

Australian Standard[®]

Classification of hazardous areas

Part 3: Specific occupancies

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Australian Chamber of Manufactures
Australian Electrical and Electronic Manufacturers Association
Australian Gas Association
Australian Institute of Petroleum
Australian Liquefied Petroleum Gas Association
Confederation of Australian Industry
Department of Labour, Vic.
Department of Resources Industries, Qld
Department of Resources and Energy, Tas.
Grain Corporation of New South Wales
The Pipeline Authority
Regulatory authorities (electrical)
Royal Australian Chemical Institute
The Workcover Authority of New South Wales

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Engineering and Water Supply Department, S.A.
Sydney Water Board

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Part 3: Specific occupancies

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PREFACE

This Standard was prepared by the Standards Australia Committee on Classification of Hazardous Areas to supersede AS 2430.3—1987.

This Standard is intended for the guidance of industry and statutory authorities concerned with the classification of hazardous areas.

The major changes in this edition are as follows:

- (a) Amendments made to the delineation of vehicle parking areas.
- (b) Amendments made to the delineation of aircraft hangars.
- (c) Amendments made to the delineation of petrol and LP gas dispensers.
- (d) Previous section on flammable liquids and gases has been restructured to cover major refineries and chemical plants; flammable liquids, heavier-than-air flammable gases and lighter-than-air flammable gases.
- (e) Amendments made to the classifications for heavier-than-air flammable gases.
- (f) A new section on installations complying with the relevant gas industry codes has been introduced.
- (g) Amendments made to the delineation of anaesthetizing areas and fruit ripening rooms.
- (h) Amendments to the classification and delineation of sewage treatment plants and sewage pumping stations.

It is intended that this Standard be extended to include specific occupancies not already covered. Users of this Standard who have developed area classifications for their installations which they feel may have a general application are invited to forward such classifications for consideration by Standards Australia for inclusion in a future edition.

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STANDARDS AUSTRALIA

Australian Standard

Classification of hazardous areas

Part 3: Specific occupancies

1 SCOPE This Standard classifies specific hazardous areas. It covers several commonly occurring situations where the degree of hazard has been determined and the relevant authorities have agreed on the classifications to be used.

The classifications given in this Standard may not apply to specific occupancies where –

- (a) the quantity of release is either very large or very small;
- (b) the design of a particular plant does not comply with the appropriate Australian Standards; or
- (c) ventilation, use of inert gases, vapour barriers or other methods are used to reduce the extent or degree of risk of a particular hazardous area.

In such situations, reference should be made to AS 2430.1.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
1482	Electrical equipment for explosive atmospheres—Protection by ventilation—Type of protection v
2030	The approval, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases
2106	Methods for the determination of the flashpoint of flammable liquids (closed cup)
2229	Electrical equipment for explosive atmospheres—Electrical systems of dispensing equipment
2229.2	Part 2:Liquefied petroleum gas dispensing equipment
2430	Classification of hazardous areas
2430.1	Part 1:Explosive gas atmospheres
2746	Working areas and workshops for gas-fuelled vehicles
BS	
5908	Code of practice for fire precautions in chemical plant
American Petroleum Institute	
RP 500	API recommended practice for classification of areas for electrical installations in petroleum refineries
Institute of Petroleum, London	
Institute of petroleum safety codes	
Australian Institute of Petroleum	
AIP CP6	Vapour recovery equipment for vehicles equipped for bottom loading

3 DEFINITIONS For the purpose of this Standard, the definitions given in AS 2430.1, and the following apply.

3.1 Area, hazardous – An area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of potential ignition sources.

NOTES:

- 1 For the purpose of this Standard, an area is regarded as a three-dimensional region or space.
- 2 Examples of potential ignition sources are electrical equipment, naked flames, sparks from grinding and welding operations, and hot surfaces.

3.2 Area, non-hazardous – an area in which an explosive atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of potential ignition sources.

NOTE: Abbreviated as ‘NH’ throughout this Standard.

3.3 Authority, authority having jurisdiction – the authority having statutory (legal) control of the subject area.

3.4 Capacity (of a tank or cylinder) – for heavier-than-air gases, the total volume, in litres, of the space enclosed within the tank or cylinder.

NOTE: This is often referred to as ‘water capacity’.

3.5 Gas capacity (of a tank or cylinder) – for lighter-than-air gases, the maximum volume of gas that the tank or cylinder can contain, at metric standard conditions, expressed in cubic metres.

