

Ventilation of Dangerous Goods Chemical Storage Cabinets. Information and Guidelines.

The various Australian Standards for The Storage and Handling of Chemicals provides minimum design and performance specification requirements for the type of chemical storage cabinets for each respective standard. In most cases the standards make reference for the option of ventilating cabinets, however some standards require that cabinets shall be vented. Note - the word **"Shall"** in the context of the Standards "indicates that a statement is mandatory".

This Information Bulletin has been prepared to provide a summary of these standards in respect of the ventilation of the cabinets and provide additional information and recommendations as a service to our customers.

All Pratt Safety Systems chemical storage cabinets are designed and manufactured to comply with these standards and subsequently includes venting provisions for each cabinet class and model. For all metal constructed cabinets the venting bungs, including flash arresters and connection fittings, are built into the cabinets during manufacture. The vent bungs are supplied with metal caps which must remain tightly fitted, unless the cabinet is being vented. For all polypropylene constructed Corrosive Substance Cabinets a venting kit is included, but is not fitted, allowing for on site installation to preferred positioning of the vents.

Before venting cabinets, consider the following precautions and options:

Generally ventilation of chemical storage cabinets should not be required unless it is determined to be an essential risk and safety control measure or the standard requires it. Cabinet ventilation is not an alternative or solution to poor house-keeping practices.

1. Store chemicals only in containers that are made of materials determined to be chemically compatible so that leakage/damage will not occur. Frequently inspect containers for signs of damage and aging.
2. Always make sure that caps are replaced tightly on containers, and that the outside of containers is clean and free from residual liquids.
3. All packages in storage shall be labelled to provide unmistakable identification of the contents.
4. Opening of packages, transferring of contents, dispensing of chemicals or sampling shall not be conducted within or on top of a cabinet.
5. Regularly inspect inside of cabinets for spills or leakage and clean immediately if found.
6. Dispose of any aging chemicals that could become unstable.
7. Place cabinets in a cool, dry location out of direct sunlight and away from any possible heat or ignition source. Temperature fluctuation in many chemicals will increase vapour emissions.
8. Always maintain continuous and adequate room ventilation. The risk can be increased when room ventilation is turned off over night or the weekend.
9. Maintain an accurate inventory of chemicals and their properties to prevent dangerous reactions resulting from incompatible chemical storage. Never store chemicals solely based on alphabetical classification, as this can result in dangerous chemical reactions. Do not store different classes of dangerous goods together. Also refer to the MSDSs for further information.

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10. Use of proper vapour absorbents inside the cabinet can also reduce the irritant level of vapours.
11. Regularly inspect cabinets and any metal items in surrounding area for signs of rust, corrosion, or other indications that the vapour levels are excessive. If detected mechanical ventilation may then be necessary.
12. Do not remove the vent bung caps. The caps must remain tightly sealed when the cabinet is not connected to a venting system.

CLASS 3 - FLAMMABLE LIQUID STORAGE CABINETS.

Standards Compliant to: AS1940 - The Storage and Handling of Flammable and Combustible Liquids.

Flammable and Combustible Liquid Storage Cabinets are designed to protect the internal contents from a fire outside the cabinet. A vented cabinet could compromise the ability of the cabinet to protect its contents from a fire. This type of cabinet is not required to be vented for fire protection purposes.

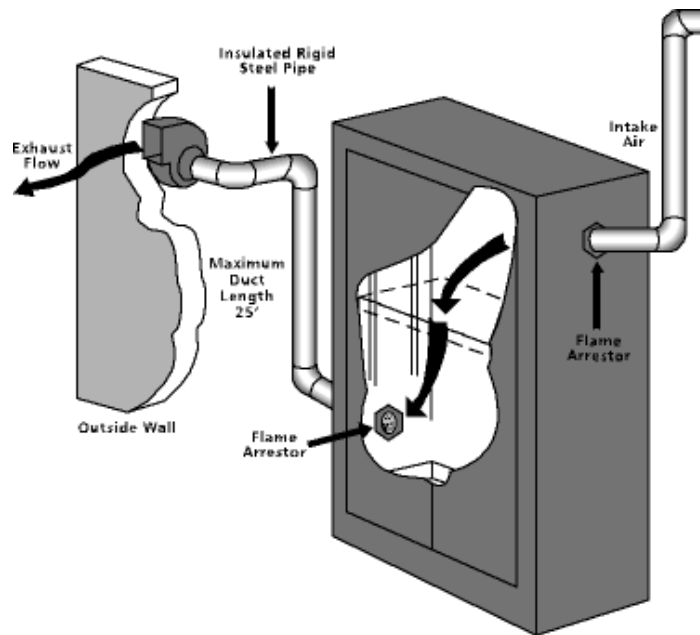
AS1940 does not require that cabinets must be vented, but provides the option to do so, if preferred.

