check that the hose runs freely through the hose guide.
    4. Check for signs of corrosion or damage which may affect the operation of the hose reel. After this inspection, it is essential that the hose is rewound in even layers, the nozzle re-engaged correctly in the interlock, the valve shut off and the hose de-pressurised by opening the discharge nozzle. Close the nozzle when de-pressurised.
2. Annual Inspection: (As per 1851.2/ 88 Section 3)
3. Carry out the checks required for the six monthly inspections with the exception of item (b), in addition the following points should be checked:
    1. With the stop valve turned fully open, the nozzle closed and the hose fully run out, check for any leakage of water exceeding 5ml in a 3 minute period, from wither the valve gland, spindle gland, or discharge nozzle.
    2. That the hose can be run out easily in any direction.
    3. That the flow rate supplied is not less than 0.33 litres per second, with the nozzle in jet mode. (this will fill a 10 litre bucket in 3 seconds)

As with the six monthly test, it is essential that the hose is rewound with even layers, the nozzle re-engaged correctly in the interlock, the valve shut off, and the hose de-pressurised by opening the discharge nozzle. Close the nozzle when depressurised. Any defects found should be reported to management and the necessary repairs or replacement carried out as soon as possible, to ensure the equipment is ready for use if needed. In addition, a label, showing the date of service and description of the fault should be attached to the side plate of the faulty hose reel.

Maintenance records:

A logbook, showing the location and identifying marks or numbers for each hose reel on your premises, must be established. The following information must be recorded:

1. The date of each inspection carried out.
2. Any defects found.
3. On the tag attached to the hose reel, record the date of each inspection.

Fire Hose Reel Pump:

If your fire hose reel system incorporates a pump to provide the necessary water supply, record the date of test carried out to ensure correct start-up of the pump.

Fire Detection and Alarm System

BCA 1990: E1.7, Spec E1.8
BCA 1996: EP2.1, EP2.2, (Part E2, Spec E2.2a)
Reference: AS 1670, AS 1851.8

Fire Brigade Connections

Fire Control Panels

Purpose

A fire detection and alarm system is installed to sense and provide warning of a fire in its initial development stage. Proper operation of this system will afford the building occupants the maximum amount of time available to seek safe refuge.

Requirement of the equipment:

A fire alarm system must automatically:

1. Sense the presence of a fire and advise its location
2. Sound a local alarm
3. Advise the fire brigade

If installed:

1. Switch your air handling system into the smoke ventilating mode
2. Activate the closure of smoke and fire isolating doors
3. Activate necessary fire pumps

In addition to these automatically activated functions, the alarm system may have a manual means to activate the system.

Method of Operation:

Detectors of differing types are installed throughout your building to comply with AS 1670. The standard designates the location and the suitable detector to be installed. A signal from the detector is relayed to the control and indicating equipment in your system, which activates the various response listed above.

Maintenance Checks:

BCC Practice Note 23 recommends the facilities be inspected weekly. Testing procedure for weekly, monthly and yearly maintenance routines are detailed in AS 1851.8. Weekly tests are required when the alarm is connected to an unmanned fire station, or when required by the building surveyor because of the nature of the premises.

Fire Hydrant System / Fire Mains

BCA 1990: E1.3, BCA 1996: EP1.3 (E1.3), Reference: AS 2419, AS 1851.4

Purpose:

A fire hydrant system is installed to provide a fire fighting personnel a supply of water for firefighting purposes.

Requirements of the Equipment:

To fulfill its purpose, your hydrant system must:

1. Be installed to AS 2419.1
2. Be located to provide coverage to every part of your building or site requiring coverage
3. Provide a specified minimum flow of water at all times
4. Be readily accessible to fire fighting personnel

Method of Operation

The supply of water to the hydrant system must be provided automatically, once a hydrant valve is opened, or in some systems, once a fire alarm had been activated. Any pump incorporated into the system must be powered by a motor that will enable operation regardless of primary electrical mains failure. The water supply must be acquired from a source that will provide adequate water for a specified period of time.

Maintenance Checks:

Maintenance work, involving inspections, testing and services, has been classified into six levels, at the following frequencies:

1. Six monthly
2. Twelve monthly
3. Three yearly
4. Six yearly

Complete details of this six-level program are included in AS 1851.4.

Before maintenance work is carried out, the following precautions must be taken:

1. Whenever the maintenance work will render your system inoperative, or will activate your fire alarm system, notify the fire brigade and the owner of your building, or his agent, before any action is taken. If you turn out the fire brigade unnecessarily, you could be charged for their attendance.
2. Before turning off the water, a thorough check of all your premises must be made, to ensure you are safe from a threat of fire as soon as possible.
3. Ensure all your other fire suppression equipment is fully operational.

After all this work is completed, the hydrant system must be tested to ensure it operates at its designed performance level, and the fire brigade must be notified that the system is again operational. Whenever the system is disabled for maintenance or modifications, special precautions should be implemented as detailed in AS 1851.4.