3.6 Metric standard conditions (MSC) – a temperature of 15°C and a pressure of 101.325 kPa absolute.

3.7 Vapour barrier – a wall or other barrier constructed and placed with the object of preventing the passage of vapour from one place to another.

3.8 Drum – a metal container having a nominal capacity in excess of 25 L (and not more than 250 L).

3.9 Pail – a metal container of circular cross-section having a nominal capacity of 10 L but not exceeding 25 L.

3.10 Cylinder – a vessel, other than a tank, which is constructed in accordance with AS 2030.

4 MEASUREMENT OF DISTANCES Distances may be measured in a horizontal plane around the end of any vapour barrier which intervenes, provided that it is not lower than the height specified in the relevant requirement.

5 VEHICLE WORKSHOPS

5.1 Scope of Clause ‘Vehicle workshops’ shall include areas used for service and repair operations in connection with self-propelled vehicles in which volatile flammable liquids are used for fuel or power, and in which more than three such vehicles are or may be serviced or stored at one time.

Clauses 5.2 and 5.3 shall also apply to areas in which gas-fuelled vehicles are stored or serviced, provided that the workshop complies with AS 2746.

NOTES:

1. For the classification of vehicle parking areas, see Clause 6.
2. For the classification of areas where tank-vehicles are garaged or areas where maintenance operations may be carried out on such vehicles, see Clause 11.2.7.

5.2 Dispensing pumps Garages with pumps or similar devices for the dispensing of petrol or other volatile flammable liquids shall be classified in accordance with Clause 9.

5.3 Delineation of hazardous areas

5.3.1 At or above ground or street level Floors at or above adjacent ground or street level provided with adequate ventilation acceptable to the authority **NH**

5.3.2 Below ground or street level

(a) *Ventilated by natural means* For each floor below adjacent ground or street level which is ventilated by natural means:

The entire area up to 0.5 m above the bottom of the outside doors or openings which provide the natural ventilation **Zone 2**

(b) *Ventilated by mechanical means* For each floor below adjacent ground or street level which is ventilated by mechanical means:

The authority may deem that a **Zone 2** area extends up to only 0.5 m above each floor below adjacent ground or street level, provided that the garage is mechanically ventilated so that six air changes per hour are exhausted from the garage through exhaust registers located so that the bases are not more than 0.1 m above the floor and that extensive dead spots do not occur at floor level.

5.3.3 Pits or depressions Any unventilated pit or depression below adjacent ground or street level shall be classified as **Zone 2** which shall extend up to floor level, except that an individual unventilated pit or depression may be classified by the authority as **Zone 1**.

Any pit or depression provided with mechanical ventilation complying with AS 1482 **NH**

6 VEHICLE PARKING AREAS

6.1 Scope of Clause ‘Vehicle parking areas’ shall include areas used exclusively for the parking of vehicles and which will not be used for other than minor service or repair operations on such parked vehicles.

6.2 Delineation of hazardous areas

6.2.1 At or above ground or street level Floors at or above adjacent ground or street level, provided there exists at least one outside door for vehicle access at the lowest level **NH**

6.2.2 Below adjacent ground or street level For each floor below adjacent ground or street level, the area within the space 0.1 m above floor level and extending 1 m in all directions horizontally from locations where vehicles may be parked **Zone 2**

6.2.3 Lift wells Where a lift well is below adjacent ground or street level and the well communicates with a hazardous area as defined in Clause 6.2.2, the well up to the level of the lowest floor – **Zone 2**

6.2.4 Depressions, pits or sumps Where a depression, pit, sump, or the like is provided for the collection of waste from a graded floor, the entire volume of the depression, pit, sump, or the like **Zone 2**

NOTE: The above delineations have been made on the assumption that hazardous vapours caused by spillage or escape of liquid or gaseous fuels will be cleared either by –

- (i) mechanical ventilation (required by the relevant authority where toxic gases are present); or
- (ii) natural ventilation.

7 RESIDENTIAL GARAGES

7.1 Scope of Clause ‘Residential garages’ shall include rooms or a substantially enclosed portion of a building or room in which not more than three vehicles of the types described in Clause 5.1 may be garaged and which will not be used for other than minor service or repair operations on such vehicles.

Where more than three vehicles may be garaged or where a pit is provided, the location shall be classified as for a vehicle parking area in terms of Clause 6.