If after all the above steps are taken and venting is still required, then the following guidelines need to be considered.

The purpose of ventilation is to create and maintain a safe working atmosphere within the cabinet by means of an air flow-through system.

- A mechanical ventilation system is preferred as this will provide a constant flow of air through the cabinet. A natural ventilation system using a wind driven air-ball fan is acceptable, but is reliant on the wind to operate and may not have the air flow capacity required.
- A suitable mechanical fan should be constructed of non-sparking blades and shrouds and be compatible with for conveying of flammable vapours, gases, or mists.
- It shall be designed so that the vapours are prevented from escaping into any room.
- Any ventilation exhaust shall be to the outside atmosphere and in a location which allows the safe dispersal of vapours and is away from any ignition sources and where people congregate. The outlet of the ventilation should be at least 3 m above the ground and should be guarded to prevent entry by birds, insects etc.
- Ventilation ducting should provide at least the same level of fire protection as the cabinet walls and be resistant to vapours, fumes or dust in the cabinet. Steel piping is recommended where as PVC should not be used as it cannot withstand excessive temperatures such as a fire. The ducting tubing must have an inner diameter no less that the vent bung opening.
- The total run of the exhaust ducting should not exceed 25 feet (7.62 metres).
- All Pratt cabinets are supplied with two 50mm vent bungs with a BSP threaded connection. Both bung openings are also fitted with proven flash arresters to prevent flash back into the cabinet from an external ignition source. These flash arresters must not be removed.
- Remove both metal bungs caps from the sides of the cabinet. Ducting should be from the bottom vent bung to draw the air and vapour from the cabinet as vapours are generally heavier than air. The top vent bung is a fresh air inlet to the cabinet. When the fan is operating this may create a slight negative pressure within the cabinet.

- There shall be no ignition sources within the cabinet.
- **DO NOT** manifold vent piping and ducting together from multiple cabinets.
- **DO NOT** connect the fan to the air intake vent in order to push the air through the cabinet. This could cause an internal pressure build-up within the cabinet and also force the vapours to escape through the doors when the cabinet is opened.
- The Ventilation system should be designed by an appropriately qualified person to suit each installation. Also consult with local and state authorities to ensure compliance with any appropriate Regulatory requirements.



Example of a Mechanical Ventilation System



Bottom outlet vent bung.



Top inlet vent bung.



Vent bung cap



Flash arrester inside cabinet.

Vent bung with 50mm BSP threaded connection, flash arrester and sealed enclosure between the wall cavities.

CLASS 4 – DANGEROUS GOODS STORAGE CABINETS.

Includes divisions: 4.1- Flammable Solid, 4.2- Spontaneously Combustible & 4.3- Dangerous When Wet.

Standards Compliant to: AS/NZS 5026 - The Storage and Handling of Class 4 Dangerous Goods.

Class 4 Dangerous Goods Storage Cabinets are also designed to protect the internal contents from a fire outside the cabinet. A vented cabinet could compromise the ability of the cabinet to protect its contents from a fire. This type of cabinet is not required to be vented for fire protection purposes.

AS/NZS 5026 in general does not require that cabinets must be vented, but does provide the option to do so if preferred. However cabinets **shall** be vented when storing Division 4.1 desensitized explosives and nitrocellulose.

Follow the same guidelines as stated for Flammable Liquid Storage Cabinets for the venting of Class 4 cabinets.

