Workplace Health and Safety Queensland



A guide for pool chemical retailers





BY ND The State of Queensland

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Foreword

This guide was first published in 2010 to help pool chemical retailers meet their obligations under the *Dangerous Goods Safety Management (DGSM) Act 2001*. Since then, the DGSM legislation has been repealed (31 December 2011) and those obligations are covered by the *Work Health and Safety Act 2011* (WHS Act) and the Work Health and Safety Regulation 2011 (WHS Regulation).

This guide was developed to help address gaps in the existing guidance material for retail situations, where pool water treatment chemicals are stored and handled. For example, various Australian Standards exist, but typically address industrial situations and are not tailored to the unique circumstances of a retail pool shop. Where relevant guidance did exist, it was limited in nature. This guide was developed during 2010 in consultation with the Swimming Pool and Spa Association (SPASA) and various chemical suppliers and retailers to arrive at a comprehensive guide for chemical safety management for pool chemical retailers.

The WHS Regulation has introduced several changes requiring the guide to be updated to reflect the new legislation. For example, the WHS Regulation introduces:

- the term 'hazardous chemicals' which incorporates dangerous goods
- the global harmonised system (GHS) for the classification and labelling of hazardous chemicals, which will affect package labelling to reflect GHS pictograms, hazard and precautionary statements
- mandates the 16-header format for product safety data sheets (SDS)
- requires workplaces to control risks using the hierarchy of controls, with a focus on engineering, isolation and substitution controls before considering safe work procedures and personal protective equipment
- the need to identify and manage risks of chemical reactions
- a requirement for all workplaces to have an emergency plan which account for all types of likely emergencies (e.g. hazardous chemical incident).

These are in addition to various requirements carried over from the DGSM legislation, such as identifying chemical hazards and controlling associated risks, safe installation and operation of tanks, spill containment systems, information, and training of workers on hazards and managing incompatibilities.

This latest edition incorporates improved recognition of GHS classifications for pool chemical products. Under WHS laws, placarding, manifest and notification requirements are dependent on the GHS classification. Some changes in trigger levels have happened in the transition from dangerous goods classification to the GHS. The Guide has been updated to better reflect GHS information and related requirements.

The guide is designed to be comprehensive yet practical, covering chemical safety matters within the context of the WHS legislation. It includes useful tools such as a chemical register, an example risk assessment and a compatibility chart to assist those in the industry to meet their safety duties and to help ensure the health and safety of all persons involved in the retailing of pool chemicals.

Director/Chief Safety Advisor (Hazardous Chemicals) Workplace Health and Safety Queensland.

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Introduction

Many pool chemicals available in the retail sector are classified as hazardous chemicals because they may be combustible, oxidising, water-reactive, corrosive and have various health-hazards. Hazardous chemicals can cause significant harm and serious damage to property and the environment. Unsafe storage of hazardous chemicals can lead to incidents such as spills and fires that can cause significant disruptions and costs to business.

The storage and handling of hazardous chemicals in Queensland is regulated by the *Work Health and Safety Act 2011* (WHS Act) and the Work Health and Safety Regulation 2011 (WHS Regulation). This legislation aims to protect the safety of all people, including workers and the public from being harmed by hazardous chemicals. This guide provides practical guidance to the pool chemical retailer to help meet their duties under this legislation. The pool chemical retailer is recognised as a person conducting the business or undertaking (PCBU) under the WHS Act. That is, the person who has overall management control of the workplace.

The WHS legislation requires that the risks from hazardous chemicals be controlled to an acceptable level, which means that risks are minimised so far as is reasonably practicable. Practical guidance on how to do this is available in certain Australian Standards.

Australian Standards that are applicable to the storage and handling of a range of hazardous chemicals (incorporating dangerous goods) typically found at pool chemical retailers are:

- AS 3780: The storage and handling of corrosive substances (Class 8 dangerous goods)
- AS 4326: The storage and handling of oxidising agents (Division 5.1 dangerous goods)
- AS/NZS 3833: The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers.

This guide is based on these Australian Standards and the requirements of the legislation and can be used to assist any retail outlet selling pool chemicals. When referring to such standards, always ensure you are referring to the most recent versions as these are updated from time to time.

Some retail outlets, such as service stations and hardware stores, will have additional hazards that are not covered in this guide, for example, the hazards from the storage and handling of flammable and combustible liquids, such as fuels and oils.