7.2 Delineation of hazardous areas

7.2.1 At or above ground or street level Where the floor is at or above adjacent ground or street level, and where there is at least one outside door at or below floor level, the entire garage area **NH**

7.2.2 Below ground or street level Where the floor is below adjacent ground or street level, the entire area of the garage or of any enclosed space which includes the garage up to a level 0.1 m above the garage floor **Zone 2**

8 AIRCRAFT HANGARS

8.1 Scope of Clause ‘Aircraft hangars’ shall include locations used for storage or servicing of aircraft in which petrol, jet fuels, or other volatile flammable liquids, or flammable gases are used. It shall not include locations used exclusively for aircraft that have never contained such liquids or gases, or that have been drained and properly purged.

8.2 Delineation of hazardous areas

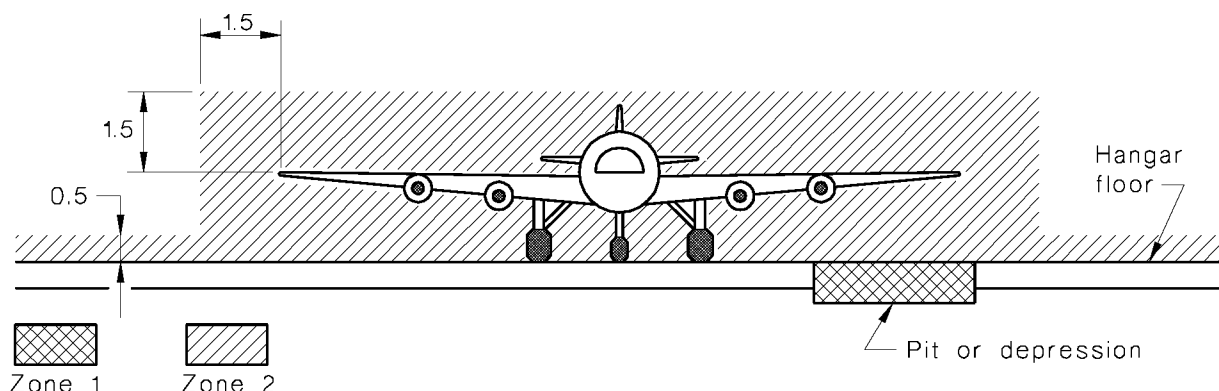
8.2.1 Pits or depressions Any pit or depression below the level of the hangar floor including channels, conduits and ducts, up to the top of the pit, or, for a depression, to the hangar floor **Zone 1**

8.2.2 Hangars The entire area of the hangar including any adjacent and communicating areas not suitably separated from the hangar up to a level 0.5 m above the floor **Zone 2**

8.2.3 Around aircraft The area within 1.5 m horizontally from aircraft engines, aircraft fuelling tanks, points and vent outlets, or aircraft structures containing fuel shall be classified as **Zone 2**, which shall extend upward from the floor or apron to a level 1.5 m above the upper surface of wings and of engine enclosures (see Figure 8.1).

NOTE: The requirements of Clause 8.2.3 are not intended to apply to fixed wall or bench-mounted equipment or wiring unless it is the intention or the practice to park aircraft in such a position that a hazard would be created by such parking. For example, wing tip tanks positioned within 1.5 m of a wall on which electrical wiring or equipment is mounted would require a portion of that wall to be treated as Zone 2.

8.2.4 Other areas Adjacent areas in which hazardous vapours are not likely to be released, such as stock rooms, electrical control rooms, and other similar locations, if adequately ventilated or if separated from the hangar itself by a vapour barrier **NH**



DIMENSIONS IN METRES

FIGURE 8.1 AIRCRAFT HANGARS

9 PETROL AND LP GAS DISPENSING STATIONS

9.1 Scope of Clause 'Petrol and LP gas dispensing stations' shall include areas where petrol or LP gas is transferred by means of a dispensing pump, or similar dispensing device, to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or waterborne craft.

NOTE: The term 'petrol' includes petrol/alcohol mixtures and any other volatile flammable liquid fuels.