Maintenance Records:

The maintenance records must record:

1. All the inspections, testing and servicing procedures required under AS 1851.4
2. Details of defects found and unscheduled repairs carried out
3. Details of any remedial action taken

All those details must be systematically entered in the logbooks established for your hydrant system. This logbook should be maintained by a person responsible for it, and must be available for inspection when required.

In addition, each hydrant must have a tag attached to it, showing the dates on which the yearly, three-yearly and six-yearly procedures were carried out.

2.0 Mechanical Services

For further information refer to the Australian Standard AS 3666

Smoke Vents

BCA 1990: E2.4, G3.8, H1.2, Spec H1.2, BCA 1996: EP2.1, EP 2.2, (Part E2, G3.8), Reference: AS 2665, AS 1851.5

Purpose:

Smoke and heat vents are installed to assist the discharge of smoke and heat generated by fire.

Requirements of the Equipment:

A smoke venting system is made up of the following components:

1. Vents and their operating mechanism
2. Draught curtains
3. Inlet ventilation

This system must be designed and installed in accordance with AS 2665.

Method of Operation:

This system:

1. Contains the smoke/heat within the confines of the smoke curtains
2. Activates the vents, using the rising temperature, releasing the trapped smoke/heat to the atmosphere
3. Assists the ventilation process by introducing air to replace the rising smoke/heat column

Operation of the system must be automatic, with a manual control in addition.

Records must be maintained

Air Conditioning System Mechanical Ventilation Systems Fire Dampers

BCA 1990: F4.5, BCA 1996: FP4.3, FP4.4, AS 1668.2, Reference: AS/NZS 3666.2

Purpose:

A mechanical air handling system must safeguard occupants from illness or loss of amenity due to lack of air freshness.

System and equipment

The following systems and equipment are included within the scope of this section:

1. Air conditioning systems including air handling systems and thermal plant systems incorporating condenser systems
2. Ventilation systems including car park ventilation systems, evaporative cooling systems and general exhaust systems
3. Smoke spill and smoke control systems including stair pressurisation systems
4. Kitchen exhaust systems
5. System components including fire dampers, humidifiers, electric duct heaters, etc

Requirements of the Equipment:

A mechanical air handling system must:

1. Be installed in accordance with AS 1668.1, 2 and AS/NZS 3666.1 and 2; and
2. Deliver adequate amounts of outdoor air and provide sufficient circulation; and
3. Remove contaminants present in the compartment or building to maintain an acceptable air quality

Maintenance Checks:

To ensure the ongoing efficiency of an air handling system after installation, a series of four-level routine checks of various components are a part of the necessary maintenance schedule. The maintenance of these systems is an ongoing responsibility. This is a requirement of the regulation and both AS 1851.6 and AS3666.

Smoke Control Measures

BCA 1990: Part E2, G3.8, Part H1, BCA 1996: EP2.1, EP2.2
(Part E2, G3.8), Reference: AS 1668.1, AS 1851.6, AS 1851.6C

Stairwell pressurisation systems

Fire Dampers

Purpose:

To ensure, under fire and smoke conditions occupants have sufficient time to evacuate before evacuation route becomes untenable.

Requirements of the Equipment:

To fulfill its purpose, the system must:

1. Be installed in accordance with AS 1668.1 1991 or Specification E2.2
2. Respond to automatic heat or smoke sensing equipment; and
3. Remove smoke from the fire affected area to the outside atmosphere or if required, provide a pressurised atmosphere in fire isolated exits to prevent the entry of smoke into the fire compartment.

Method of Operation:

The smoke control system must:

1. Respond to an automatic sensing of a fire condition; and
2. Automatically activate the appropriate equipment to:
    1. Vent smoke to the atmosphere; and
    2. Introduce outside air to either within the same fire affected compartment or to the non fire affected compartments; and
    3. Develop a positive air pressure in the fire isolated stairwells (where required); and
3. Have a manual override the facility to enable fire fighting personnel to control the system

The systematic re-action of the various components in the smoke and air handling systems will have been programmed into this equipment during the design, installation and commissioning of the equipment into your building.