What is the guide about?

The guide identifies a range of hazards associated with the storage and handling of pool chemicals in the retail sector. Hazards include the:

- storage and handling of hazardous chemicals in packages
- storage of hypochlorite solution in tanks
- bulk delivery of hypochlorite solution
- dispensing of hypochlorite solution.

The guide also includes appropriate risk control measures, outlines relevant standards, and safety duties and provides practical tools to assist pool chemical retailers protect people, property and the environment.

Practical tools include:

- a hazardous chemical register
- an example risk assessment for hypochlorite solution storage and handling
- a liquid pool chemical compatibility chart.

1 Work health and safety duties

The WHS Act outlines the general health and safety duties of PCBUs, officers of companies, workers and other people at a workplace. These general duties require the duty holder to ensure health and safety, so far as is reasonably practicable, by eliminating risks to health and safety. If this is not possible, risks must be minimised so far as is reasonably practicable. This section summaries duties specified under the WHS Act.

Safe management of hazardous chemicals

The PCBU must meet the safety duties under the WHS Act, and specific safety obligations for hazardous chemicals under the WHS Regulation. To understand the applicable requirements, it is important that you know the types and quantities of hazardous chemicals that you store and handle, as well as their hazards. The hazard information is provided by product manufacturers and importers using safety data sheets (SDS) and container labels. This information is determined based on the chemical classification system. WHS laws use the Globally Harmonised System of classification and labelling of chemicals (GHS) for hazard communication. It is the duty of the Australian manufacturer or importer to correctly classify their hazardous chemical products according to the GHS and produce the associated SDS and container labels.

Chemical classification

Many pool chemicals are classified as hazardous under the GHS. Products may have multiple GHS hazard classes and categories conveying information on their physical and health hazards. Knowing these hazard classifications forms the basis of your risk management. WHS laws also use this information to trigger specific requirements such as placarding and manifests.

Because certain requirements depend on the type and quantity of hazardous chemicals at the workplace, an assessment of the inventory must be conducted to identify:

- the GHS hazard class and category for products
- maximum quantity of those products likely to be stored and handled at the workplace.

This hazard category information can be obtained from the product's SDS (Section 2-Hazard identification).

The table below includes several hazardous chemicals used as active ingredients in pool chemical products with their indicative GHS hazard class and category sourced from Safe Work Australia's Hazardous Chemical Information System (HCIS).

Chemical name	Also known as	Indicative GHS hazard class and category*
Hypochlorite solution (>10%) CAS** 7681-52-9	Sodium hypochlorite, liquid pool chlorine	Skin Corrosion - category 1B# Eye damage – category 1 Specific target organ toxicity (single exposure) – category 3 Hazardous to the aquatic environment (acute & chronic) – category 1
Hydrochloric acid (~30%) CAS 7647-01-0	pH decreaser, Muriatic acid	Skin Corrosion – category 1B Specific target organ toxicity (single exposure) – category 3
Sulphuric acid (~30%) CAS 7664-93-9	Pool acid	Skin Corrosion - category 1A
Calcium hypochlorite CAS No. 7778-54-3	Granular pool chlorine	Oxidising Solid - category 2 Skin Corrosion – category 1B Acute toxicity – category 4 Hazardous to the aquatic environment (acute) – category 1
Sodium dichloroisocyanurate 2893-78-9 51580-86-0 (dihydrate) No oxidiser category given in HCIS	Stabilised pool chlorine, Dichlorvos	Oxidising Solid - category 2 Skin irritation – category 2 Acute toxicity – category 4 Eye damage – category 1 Specific target organ toxicity (single exposure) – category 3 Hazardous to the aquatic environment (acute & chronic) – category 1
Trichloroisocyanuric acid CAS 87-90-1	Stabilised pool chlorine, Trichlor	Oxidising Solid - category 2 Skin irritation – category 2 Eye damage – category 1 Acute toxicity – category 4 Specific target organ toxicity (single exposure) – category 3 Hazardous to the aquatic environment (acute & chronic) – category 1
Hydrogen peroxide solution (~30%) CAS 7722-84-1		Oxidising liquid - category 1 Skin Corrosion – category 1A Acute toxicity – category 4 Specific target organ toxicity (single exposure) – category 3

*Indicative GHS hazard class and category based on those listed on SafeWork Australia's HCIS for the nominated CAS number.