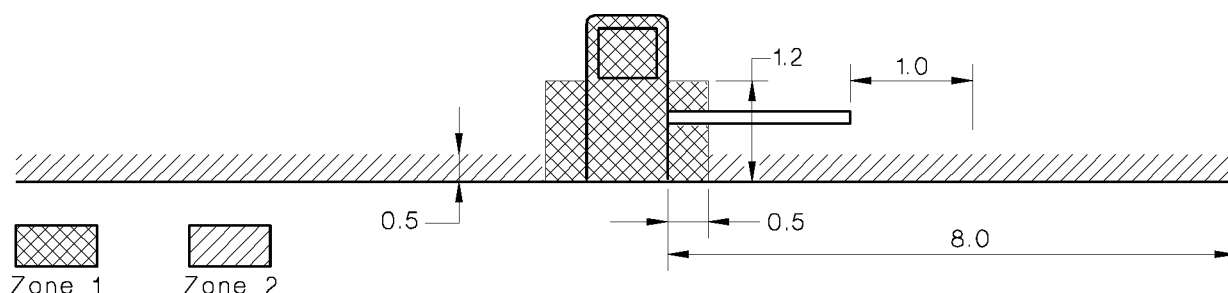
9.2 Delineation of hazardous areas

9.2.1 Petrol dispensing units in outdoor locations

- (a) For dispensing pumps, or similar dispensing units, mounted at or near ground level, the area within the space 1.2 m above the base of the dispensing unit and extending 0.5 m in all directions horizontally from the dispensing unit (see Figure 9.1) **Zone 1**
- (b) Any area within the space 0.5 m above the driveway or ground level and extending 8 m in all directions horizontally from the dispensing unit or 1 m laterally from the hose nozzle, whichever is the greater (see Figure 9.1) **Zone 2**

NOTE: The distance of 1 m specified in (b) above is to be taken from the end of the hose nozzle at its maximum lateral distance of travel from the dispenser unit in any direction.

- (c) Conduit and ducts below the surface and passing within 3 m of the dispensing unit **Zone 1**
- (d) For dispensing units mounted on a wharf or jetty:
 - (i) The area within the space 1.2 m above the base of the dispensing unit and extending 0.5 m in all directions horizontally from the dispensing unit (see Figure 9.1) **Zone 1**
 - (ii) The area beneath the dispensing unit to a distance of 1.5 m, or to water level, whichever is the lesser **Zone 1**
 - (iii) Where the distance between water level and the dispensing unit as specified in (ii) above exceeds 1.5 m, the area extending from the Zone 1 boundary to the water level **Zone 2**



DIMENSIONS IN METRES

FIGURE 9.1 PETROL DISPENSING UNITS IN OUTDOOR LOCATIONS

9.2.2 Petrol dispensing units in indoor locations

- (a) For dispensing pumps, or similar dispensing devices, mounted at or near ground level, the area within the space extending 0.5 m in all directions horizontally from the dispensing unit and up to a level with the top of the dispensing unit **Zone 1**
- (b) Any area within the space extending 8 m in all directions horizontally from the dispensing unit and up to a height of 1.5 m **Zone 2**

9.2.3 'Type A' LP gas dispensing devices in outdoor locations LP gas dispensing devices, complying with the requirements for 'Type A' devices in accordance with AS 2229.2 (see Figure 9.2):

- (a) The area within 0.5 m in all directions from the dispenser cabinet **Zone 1**
- (b) The area outside Zone 1 but within 1.5 m in all directions from the dispenser cabinet **Zone 2**
- (c) The area outside Zone 1 but within the space 1.2 m above ground level and extending to 4 m from the cabinet or 1 m laterally from the hose nozzle, whichever is the greater **Zone 2**

NOTE: The distance of 1 m specified in Item (c) above is to be taken from the end of the hose nozzle at its maximum lateral distance of travel from the dispenser cabinet in any direction.

9.2.4 Other LP gas dispensing devices in outdoor locations LP gas dispensing devices not qualifying for classification under Clause 9.2.3 (see Figure 9.3):

- (a) The area within 3 m in all directions from the hose nozzle **Zone 1**
 (b) The area outside Zone 1 but within the space 3 m above ground level and extending 6 m laterally from the hose nozzle **Zone 2**

NOTE: The distances specified above are to be taken from the end of the hose nozzle at its maximum lateral distance of travel from the dispenser cabinet in any direction.