Maintenance Records:

To ensure proper control of the maintenance programme, the following documentation must be provided:

1. A Maintenance Schedule – This must list all the items of plant and equipment and operational features that will some under the maintenance routines outlined in the above programme. It must also include the frequencies at which the relevant levels of these routines need to be carried out; and examples of these documents appear in Appendix C of AS 1851.6
2. A Plant Register – This must list all items of plant and equipment which require inspection as a prerequisite to maintenance, and should describe their location within your building. Each item must have a unique reference number to identify that particular equipment, and its location indicated on your installation diagram. Means of access to the equipment could also be listed.; and
3. Plant History Sheer – Each item must have its own history record. This must show:
    1. The performance of that item at its commissioning, and at any subsequent re-commissioning; and
    2. The results of any inspections and tests. These results must then be compared with its original performance; and
    3. Any defects identified; and
    4. Any repairs and modifications carried out; and
4. Installation Diagram – This must show:
    1. The location of each item of equipment; and
    2. The unique identification number for that item

Method of Operation:

This system:

1. Contains the smoke/heat within the confines of the smoke curtains
2. Activates the vents, using the rising temperature, releasing the trapped smoke/heat to the atmosphere
3. Assists the ventilation process by introducing air to replace the rising smoke/heat column

Operation of the system must be automatic, with a manual control in addition

2.0 Emergency Lighting

For further information refer to the Australian Standard AS 2293

Emergency Lighting

BCA 1990: E4.2, BCA 1996: EP4.1 (E4.2), Reference: AS 2293.1, AS 2293.2

Purpose:

To safeguard occupants from injury by providing sufficient lighting to allow safe occupant evacuation in an emergency.

Requirements of Equipment:

Emergency lighting system must:

1. Be installed to AS 2293.1; and
2. Be automatic in operation in the event of failure of power supply to the main lighting system; and
3. Provide a level of illuminance appropriate:
    1. to the sue and size in floor area of the building; and
    2. the distance required to reach exits

Method of Operation:
Central Lighting Systems:

1. Where the emergency lighting is energised at all times when building is occupied; or
2. Where the emergency lighting is energised only when power to the normal lighting system fails.

Single Point Light Systems:

Each unit "stands alone" and illuminates when normal lighting fails. Power is supplied from a built-in battery which is continuously under charge while normal lighting operates.

Maintenance Checks:

BCC Practice Note 23 recommends maintenance to be carried out at least every six months.

Exit Signs

BCA 1990: E4.5, BCA 1996: EP4.2 (E4.5), Reference: AS 2293.1, AS 2293.2

Purpose:

Exit signs are provided to aid occupant identification of exits and paths of travel between exits.

Requirements of the Equipment:

Exit signs must be:

1. Installed to AS 2293.1; and
2. Clearly visible to persons approaching an exit; and
3. Located in positions where exits are not readily apparent, i.e. corridors, hallways and lobbies, with directional arrows, indicating the direction of an exit; and
4. Located on, above, or adjacent to each door providing egress. (As detailed in BCA E4.5); and
5. Clear and legible in writing with adequate size letters and symbols; and
6. Provided with emergency illumination in the event of normal power supply failure.

Method of Operation:

Exit signs must be set up to operate as follows:

1. Be illuminated at all times by mains power supply or by being a self contained unit; and
2. Be either internally or externally illuminated; and
3. Have a provision for emergency power supply in the event of failure of the normal power source.

Maintenance Checks:

BCC Practice Note 23 recommends maintenance to be carried out at least every six months to AS 2293.2. The testing procedures of exits are detailed in 2293.2. These procedures must be available to your designated tester in a hard bound A4 size maintenance folder. This folder must be provided by the installer of your system.

Emergency Warning and Intercommunication System

BCA 1990: E4.9, Spec E1.5, Spec E1.7, BCA 1996: EP4.3 (E4.9), Reference: AS 2220.1, AS 2220.2, AS 1851.10

Purpose:

An emergency warning and intercommunication system (EWIS) is installed in a building to alert occupants in the event of an emergency and enable an orderly evacuation of the building.

Requirements of the Equipment

To fulfill its function, the EWIS must have the following facilities:

1. A master emergency control panel (MECP); and
2. Any necessary additional emergency control panels (ECP); and
3. The necessary distribution system to transmit a warning signal to each evacuation zone in the building; and
4. A warden intercommunication point (WIP) located on each floor or in each evacuation zone; and
5. A notice at each ECP giving clear instructions on how to operate this equipment correctly; and
6. An inter-connection with the building fire alarm system.

To ensure the system fulfils its purpose, it is essential that all staff/personnel located in your building are given training in identification of the "alert" and "evacuation signals, both audible and visible, and take part in an evacuation exercise.

Method of Operation:

A key requirement for this system is the appointment of a house warden and zone warden for each evacuation zone in the building. These people should be appointed and trained to fulfill their respective roles. In addition each member of staff should be advised of the house and zone wardens appointed, their duties, and the authority designated to these wardens.On activation of the fire alarm system, the EWIS shall transmit the "alert" signal, until manual control of the system is established. If manual control is not established in the pre-determined time for your system, the "evacuate" signal is automatically transmitted. The "alert" signal must also be capable of manual initiation from each ECP and WIP.

If manual control is established, the house warden:

1. Attends the MECP
2. Gathers information on the incident
3. Makes a decision on evacuation
4. Advises the zone wardens of his decision
5. Supervises the evacuation if ordered
6. Becomes the focal point of contact with responding emergency services

3.2 Public Lighting Hazards

Installation of public lighting

This report comments on the requirement to ensure that there is adequate lighting to common areas.