**CAS refers to the unique Chemical Abstracts Service number used to identify a chemical and source HCIS information.

GHS hazard category in blue denotes physical hazards included in Schedule 11 for placarding and manifest purposes.

Note 1: Some retail products may be formulated with chemicals identified in the table in concentrations that do not meet the GHS classification criteria.

Note 2: There are many products from different suppliers that are based on the same active chemical constituent but at varying concentrations which may result in different classifications as determined by the product's Australian manufacturer or importer. You must always refer to the manufacturer's SDS.

Note 3: The Australian Dangerous Goods (ADG) Code is no longer used for chemical hazard classification under WHS laws but remains for transport purposes. Refer to the product SDS Section 14 - Transport information for the assigned dangerous goods class/division, United Nations number, proper shipping name, packing group (PG) and HAZCHEM Code. This information is still required for bulk container (e.g.tank) placards and manifest information to assist the emergency services in responding to an incident at the workplace. Note that differences in classifications between GHS and the ADG Code can arise which affect the applicable prescribed placarding and manifest quantity under WHS laws. For example, sodium hypochlorite solution (>10% v/v) is classified under the ADG Code as Class 8 PG III compared to the GHS hazard classification of skin corrosion/irritation category 1B which is used in Schedule 11 for placard and manifest quantities.

Register

Details of each hazardous chemical kept on site must be recorded in a <u>register</u> (s.346 WHS Regulation) with exceptions as described below. The information to be recorded is a list of the products classified as a hazardous chemical and the product's current safety data sheet (SDS).

The register can be paper, or electronic-based as long as it is accessible to all workers involved in the use, handling or storage of the hazardous chemical or anyone that is likely to be exposed to the hazardous chemical at the workplace such as an emergency service worker. Accessibility means ensuring that the register is in a central location close to work areas (for paper-based) or software that all workers can use and access (for electronic-based). For electronic-based systems, there must be consideration given to training, connectivity issues and availability of equipment used to access the register.

Some hazardous chemical products will be exempted from inclusion in the hazardous chemical register for a retailer. These include:

- A consumer product that is not opened at the retailer and is intended for supply to other premises. For a PCBU to be classified as a retailer, their principal business is in the supply of consumer products to members of the public who are not engaged in the further supply of those products.
- Consumer products that will be used in the workplace only:
- in quantities that are consistent with household usage
- in a way that is consistent with household use
- in a way that is incidental to the nature of the work carried out by a worker using the hazardous chemical. Incidental will not include the use of hazardous chemicals to perform work such as the testing of water samples or filling customer-supplied containers.

Where such exemptions apply, the PCBU must ensure that sufficient information about the safe use, handling and storage of the hazardous chemical is readily accessible to workers at that workplace and anyone that is likely to be exposed to the hazardous chemical at the workplace such as an emergency worker.

See Attachment 1 for an example register for hazardous chemical products.

Safety data sheets

Retailers are not required to provide customers with a SDS for hazardous chemical products supplied in retail packages. However, retailers must have the required SDS subject to any exemptions as part of a register kept on the premises to meet their obligations as a PCBU (s.344 WHS Regulation) and will assist to:

- identify hazards and conduct risk assessments
- develop emergency procedures (e.g. spill clean-up)
- provide information and training for staff and the public where appropriate.

As SDSs are an important part of risk assessment for the use, handling, and storage of hazardous chemicals, PCBU's must have a current version of this document. Manufacturers and importers are required to review their product SDSs every five years or amend whenever necessary to ensure it contains correct and current information.

Labels

Some hazardous chemicals may be intended for supply to both the consumer household markets and workplaces in identical containers and packaging. These products are sometimes referred to as dual use products. A dual use product label may need to comply with the Poisons Standard¹ labelling requirements, the workplace labelling requirements or both.

Where a hazardous chemical is also a scheduled poison intended for predominantly but not solely workplace use, both labelling requirements apply. Further information is available in the Labelling of workplace hazardous chemicals code of practice 2021.