These additional ventilation requirements apply as stated within the Standard:

- Where ventilation is installed the design of any vent opening in the cabinet wall shall not compromise the structural strength of the cabinet.
- Where a toxic or flammable gas could be emitted, ducting shall be designed in such a manner as to prevent back-pressure.
- When storing of Division 4.1 Flammable Solid Chemicals of desensitized explosives and nitrocellulose, each cabinet shall be ventilated to outside the building. Each vent shall be –
 - (a) at least 250 cm² in area.
 - (b) constructed of steel at least 1.5mm thick; and
 - (c) insulated to provide an FRL/FRR of at least 120/120/120.

Explanation: FRL – Fire Resistant Level
FRR – Fire Resistant Rating
Structural Adequacy – 120 minutes
Integrity – 120 minutes
Insulation – 120 minutes.

CLASS 5.1 - OXIDIZING AGENT STORAGE CABINETS.

Standards Compliant to: AS 4326 - The Storage and Handling of Oxidizing Agents.

The Standard does state under Cabinet Design and Construction, that “Where appropriate, cabinets shall be vented to atmosphere, away from ignition sources and areas where persons are likely to congregate”.

Therefore follow the same guidelines as stated for Flammable Liquid Storage Cabinets for the venting of Oxidizing Agent cabinets.

CLASS 5.2 - ORGANIC PEROXIDE STORAGE CABINETS.

Standards Compliant to AS 2714 – The Storage and Handling of Organic Peroxides.

The Standard does state under Cabinet Design and Construction, that “the cabinet **shall** be ventilated in accordance with the following”:

- The cabinet is vented to the atmosphere, ducting shall be designed to prevent back-pressure and shall be directed away from any ignition sources and areas where people congregate.
- A cabinet for organic peroxides (other than for those requiring refrigeration), shall be provided with ventilation at high and low levels, in order to prevent the build-up of flammable or toxic vapours and to assist in maintaining an even temperature.

Therefore follow the same guidelines as stated for Flammable Liquid Storage Cabinets for the venting of Organic Peroxide cabinets.

CLASS 6 – TOXIC SUBSTANCE STORAGE CABINETS.

Standards Compliant to: AS/NZS 4452 – The Storing and Handling of Toxic Substances.

This Standard does make provision for the option of the ventilation of cabinets. Where mechanical ventilation of the cabinet is required the following requirements apply:

- The design of any vent opening in the cabinet wall shall not compromise the structural strength of the cabinet.
- The extraction system shall be sufficient to ensure that the ambient concentration of any toxic substance with the breathing zone of any person using the cabinet is maintained as low as practicable.
- Where a cabinet incorporates provisions for connection to an external venting system:
 - (a) the vent opening shall be provided with a means for permanent closure when venting is not required.
 - (b) the information supplied with the cabinet shall include instructions on the installation and operation of the vent system; and
 - (c) the cabinet design shall be such as to ensure that surrounding work areas are not contaminated by emissions.

Note: Ventilation provisions should be designed by an appropriate qualified engineer.

Whenever people are in the area where toxic substances are kept, the following requirements shall apply.

- The store/cabinet shall be provided with adequate natural or mechanical ventilation.
Note: Adequate ventilation is dependent on the nature of the toxic substance and the circumstances of its use.
- Where a toxic substance is likely to present an inhalation hazard (of dusts, mists or vapours), assessment shall be made in accordance with relevant workplace hazardous substance regulations and appropriate controls and monitoring implemented.
- Ventilation shall be sufficient to maintain the ambient concentration of any vapours or dusts in the storage area as low as practicable. Where the toxic substance has been assigned an exposure standard by Worksafe Australia, exposure levels shall be kept below this level.
In New Zealand, recommended workplace exposure standards are set by Occupational Safety and Health, Department of Labour. Exposure levels should be kept below the recommended levels.

Note: Where no exposure standard is assigned to a toxic substance, it is not implied that the substance is not hazardous to health.

- Where mechanical ventilation is required, the system shall comply with the requirements of AS 1668.2/NZS 4303. For toxic substances, exhaust air dilution by means of general exhaust ventilation and local exhaust ventilation are the appropriate techniques. Exhaust air flow rates shall be determined by an appropriately qualified engineer.

Note: The extraction system may require a scrubber prior to venting to atmosphere.