3.3 Rubbish & Waste Handling Hazards

Management of rubbish and waste handling

Generally all bin storage areas must have a wash down facility including drainage. In older type units this was not provided but should be considered.

3.4 Tripping Hazards

This report standard is based on the tripping guidelines produced by most local councils. This report considers that:

Egress and Access Pathways	Level differences of no more than 12mm+
On Stairs landings ramps	Level differences of no more than 6mm+
General Areas i.e pathways driveways	Level differences of no more than 15mm+
Single steps that are not marked	
Gaps in trafficable areas between surfaces	No more than 25mm+ between surfaces

3.5 Garden & Vegetation Hazards

This report standard is based on the pruning guidelines produced by most local councils. The above envelope should be kept clear of vegetation to maintain the path way in a trafficable condition. Note that driveway should have a clear envelope of a minimum of 3metre wide x 4 metres high.

3.6 Slipping Hazards

For further information refer to the Australian Standard AS 4663 and AS 3661

Assessment of Slipping:

A/NZS 3661.2: 1994

Assessment of flooring with reference to risk of slipping:

General qualitative guidelines on the slip resistance (dry and wet) of typical flooring materials are not listed due to the large variability in the slip-resistant characteristics of generic types of surfacing materials. As a rule, textured surfaces provide better slip resistance than smooth, the extent depending on the type of texturing. Slip-resistant characteristics will also vary due to different manufacturing surfaces, the quality and grade of the material, and maintenance and application of waxes polishes, as required, and type of footwear worn. However, a quantitative evaluation involving actual measurement of coefficient of friction requires appropriate apparatus and a test specification such as provided in AS/NZS 3661.1. NOTE: Specialty products may not be appropriately tested by the test methods described in AS/NZS 3661.1. The effect of texture in providing slip resistance is dependent on the size and spacing of the texturing. Generally a granulated effect of raised areas 1mm-2mm in diameter and a similar distance apart is the most effective. These comments particularly refer to indoor flooring surfaces. Outside, concrete, asphalt, perforated rubber or plastic matting and outdoor carpet are preferable to gravel or other loose granular materials. However, in areas where snow, ice or frost may occur, surface slip resistance will degrade significantly.

Assessment of footwear:

A future standard will give guidance on the selection of footwear for slip resistance (Jung K. and Fisher A. "Safety Science" vol 16). However, footwear cannot generally be relied upon to prevent slipping accidents, particularly when there is an oily contaminant on the floor.

Slipping problems during installation of finishing:

A/NZS 3661.2: 1994

Slip hazards created by the installation process include:

1. General preparation of bases, developing wet, dusty, primed and smooth surface.
2. Adhesives spread over the floor areas.
3. The factory finish on new materials.
4. Adhesives left on finished surfaces.
5. Water and solvents cleaning off adhesives.
6. Loose pieces of material left on surfaces.
7. Untidy and uncompleted work.
8. Other trade dust, water and foreign matter.
9. Initial cleaning prior to handover.
10. Neglect of finished surface after handover and prior to occupation. Mud, dust, water, paint, paper, wrappings and oil.
11. Inattention to hazardous situations by installer and owner.
12. Inattention to hazardous situations by people and ignoring of warning notices.
13. Absence of warning notices
14. Absence of good lighting.
15. General preparation of bases, developing wet, dusty, primed and smooth surface.

NOTE: Lighting levels above 200 lux are preferable and light levels should not be less than 30 lux. Reduction of slip hazards on existing floors

Surface treatment of existing floors:

Acid etching, sand blasting, grinding, paint and sand, and grooving are methods of improving the slip resistance of existing floors. Table 1 shows which surfaces are suitable for each treatment. It is necessary to determine whether the particular treatment will render the surface unacceptable from aesthetic functional perspectives.

Special precautions in the home environment:

Kitchens: This is the area in the house where spills are most likely to occur. PVC sheet or tile (vinyl), commonly used as flooring in this area can be very slippery when wet. Any spills should be cleaned up immediately.

Bathrooms: Special precautions for bathrooms include:

1. Using a slip resistant mat or tapes in bath or shower.
2. Treatments to improve slip resistance are also available (refer to NOTE 6 of Table 1).
3. Strong handrails are helpful, particularly for the elderly of people with disabilities.
4. Be careful with talc or bath oil which can make surfaces particularly slippery. In some situations it may prove desirable to consider various means of reducing slip hazards of existing floors.