Placards and manifests

Pool chemical retailers typically require placards and may require a manifest if larger quantities of hazardous chemicals are used, stored, or handled. The prescribed placarding and manifest quantities are listed in column four and five of Schedule 11 of the WHS Regulation. Examples are shown below:

GHS Hazard category ¹	Example	Placard required if this aggregate quantity for a storage area is exceeded	Manifest required if this aggregate quantity at the workplace is exceeded
Skin corrosion Category 1A	Sulphuric acid	50 L	500 L
Skin corrosion Category 1B	Hydrochloric acid Hypochlorite solution	250 L	2500 L
Oxidising solid Category 2	Calcium hypochlorite	250 kg	2500 kg

¹Refer to the Australian manufacturers' or importer's SDS.

¹ Poisons Standard means the current Poisons Standard within the meaning of the Therapeutic Goods Act 1989 (Cwlth).

If a retailer exceeds the prescribed manifest quantity, then the following additional obligations apply:

- Maintain an emergency services manifest in accordance with Schedule 12 of the WHS Regulation at the workplace².
- Notify³ Workplace Health and Safety Queensland (WHSQ) of the location and quantities of hazardous chemicals.
- Submit a copy of the workplace's emergency plan to the Queensland Fire and Emergency Service (QFES).

The retailer will also have other specific safety duties for the safe use, storage, and handling of hazardous chemicals at the workplace, and as a supplier of hazardous chemicals to customers.

Information placards must be displayed at pool chemical retailers, to provide a visual warning of the hazards associated with the large quantities of hazardous chemicals stored. The placarding requirements under the WHS Regulation are summarised below.

When a pool chemical retailer stores hazardous chemicals above placard quantities, an outer warning placard ('HAZCHEM') must be displayed at the entrance to the premises, either at the entry gate on the fence line, or at the entry to the retail outlet when part of a multi-occupier retail area.

An additional placard should be erected at the rear dock area, as it is a likely access point for emergency services attending an incident.

Tanks must display a placard that has the form and dimensions specified in Schedule 13 of the WHS Regulation. For hypochlorite solution, the placard must display:

- a proper shipping name (Hypochlorite Solution)
- the United Nations number (UN No. 1791)
- the HAZCHEM Code (2X)
- a dangerous goods class label (Class 8 Corrosive).

The placard must be placed either on the tank itself, or on the bund wall so that it is clearly visible from normal approaches.

The relevant dangerous goods class label (i.e. Diamond, and not the GHS pictogram) must be displayed in areas where hazardous chemicals in packages are stored in large quantities, such as:

 exceeding 250 kilograms of Oxidising liquids or solids – Category 2 (e.g. powdered oxidisers)



 $^{^{2}}$ QFES recommends the manifest be kept in a red weather-proof container or 'HAZMAT box' at the entry to the workplace.





³A site requiring a manifest in Queensland must notify WHSQ using <u>Form 73</u> Notification of a manifest quantity workplace.

 exceeding 250 litres of Skin Corrosion – Category 1B (e.g.5 L bottles of acid, pH Decreaser or hypochlorite solution in packages)

Where required, information placards for packages must be placed at the entry point to the retail outlet and at the area where the packaged goods are located. This could be the product sales display area and a delivery area wherever the placard quantity is exceeded. The placards can be displayed adjacent to palleted product or on a racking/shelving system. All placards must be legible and clearly visible (unobstructed).

Refer to WHS Regulation Schedule 13 for the form and minimum dimensions for placards. Further information is available in <u>Placarding for storage of hazardous chemicals</u>.

Supplier's duties

A supplier's obligations include:

- supplying products in appropriate containers that are fit-for-purpose and suitably labelled as per the <u>Labelling of workplace hazardous chemicals code of practice 2021</u>
- ensuring customer-supplied containers provided for re-filling are fit-for-purpose containers, correctly labelled, including the name of the product (e.g. hypochlorite solution)
- not supplying the chemical to another workplace if they know or ought reasonably to know that the hazardous chemical is not correctly labelled.

An appropriate, fit-for-purpose container is:

- a container suitable for the chemical to be contained
- leak proof and will not deteriorate from the chemical
- fitted with a tight-fitting lid (incorporating a specially designed vent where required)
- free of contamination from other chemicals
- not used for food products.

2 Hazard identification and risk controls

Hazards associated with storing and handling hazardous chemicals (including the chemical and physical properties, work environment and work activity hazards) must be identified and the associated risk control measures implemented in accordance with the hierarchy of controls (s.36 WHS Regulation).

Hazards

Certain pool chemicals have chemical and physical properties that may:

- corrode metal or chemically burn the skin and eyes
- cause or increase the intensity of a fire
- react dangerously with other products.