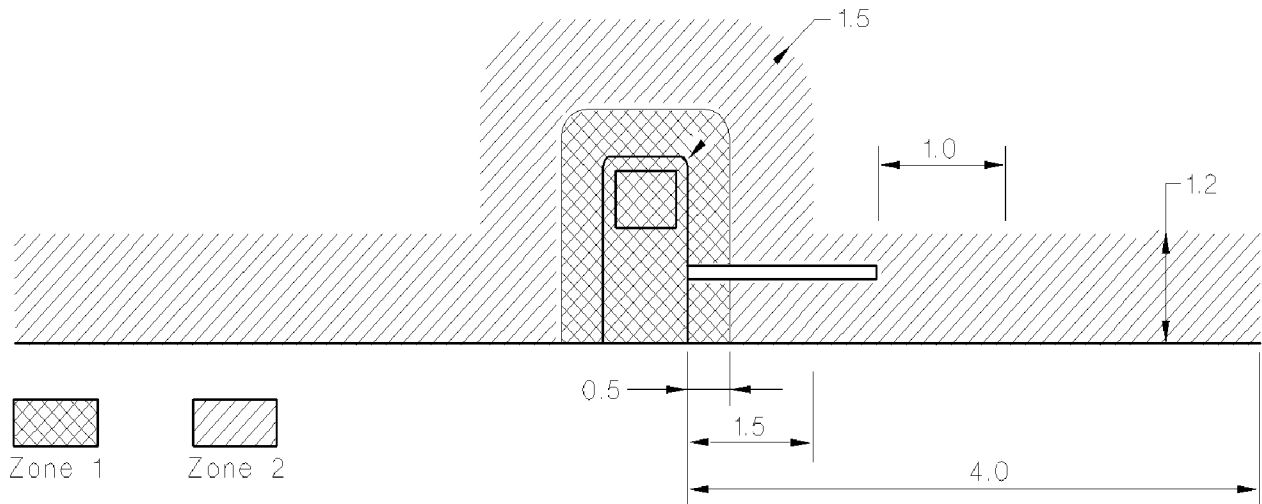
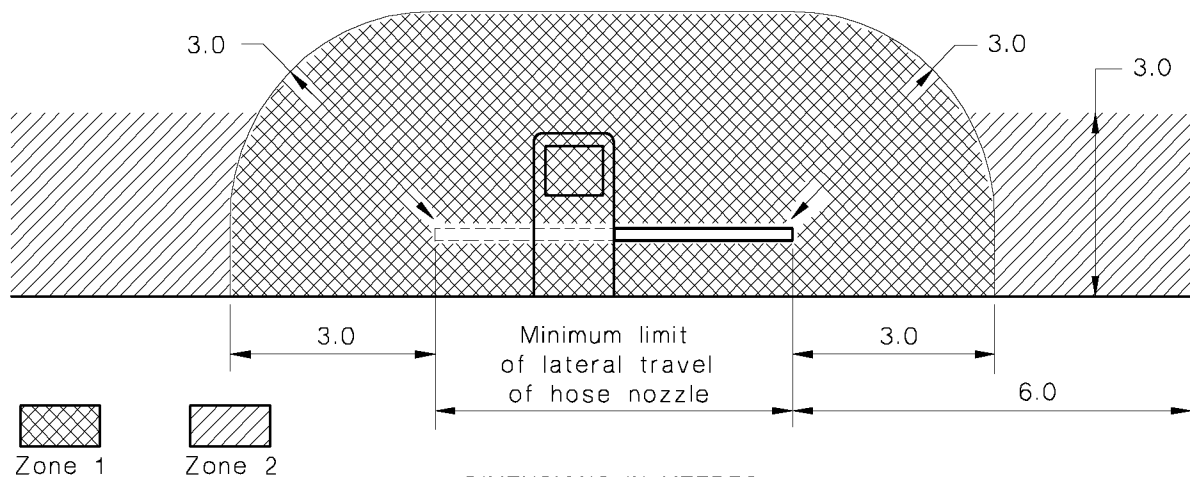