Outdoors: Special precautions for outdoor areas include:

1. Slip resistant door mats at entrances are recommended. These should be secured or large enough to remain in place.
2. Keep paths and patios free from leaves, mud, clippings and paper, and remove moss or slime with a chlorine-based solution.
3. Provide lighting and handrails for steps which should have slip-resistant treads and nosings, all as required by the relevant regulatory authorities.
4. Be cautious of grease spills in the barbeque area.
5. Clean home pool surrounds with calcium hypochlorite to prevent algae build up. Provide slip resistant surfacing around pool or spa edges.
6. Grass can be particularly slippery. The use of golf or other spiked sports shoes can assist in slippery situations. Special care is required in the use of power mowers, particularly on slopes.

Garages: Spills of oil or grease are particularly hazardous. These shall be cleaned up immediately as per 'Oil Cleaning Recommendations' noted earlier.

Care and maintenance of floors:

A/NZS 3661.2: 1994

General:

In choosing a flooring surface often insufficient attention is given to cleaning and care over its lifetime. Specifications and general assistance should be obtained from the flooring manufacturer, cleaning contractor or flooring supplier. Owners are advised to assemble a complete file of instructions and precautions for use when required. In choosing a flooring surface reference should also be made to the requirements of the relevant regulatory authorities.

Conditions of use:

1. Flooring and other surfacing materials in common use usually have acceptable slip resistance proved they are:
2. Dry
3. Clean

4. Free from oil, fat and other slippery substances
5. Where required, maintained with a slip resistant polish or finish

Design of cleaning systems:

Designers, in consultation with their clients, shall consider at the design stage how the floors are to be cleaned and maintained and make adequate provisions for same. Where necessary, advice may also be sought from material suppliers. Examples of factors to take into account are:

1. Decisions about what activities are performed in an area, e.g. food preparation.
2. What will fall on the floor? For example, fat and water.
3. What is the flooring surface? For example, quarry tile.
4. How are the contaminants to be removed from the floor? For example, detergent in hot water applied by a mop.
5. How is the detergent residue rinsed from the floor? For example, by hosing to sump will remove contaminants more effectively than rinsing by mop, yet requires careful placement of drains to assist removal of water. Detergent rinses and dirty water should be removed preferably by a wet vacuuming method prior to use as a pedestrian surface for work activities.
6. Where can cleaning materials and equipment be stored securely? For example, a heavy polishing machine stored in the basement needs good lift access to all floors.
7. Is hot water and a tub available on each floor?
8. Does the flooring manufacturer specify a special machine, method or material for cleaning and polishing? For example, some rubber floors cannot be cleaned with alkaline detergents.
9. Does the floor have any crevices where dirt can accumulate?
10. Can the cleaning be performed at a time that permits the floor to be used only when it is dry?

Elimination of water:

Water is arguably the substance which most often makes floors slippery. Spills of tea, cleaning solution, rinse water and other liquids are too hazardous to leave until cleaners arrive. Water on the floors is primarily the responsibility of the person who has spilt it and that person should remove the water immediately and signpost the hazard while attending to it. Large quantities of rainwater may be tracked inside on rainy days. Architects may sensibly provide foyers with adequate drainage and walking surfaces that are slip resistant when wet. Failing this, carpet runners or mats can provide walkways with sufficient capacity to absorb water. Runners will need to be cleaned and dried after use (refer to clause 4.3(c)).

Elimination of slippery surfaces:

Slippery substances include oil, mud, fat, food and detergents. If possible, these should be wiped up immediately after the spillage. Where a slow build up of slippery contaminants occurs (e.g. from frying of food), a regular cleaning program is the best remedy.

Oil:

Oil is a particular problem. Once the bulk of a spill has been wiped up, a thin film usually remains and poses a continuing hazard. Recommended methods of dealing with oil spills include:

1. Mopping up the spill with a specialised absorbent, which is then placed in a covered bin for disposal. NOTE: sawdust and oil can spontaneously ignite, so sawdust must not be used for this purpose.
2. Treat with emulsifier designed to remove oil spillages, and wash away with water. This does not create a hazard in drains, but washing large quantities of emulsified oil down the drains would not meet local regulations. Disposal would therefore have to be at an approved tip.

The use of gratings may be advisable where heavy oil spillage is likely. Abrasive grit coated surfaces may be helpful. The use of footwear soled with leather or PVC should be discouraged. Nitrile rubber soles are preferred, but no footwear is safe on oily surfaces.

Cleaning:

Regular cleaning is necessary to remove soil which is not only unsightly and unhygienic, but may be slippery. Uncarpeted floors are usually swept or vacuumed to remove the loose dirt. The floor is mopped with detergent and hot water. The slurry is then picked up. Next it is common to rinse the floor by mopping with clean water. The surface is then allowed to dry. Of course there are many systems, different chemicals, and pieces of equipment for cleaning floors. Relevant factors include the following:

1. Attention should be given to the manufacturer's recommendations, both of the floor finish and floor treatment. For example, unglazed ceramics should normally be cleaned with a neutral detergent to avoid deposit of inorganic salts.
2. Most modern polish systems are removed by ammoniated detergents. Refer to polish manufacturer's recommendations.
3. Self-propelled scrubbing machines are available for large areas. These can vacuum up the dirt slurry.
4. For rubber flooring, only neutral pH or acidic cleaning liquids should be used.