The chemical hazard information can be found in the product's SDS (particularly sections 2, 7, 8, 9, 10, and 11).

Hazards are also present in the work environment and with work activities including:

- bulk deliveries of product from a tanker vehicle
- dispensing corrosive liquids
- conducting repairs on storage and handling equipment
- using a forklift to move stock around the workplace.

The retailer must identify all the hazards that may cause harm to:

- people (e.g. staff, customers, and emergency services personnel)
- property (e.g. the shop and related structures, and neighbouring properties)
- the environment (e.g. stormwater system and local area).

You need to ask what can go wrong, who and what may be harmed and how.

There are several hazards present at pool chemical retailers including:

- storage and handling practices for hazardous chemicals in packages
- the storage of hypochlorite solution in tanks
- bulk delivery of hypochlorite solution
- dispensing hypochlorite solution.

Hazards of pool chemicals - examples where QFES have been required to attend

- A hazardous reaction occurred when a person mixed two solid pool chlorine chemicals. The materials were calcium hypochlorite (old stock) and dichloroisocyanuric acid (new stock), which the person had mixed to use up the last of the old material with some of the new material.
- A leak of sodium hypochlorite solution occurred through a spilt on the pipe between the main valve and tank outlet from a 2000 litre tank. While a bund was present, the elevated tank design relative to the bund wall meant that some liquid was not contained by the bund. The tank was located immediately to the left of the entry door with no rear exit available, which affected safe entry and exit from the shop. The operator had attempted to stem the flow with tape and towels. Arrangements were made with the supplier of the product to decant the product so that the system could be repaired.
- A fire occurred in an aisle of the supermarket. The fire was located about midway up the shelf and within a centre of packages containing dry pool chlorine. The shelf above contained sodium dichloroisocyanurate, and below contained further dry pool chemicals. The fire was deemed suspicious because security footage showed a person in the area immediately before the fire. It was suspected the fire was caused by tampering with the product and introducing an organic liquid into the 2 kilogram container.
- A tanker had been transferring sodium hypochlorite solution to a tank at the rear of the shop when the pipe on the tank broke behind the valve. This caused approximately 1200 litre of hypochlorite solution to spill onto the ground. The tank was in a bund, but the tank had been raised up on wooden pallets and pulled forward so that the outlet pipe and valve were over the edge of the bund for easier access. Due to the tank's position, virtually all of the spilt solution went onto the concrete outside the bund where it ran down the driveway and out onto the road. Several hundred litres entered the storm water drain before the fire service arrived to contain the spill. The response included officers from the local authority and Department of the Environment. The incident duration was about five hours, causing considerable disruption to surrounding streets and businesses.
- The wall fixings for a dispensing device failed, breaking the pipework, and releasing hypochlorite solution. The flow of spilled liquid was stopped by closing the outlet valve on the tank. Spilled liquid spread across floor area and required extensive clean-up.

Hierarchy of controls

There are several ways to control the risks associated with hazardous chemicals. Some control measures are more effective than others. Control measures can be ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of control.

You must always aim to eliminate a hazard and associated risk first. If this is not reasonably practicable, the risk must be minimised by using one or more of the following approaches:

Approach	Example
Substitution	 Substituting a more hazardous product for a less hazardous product (e.g. non-fuming acid being used instead of fuming acid).
Isolation	 Separating the activity of dispensing hypochlorite solution from a public area using physical barriers or having the activity conducted in another location on the premises where access is restricted to staff only. Using solid partitions to isolate incompatible retail products from each other.
Implementing engineering controls	 Installing a fixed fill line for filling bulk tanks. Installing a dispenser unit which controls the volume dispensed into a container.

If a risk remains, it must then be further minimised by implementing administrative controls, so far as is reasonably practicable. Administrative (i.e. operational) controls should only be considered when other higher order control measures are not practicable, or to supplement other control measures. Examples of administrative controls include:

- tank filling instructions
- operating instructions for a chlorine dispenser
- spill clean-up and emergency procedures
- a customer container policy and procedure/s for managing this.

In most circumstances, personal protective equipment (PPE), including overalls, aprons, footwear, gloves, chemical resistant glasses, face shields and respirators, should not be relied on to control risk. It should only be used as a last resort when all other reasonably practicable control measures have been used and the risk has not been eliminated, or as interim protection until higher level controls are implemented. There may also be situations when the use of other controls is not practicable.