FIGURE 9.2 'TYPE A' LP GAS DISPENSING DEVICES IN OUTDOOR LOCATIONS

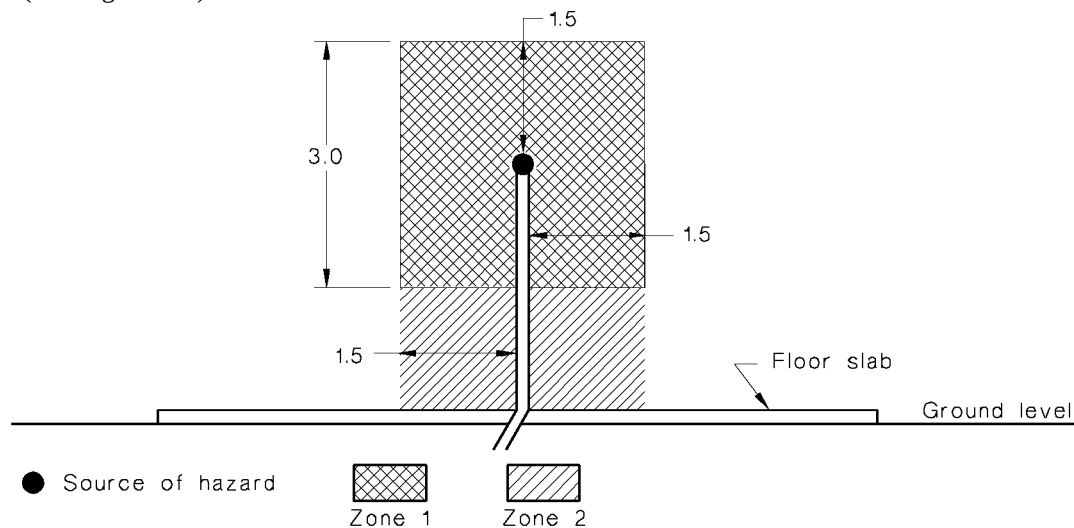


DIMENSIONS IN METRES

FIGURE 9.3 LP GAS DISPENSING DEVICE IN OUTDOOR LOCATIONS (NOT TYPE A)

9.2.5 Outlets of tank venting pipes

- (a) A cylindrical volume of 1.5 m radius measured from the outlet of any vent pipe and extending to a level 1.5 m above and below the outlet point **Zone 1**
- (b) A cylindrical volume of the same radius as in (a) above, extending from the Zone 1 area down to ground level (see Figure 9.4) **Zone 2**



DIMENSIONS IN METRES
FIGURE 9.4 VENT PIPE OUTLET

9.2.6 Other areas Adjacent areas which are separated from defined hazardous areas by vapour barriers and within which hazardous vapours are not likely to be released, such as areas used for lubrication, service repair, offices or sales rooms, and the like **NH**

10 MAJOR REFINERIES AND CHEMICAL PLANTS

10.1 Scope of Clause 'Major refineries and chemical plants' shall include oil refining, petrochemical and continuous chemical process areas and locations where petrol or other volatile flammable liquids, liquefied flammable gases, or compressed flammable gases are produced, processed, handled, transported or stored.

NOTE:

- 1 The delineations given below are based on the assumption that the installations are carried out in accordance with the relevant requirements of the authority having jurisdiction. In general, the requirements of the following codes are acceptable, subject to any additional provisions or modifications as required by the authority.
 - (a) Institute of Petroleum Safety Codes.
 - (b) API RP 500.
 - (c) BS 5908.
- 2 This section should be read in conjunction with other parts of this Standard.

10.2 Delineation of hazardous areas

10.2.1 Extent of hazardous areas The following aspects shall be borne in mind:

- (a) The classifications are based on conditions where the gases or vapours are heavier-than-air, as this is the condition normally encountered in the petroleum industry. The heavier-than-air condition shall be verified in each case before a classification is applied.
- (b) Heavier-than-air gases, when escaping into atmosphere, will tend to spread outwards and downwards. For this reason, the vertical extent of the hazardous area is reduced at a distance of 8 m measured horizontally from the source of hazard. Where conditions prevent the normal tendency of heavier-than-air gas to spread downwards and outwards, the reduction in vertical heights shown is not permitted.
- (c) All dimensions given in these classifications should be regarded as minima and are for general guidance only.