Polishing and maintenance of floors

Modern polishes impart a hard wearing glossy surface to most non-porous floors. Polish improves appearance, increases dirt resistance, makes cleaning easier, and protects flooring from wear. Slip resistant type polishes generally achieve their slip resistant characteristics by thorough buffing with a polishing/scrubbing machine using the correct attachments. While these polishes look slippery because of their gloss they should be expected to have adequate slip resistance. Unfortunately water and other liquids make polished floors slippery. To ensure adequate performance of a polished floor the polish manufacturer's instructions regarding stripping of old polish, floor preparation, polish application, cleaning and repair of worn polish areas shall be followed.

NOTE: Polishing of floors may be inappropriate where unnecessary risk of injury exists to person undertaking this task.

Repair:

Physical damage to floors shall be repaired as soon as possible. The area should be blocked off while waiting for repairs to be carried out and during the repairing to prevent slipping or tripping hazards.

Table 1: Methods of improving the slip resistance of existing flooring

Surface	Acid Etch	Blasting	Grind	Paint & Sand	Groove (diamond saw)	Floor Sander	Proprietary Treatment	Adhesive Strip
Concrete	✘	✘	✘	✘	✘			✘
Ceramic Tiles		✘	✘	✘	✘		✘	✘
Granite		✘	✘		✘		✘	✘
Marble		✘	✘		✘		✘	✘
Pavers - Concrete	✘	✘	✘	✘	✘			✘
Pavers - Clay		✘	✘	✘	✘		✘	✘
Porcelain Enamel							✘	✘
Steel Plate		✘		✘				✘
Wood				✘		✘		✘
PVC Sheet & Tiles							✘	✘

NOTES:

1. The methods of improving slip resistance listed in Table 1 do not account for aesthetic or cleanability characteristics of resultant flooring after treatment. Consideration should be given to these aspects.
2. Hydrochloric acid used in acid etching must be handled with care. It will attack body tissue and clothing as well as paints and metal.
3. Sandblasting should be used with caution. Try it on a small area to make sure the surface is removed evenly.
4. Grinding will usually be slow, noisy and dusty.
5. Sand is supplied wither premixed into the paint, or separately. If separate, oven-dried clean sand should be sprinkled over the wet first coat of paint, the excess removed when dry, and a second seal coat of paint applied.
6. Grooving should result in shallow grooves (2-3mm) closely spaced (7-10mm) in strips.
7. Proprietary treatments may require regular retreatment to remain effective. Follow manufacturer's instructions. Some proprietary surface treatments contain hydrofluoric acid. These should only be used by specialist personnel. Hydrofluoric acid is a toxic and extremely corrosive chemical. It will also cause severe skin burns. However, some treatments are formulated with very low acid concentrations to reduce the hazard. Instructions shall indicate the necessary precautions to be taken in application.
8. Textured adhesive strips are useful, but often serve only as a temporary measure. They should be replaced immediately when they show signs of wear or loss of adhesion.

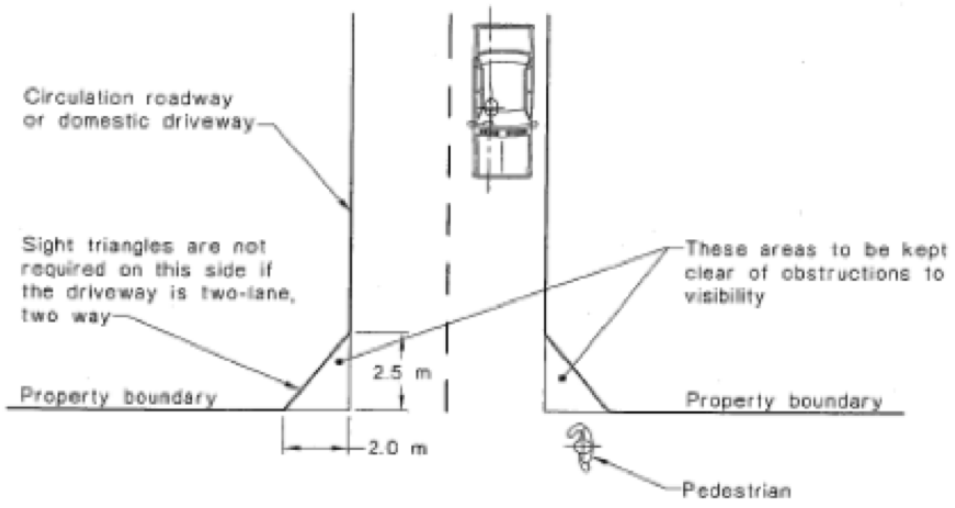
3.8 Vehicular Movement Hazards

Vehicular movement planning and warning

Sight distance at access driveway and warning

Access driveways need to be located and constructed so that there is adequate entering sight distance to traffic on the frontage road and sight distance to pedestrians on the frontage road footpath for traffic entering the frontage road, as follows:

1. Entering sight distance unsignalised access driveways shall be located so that the intersection sight distance along the frontage road available to drivers leaving the car park or domestic driveway is at least that shown in Figure 3.2.
2. Sight distance to pedestrians Clear sight lines as shown in Figure 3.3 shall be provided at the property line to ensure adequate visibility between vehicles leaving



DIMENSIONS IN METRES

the car park and pedestrians on the frontage road footpath.