Administrative control measures and PPE rely on human behaviour and supervision, and when used on their own tend to be the least effective ways of minimising risks. Training and supervision should always be provided to ensure administrative and PPE controls are effectively implemented.

For further information refer to <u>Managing risks of hazardous chemicals in the workplace</u> <u>code of practice 2021</u>.

3 Specific risk controls

Storage and handling of hazardous chemicals in packages

Many hazardous chemicals are highly reactive, unstable, or self-reactive except under controlled conditions. In those cases, the controlled conditions required to safely store and handle the hazardous chemical must be maintained. The chemical supplier must include information about the unstable conditions in the SDS. For example, products such as hypochlorite solution and hydrogen peroxide solution release gas as they age. A vent capable of releasing gas must be included in the caps of containers to prevent gas from becoming trapped. The containers must be stored in the upright position to allow any gas to escape. For example, figure 1 illustrates how gas from the breakdown of hydrogen peroxide has not been able to escape causing the container to bulge.



Figure 1 - containers placed on their side, preventing the vent in the cap from functioning properly.

Caps that have been designed with a vent as a safety feature allow the liquid to be contained while allowing any gas from the product to escape. Figure 2 shows a vented cap design.

Pinhole seen on exterior of cap at the centre.



Underside of vented cap designed to retain liquid and release vapour.

Figure 2 - example of cap with vent incorporated into its design.

Maintaining stability and identifying risks of chemical reactions

The WHS Regulation specifically requires the risk of chemical reactions be identified (s.354 WHS Regulation), and that a hazardous chemical won't become unstable, decompose, or change in a way that creates another hazard, or increases the risk (s.356 WHS Regulation).

Under normal circumstances, pool chemicals are intended to be added to large quantities of water, however, a hazardous reaction could occur if a small volume of water is added to certain chemicals, or products are pre-mixed before being added to a spa or pool. For example, dry calcium hypochlorite powder must be kept dry as contact with a small amount of water may lead to a hazardous reaction. Adding a liquid or granular hypochlorite to a container that has previously contained acid will result in an immediate release of toxic chlorine gas. The combination of granular pool chlorine (an oxidising agent) and a flammable liquid - like PVC glue products, or combustible liquids like engine oil or brake fluid - will result in a hazardous reaction that may cause a fire that is difficult to extinguish, depending on the quantities involved.

The below table provides examples of combinations of chemical products typically encountered in the retail sector and shows why the stability of chemicals must be maintained with appropriate storage and handling practices.

Product	Should not come into contact with	Hazard
	Heat Moisture	Calcium hypochlorite is thermally unstable and generates oxygen as a decomposition product. It is decomposed by water evolving chlorine gas and heat.
Calcium hypochlorite (Dry pool chlorine)	Sodium Dichloroisocyanurate, Trichloroisocyanuric Acid, or Dichloro-s-triazinetrione, Trichloro-s-triazinetrione	React to form chlorinated products.
	Acids	Heat generated from chemical reaction may initiate a spontaneous ignition of reactants. Chlorine gas is also produced.
Hypochlorite solution	Acidic solids and solutions (pH Decreaser products, scale removers, cell cleaners) and compounds (Aluminium sulphate)	Rapid reaction generating chlorine gas.
(Liquid pool chlorine)	Hydrogen peroxide solutions	Rapid release of oxygen.
	Reducing agents (sodium sulphite)	Rapid reaction generating oxygen and heat.

All hazardous chemicals must be packaged robustly and comply with transport requirements. However, incidents have happened when water has leaked into damaged or open containers. Possible sources of water entry have been traced to:

- rainwater from a leaking roof, or from an open or broken window
- wet floor when the stored chemicals were not elevated off the floor
- leakage from fire suppression sprinkler system
- hose down water generated during an area clean-up.

Incidents from improper mixing of chemicals have caused incidents when:

- tools and equipment used to handle one chemical were used with a different chemical without being cleaned
- spilled oxidising substances (e.g. from damaged containers or from sloppy handling) and other miscellaneous substances on floors were swept up together and mixed
- containers, residues, or wastes were disposed of together resulting in accidental mixing in disposal containers or at waste disposal sites.

Liquids, because of their ability to flow and spread, can create hazards not associated with solid or granular products and must be carefully handled and spills contained and safely managed.