- Where the toxic substance has a Subsidiary Risk of Class 3, no active or potential ignition source shall be introduced as part of a mechanical ventilation system.

Therefore follow the same guidelines as stated for Flammable Liquid Storage Cabinets for the venting of Toxic Substance cabinets allowing for any additional requirements as stated above.

CLASS 8 – CORROSIVE SUBSTANCE STORAGE CABINETS

Standards Compliant to: AS 3780 – The Storage and Handling of Corrosive Substances.

This Standard does not make reference to the ventilation of these cabinets. It does state for a Packaged Store that adequate ventilation shall be provided in all stores and at places where packages are opened.

Note: Ventilation should be sufficient to maintain exposure levels in the storage area below recommended workplace exposure standards.

The Standard further states that wherever people are in an area where the corrosive substances are kept, adequate ventilation shall be provided.

In addition, where corrosive substances present an inhalation hazard (of dusts, mists, fumes or vapours) and packages are opened, routine air monitoring shall be conducted to determine the level of airborne contamination. Where there is a significant level of airborne contamination, appropriate control strategies shall be implemented.

Note: Workplace exposure standards also apply.

Follow the same guidelines as stated for Flammable Liquid Storage Cabinets for the venting of Class 8 Corrosive Substance cabinets but with the following changes.

- A suitable mechanical fan should be constructed of corrosive resistant blades and shrouds and is compatible with for conveying of corrosive vapours, gases, or mists.
- Ventilation ducting should provide at least the same level of corrosion protection as the cabinet walls and be resistant to vapours, fumes or mists in the cabinet. Steel piping is not recommended where as PVC or polypropylene piping should be used as it will better withstand corrosion from these vapours. The ducting tubing must have an inner diameter no less than the vent bung opening.
- The metal flash arrester may be removed (where possible) as this will be subject to corrosion from the vapours, provided that there is no flammability of the vapour.

SAFETY IN LABORATORIES – STORAGE OF CHEMICALS.

Refer to AS/NZS 2243.10 – Safety in Laboratories – Storage of Chemicals.

This standard is part of a number of Standards relating to Safety In Laboratories to provide information on appropriate storage of chemicals and dangerous goods both in laboratories and within dedicated storage areas that are support areas for a laboratory.

For laboratory applications this Standard together with the other Standards for the storage and handling of individual classes of dangerous goods or type of chemical to be stored, as listed above, should be considered.

Chemical Storage Cabinets Ventilation.

This Standard also provides the following information regarding the ventilation of cabinets.

Cabinet ventilation should not normally be required unless determined as an essential risk control measure. Cabinet ventilation is not an alternative to vapour-tight closure of all stored containers.

If ventilation is an essential risk control measure (such as could be the case for volatile, extremely toxic or corrosive substances), the cabinet shall be vented to the external atmosphere, i.e. outside the building, in a manner that allows safe dispersal of vapours, fumes or dusts without entering the room in which the cabinet is situated. The circular vents that are installed in the sides of some cabinets allow toxic or flammable vapours to escape into the adjoining area shall be kept closed in a manner that will not be breached by pressure build-up within the cabinet.

The ventilation ducting shall provide at least the same level of fire protection as the cabinet walls, be resistant to the vapours, fumes or dust and prevent the accumulation of residues (e.g. condensation or dust) in the ducting. The ventilation for each cabinet shall be completely independent to prevent cross-contamination or fire flashover. Where flammable vapours or gases could be released, including from Class 4.3 goods, an assessment shall be made and a permanent record kept as to whether electrical equipment (e.g. the fan drive or airflow failure switch) needs to be of an explosion-protected design complying with the relevant Standard.

Note: Explosion-protected electrical equipment may need to show that it has been approved as compliant with the appropriate Standard. Relevant regulatory requirements should be checked.

FINAL COMMENTS

The above information we trust will be helpful in determining if venting of cabinets is required for your specific situation or application.

Each type of chemical storage cabinet, use, location, the types of chemicals being stored, are usually unique to each site. If the decision is to vent the cabinet, there is not one type of off the shelf venting system or kit that will be suitable for all applications for immediate installation. Each cabinet venting system will require individual assessment and therefore it is best to consult with companies specialising in this type of ventilation.