10.2.2 Open air situations

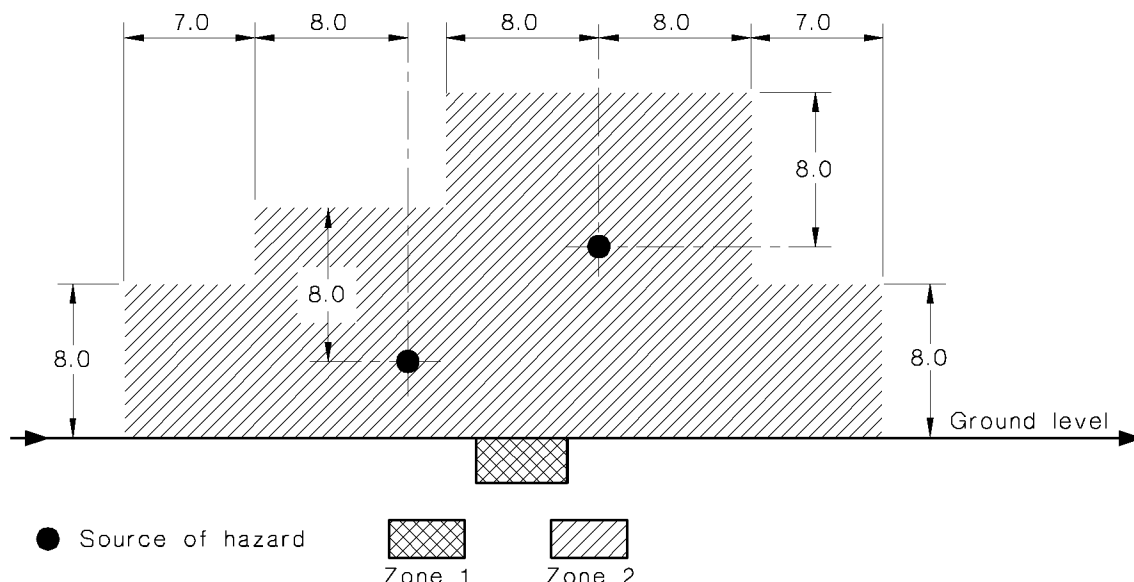
- (a) **Zone 2 areas** Figure 10.1 illustrates the situation generally encountered in the petroleum industry, i.e. the presence of a source of hazard which may give rise to an explosive atmosphere only under abnormal conditions and which is located in the open air.

The hazardous area shall in this case be classified as **Zone 2** and, for heavier-than-air gases and vapours, the hazardous area extends vertically 8 m above the source of hazard and horizontally 15 m in all directions from the source of hazard.

Beyond 8 m from the source of hazard in the horizontal plane, the vertical extent of the **Zone 2** area may be reduced to 8 m above ground level.

For petroleum pipelines (in accordance with the relevant Australian Standards) where well maintained valves, fittings, and meters of a pipeline system transporting petroleum (crude oil, products and gases) are installed in adequately ventilated areas or in a pit, the extent of the **Zone 2** area above ground may be reduced to 3 m in all directions from the possible source of hazard created by the pipeline system, although the pit itself shall be classified as a **Zone 1** area.

- (b) *Trenches or pits* Any trenches or pits below ground level and located within the area described in (a) above
 **Zone 1**



NOTE: All dimensions are minima.

DIMENSIONS IN METRES

FIGURE 10.1 HAZARDOUS AREAS IN OPEN AIR SITUATIONS

- (c) *Zone 1 areas* If the source of hazard described in (a) above gives rise to an explosive atmosphere under normal operating conditions, the area described in (a) above as Zone 2 **Zone 1**

In the event of enclosed premises not containing a source of hazard but situated within either a Zone 1 or a Zone 2 area, the inside of the premises shall be classified as **Zone 1** unless separated from the outside hazardous areas by a vapour barrier.

10.2.3 Enclosed premises and surrounding areas

- (a) *General* Figure 10.2 illustrates the classification when a source of hazard which can give rise to an explosive atmosphere under abnormal conditions is located within enclosed premises. The whole of the inside of the building shall be classified as **Zone 1**, as lack of ventilation will prevent rapid dispersal of an explosive atmosphere.

The area surrounding the building is classified **Zone 2**, wherein the openings in the building are taken as the source of hazard. For the 'heavier-than-air' gases or vapours the **Zone 2** area extends vertically 8 m above the source of hazard or 2 m above the roof line, whichever is the lesser, and horizontally 8 m in all directions from the source of hazard. Beyond 8 m from the source of hazard in the horizontal plane, the vertical extent shall be reduced to the height of the bund wall and extend to the bund wall.

- (b) *Trenches or pits* Any trenches or pits below ground level and located within the area described in (a) above
 **Zone 1**
- (c) *Zone 1 areas* If the source of hazard within the enclosed premises gives rise to an explosive atmosphere under normal conditions:
- the area within the building **Zone 1**
 - The area described in (a) above as Zone 2 **Zone 1**

When the building has a ridge-type roof with ventilators and not a sealed roof as shown in Figure 10.2, special consideration is necessary in connection with the vertical extent of the hazardous area, external to the building above the roof.

10.2.4 Open premises and surrounding areas

- (a) **Zone 2 areas** Figure 10.3 illustrates the classification when a source of hazard which gives rise to an explosive atmosphere under abnormal operating conditions is located within open premises.