4.1 Electrical Hazards

Location of Switchboards

General:

Switchboards shall be:

1. Installed in suitable places, which shall be well ventilated and dry unless the switchboards are protected against moisture
2. Located so that the switchboard and access thereto is not obstructed by the structure or contents of the building or by fittings and fixtures within the building

Location of Main Switchboard:

The location of the main switchboard shall comply with the following:

1. General: The main switchboard, or a panel for the remote control of main switches in accordance with Clause 2.8.3.3.4, shall be located within easy access of an entrance to the building.
2. Multiple Electrical Installations: In multiple electrical installations, the main switchboard shall not be located within any domestic electrical installation.

Identification of Location of Main Switchboard:

Where the location of the main switchboard cannot be readily determined due to the nature of the size or design of the electrical installation, the location of the main switchboard in other than single domestic electrical installations shall be identified by means such as a permanent sign at a main entrance to the electrical installation or at the fire indicator panel.

Restricted Locations:

Restricted height locations for switchboards are as follows:

1. Height above ground, floor or platform: In general, a switchboard shall not be located within 1.2m of the ground, floor or platform unless it meets requirements of Clause 2.9.6.
2. Water containers and fixed or stationary cooking appliances: A switchboard shall not be installed above open water containers or fixed stationary cooking appliances. If located in an area where it may be affected by water splashing or steam the switchboard shall be provided with a suitable enclosure or shall be installed in a cupboard with close fitting doors.
3. In Storage Cupboards: A switchboard installed in a storage cupboard shall only be installed in an area set aside for the purpose. The switchboard shall be i.) Separated from other sections of the cupboard; and ii.) Arranged so that access to the switchboard cannot be obstructed by the structure or contents of the cupboard.
4. Near Showers: A switchboard shall not be installed within the space contained by vertical planes 3m from the centre of a shower rose and extending from the floor the ceiling.
5. Near Swimming Pools, Spas or Saunas: A switchboard shall not be installed within or above any zone classified in accordance with Clause 7.2.2. for a swimming pool or spa pool. A switchboard shall not be installed within a sauna.
6. Egress Paths: A switchboard is not permitted to be installed within a fire-isolated stairway, passageway or ramp. A switchboard may be installed in other egress paths subject to the requirements of the appropriate building Codes.
7. Near Fire-Hose Reels: A switchboard shall not be installed within a cupboard containing a fire hose reel.
8. Near Automatic Fire Sprinklers: The following types of switchboards, unless they are suitably protected from the effects of the operation of the sprinkler system which may affect their operation, shall not be installed in the vicinity of an automatic fire sprinkler system: i) Main switchboards. ii) Switchboards from which emergency systems originate in accordance with Clause 7.10.

Accessibility

Adequate space shall be provided around a switchboard on all sides where persons are to pass to enable all electrical equipment to be safely and effectively operated and adjusted.

Emergency Exit Facilities

Sufficient exit facilities shall be provided to enable a person to leave the vicinity of a switchboard under emergency conditions. Except for domestic electrical installations, this requirement is considered to be satisfied by the provision of following:

1. Unimpeded space around switchboards NOTE: 0.6m space is considered suitable
2. One or more egress paths, particularly for large switchboards NOTE: In general, switchboards over 3m in length are considered large
3. Openings or doorways, to allow persons access to the switchboard, that are at least 0.75m wide by 1.98m high. Doors of switch rooms, or other rooms dedicated to switchboards, shall open in the direction of egress without the use, on the switchboard side of the door, of a key or tool

Consumer Billing Meters

AS 5601-2004

Meter Location:

The location and the method of installation of a Consumer Billing Meter are determined by the network Operator. Ventilation of the meter location is to be in accordance with Clauses 4.15 or 4.16 as appropriate.

Requirements:

Contact should be made with the network operator to determine the meter location and relevant installation requirements before any work commences.