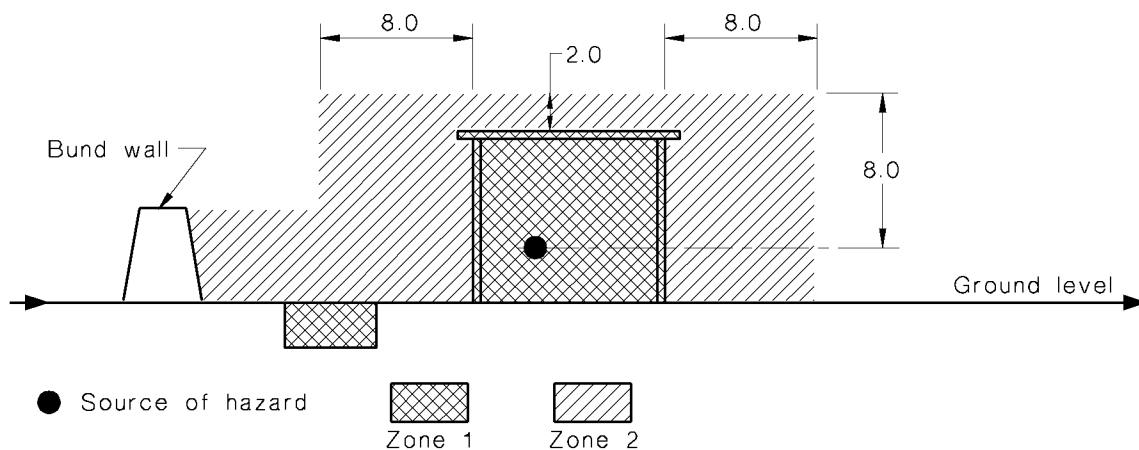
The entire area within the open premises **Zone 2**

For heavier-than-air gases or vapours, the area surrounding the open premises shall be treated as if the source of hazard were located in the open air.

- (b) **Trenches or pits** Any trenches or pits below ground level located in the area described in (a) above **Zone 1**

- (c) **Zone 1 areas** If the source of hazard within the open premises gives rise to an explosive atmosphere under normal operating conditions, the area described in (a) above as Zone 2 **Zone 1**

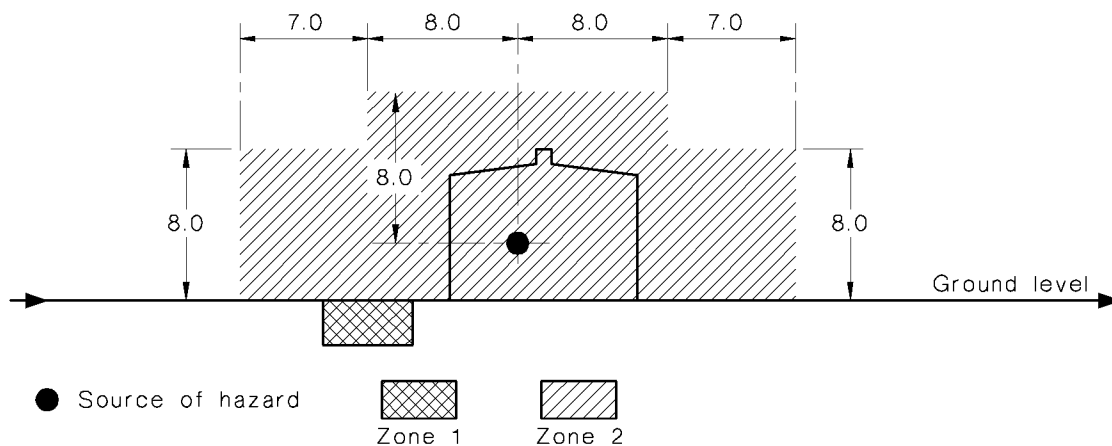
Where lighter-than-air gases are present, the vertical extent of the area around the ventilator may have to be increased.



NOTE: All dimensions are minima.

DIMENSIONS IN METRES

FIGURE 10.2 HAZARDOUS AREA WITHIN ENCLOSED PREMISES AND IN SURROUNDING AREAS



NOTE: All dimensions are minima.

DIMENSIONS IN METRES

FIGURE 10.3 HAZARDOUS AREA WITHIN OPEN PREMISES AND IN SURROUNDING AREAS