Prohibited Locations:

Meters are not to be installed in any of the following locations:

1. A bedroom
2. A lift shaft or lift motor room
3. A room specifically intended for electrical switchgear
4. A fire-isolated stairway or passage
5. A fire hydrant duct or hose reel cabinet
6. Sprinkler or hydrant pump room
7. Near a source of ignition
8. In such a position that would obstruct egress from a building
9. In such a position where the meter would be subject to physical damage unless adequately protected
10. In an area where excessive temperatures or sudden excessive changes in temperature may occur
11. In the foundation area under a building
12. In a cavity wall, unless installed in a ventilated enclosure which meets the requirements of the network operator and the cavity is sealed
13. In a position where access for reading or maintenance is restricted
14. In an unventilated position
15. On the ground
16. On a floor which is frequently wetted

17. On a floor which contains material which may corrode the meter

Multiple Meters:

Where multiple meters are installed, each meter needs to be clearly marked to indicate the portion of the premises which is supplied.

NOTE: Consumer piping should also be appropriately marked prior to meter installation.

Subsequent Work:

The network operator's requirements are to be maintained when subsequent work which involves access to the consumer billing meter is carried out. Ensure the following are provided on completion of such work:

1. Security
2. Ventilation
3. Corrosion Protection

4.2 Communication Equipment

Installation of Communication Equipment:

The installations of communication equipment are in accordance with any Australian Standard including electrical installation practices. This inspection is based on any visible failure of any existing system and does not make any comment on the legality of the installation.

4.3 Gas Services

Meter Location

The location and the method of installation of a consumer billing meter are determined by the network operator. Ventilation of the meter is to be in accordance with clauses 4.15 or 4.16 as appropriate.

Requirements

Contact should be made with the network operator to determine the meter location and relevant installation requirements before any work commences

Multiple Meters

Where multiple meters are installed, each meter needs to be clearly marked to indicate the portion of the premises that is supplied

Note: Consumer piping should also be appropriately marked prior to meter installation

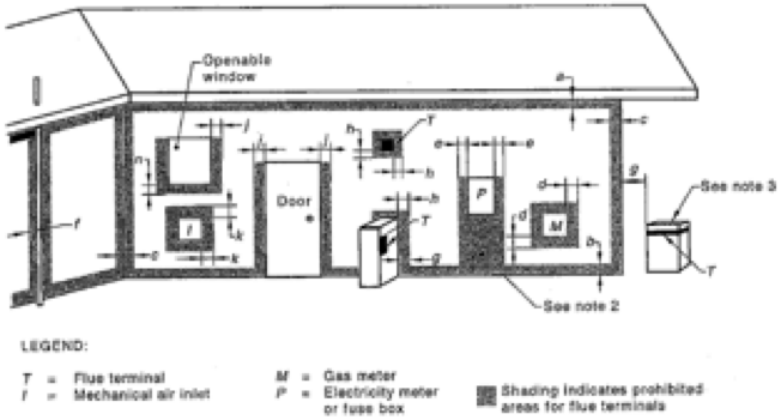


FIGURE 5.3 (in part) MINIMUM CLEARANCES REQUIRED FOR BALANCED FLUE TERMINALS, FAN-ASSISTED FLUE TERMINALS, ROOM-SEALED APPLIANCE TERMINALS OR THE TERMINALS OF OUTDOOR APPLIANCES

Item	Minimum Clearance (mm)	
	Natural Draft	Fan Assisted
Below eaves, balconies and other projections:		
- Appliances up to 50 MJ/h input	300	200
- Appliances over 50 MJ/h input	500	300
From the ground, above a balcony or other surfaces*	300	300
From a return wall or external corner*	500	300
From a gas meter	1000	1000
From an electricity meter or fuse box	500	500
From a drain pipe or soil pipe	150	75
Horizontally from any building structure* or obstruction facing a terminal	500	500
From any other flue terminal, cowl, or combustion air intake*	500	300
Horizontally from an openable window, door, non-mechanical air inlet, or any other opening into a building with the exception of sub-floor ventilation:		
- Appliances up to 150 MJ/h input	500	300
- Appliances over 150 MJ/h input up to 200 MJ/h input	1500	300
- Appliances over 200 MJ/h input up to 250 MJ/h input*	1500	500
- Appliances over 250 MJ/h input*	1500	1500
- All fan assisted flue appliances, in the direction of discharge.	-	1500
From a mechanical air inlet, including a spa blower	1500	1000
Vertically below an openable window, non-mechanical air inlet, or any other opening into a building with the exception of sub-floor ventilation:		
- Space heaters up to 50 MJ/h input	150	150
- Other appliances up to 50 MJ/h	500	500
- Appliances over 50 MJ/h input and up to 150 MJ/h input	1000	1000
- Appliances over 150 MJ/h input	1500	1500

Subsequent Work

A network operator's requirements are to be maintained when subsequent work which involves access to the consumer billing meter is carried out. Ensure the following are provided on completion of the work: security, ventilation, corrosion protection, access for reading and maintenance.

4.4 Sewer Hazards

Installation of Sewer Works:

The installations of sewer systems are in accordance with the Australian Standard and plumber codes. This inspection is based on any visible failure of the existing system and does not make any comment on the legality of the installation.