In December 2007, a large fire occurred in Victoria because of a large quantity (many tonnes) of dry chemical product getting wet following heavy rainfall. The fire was started after storm water entered a storage shed used to store a large quantity of dry chlorine product (tablets and granules) and reacted with the improperly stored chemicals. The resulting fire released large amounts of chlorine gas into the atmosphere. Local residents were affected by the gas, and some needed medical attention. The chlorine gas also caused significant disruption to local and regional train services and impacted on local wildlife and domestic pets. According to the Environmental Protection Agency, the event caused profound damage to the environment, and the company involved was fined \$160 000, plus an extra \$58, 000 in legal costs. The fines also included WorkSafe breaches, including failure to maintain an up-to-date inventory of stock on the site, failure to ensure all hazards were identified and failure to immediately report the incident.

Displaying retail packages

'Retail' means the sale of goods in consumer packages to members of the public who are themselves not engaged in any further resale of those goods. A consumer package is a container intended for retail display and sale, up to 25 kilogram or litre in capacity, which is not intended to be opened on the retail premises.

<u>AS/NZS 3833: The storage and handling of mixed classes of dangerous goods in packages</u> <u>and intermediate bulk containers</u> guidance on the storage and handling of packaged hazardous chemicals in the retail sector. The standard recognises the different risk profile for the storage and handling of hazardous chemicals in retail packs on the basis that there is a restricted pack size (a maximum package size is provided) and storage quantity (a maximum storage quantity is specified).

For example, a maximum pack size of 10 kilogram is provided in the standard (2007 edition) for granulated pool chlorine in a total quantity of no more than 2000 kilogram at a general retail shop, or 4000 kilogram at a swimming pool supply shop. A maximum pack size of 5 litre is stipulated for hydrochloric acid in a total quantity of no more than 1200 litre (typically

two pallets of product). Larger quantities can be held, but specific requirements for a dedicated hazardous chemicals package store will apply.

The following general principles can be applied for the safe storage and handling of hazardous chemicals in retail packages.

Shelving and racking

- Racks and shelves must be constructed from materials that will not absorb liquids and are compatible with the hazardous chemicals being stored. Using unprotected chipboard, medium density fibreboard (MDF), or plywood shelving is not recommended as they absorb liquids, swell and lose structural integrity.
- Know the maximum load of the shelving system and do not exceed it. Racks and shelves must be structurally sound and designed for the maximum load they will carry.
- Keep racks and shelving in good condition and regularly check for signs of damage or deterioration such as rust, swelling, impact damage, bowing or sagging and replace when found.
- Ensure that the design and installation of racking and shelving allows ready access to all stock and clear access for personnel. Keep passageways and exits clear.
- Packages should be inspected regularly for leaks. When spilled or leaked material is found or containers with signs of deterioration or distortion are found, the suspect container must be safely examined, put into an over-pack and returned to the supplier, or disposed of safely.
- Packages should be kept off the floor to assist with inspections for leaks. Pallets or low shelves can be used to do this.
- Where large stock handling occurs, bollards should be erected at the ends of racking to prevent structures and containers from being bumped and damaged by a pallet jack or forklift.
- The labels must be retained on empty hazardous chemical containers until they have been decontaminated (such as triple rinsed with water), then either removed or blotted out.
- All hazardous chemicals stored on shelves should be well supervised and visible to all staff to help prevent tampering, as several Queensland retail establishments have suffered from deliberate acts to cause harm through the deliberate mixing of incompatible products.

Handling incompatible products in packages in display areas

Incompatible goods must not be stored together on the same shelf. Separation applies to both horizontal and vertical storage on shelving. In particular:

- liquids should not be stored above solid products (powders, granules and tablets), or those products in absorbent packaging (e.g. cardboard outer packs) on shelves
- liquids such as liquid pool chlorine, clarifiers, acids, paints, and algaecides should not be kept vertically above containers of dry pool chlorine (i.e. do not put these on shelves above the dry pool chlorine).

Guidance on separating and segregating incompatible hazardous chemicals in packages is available from the product's SDS and further guidance is available in AS/NZS 3833. An incompatibility chart for guidance on separation of incompatible liquid hazardous chemicals typically found at a pool chemical retail shop is provided in Attachment 3.

As a general guide, always keep liquid hazardous chemicals apart from the solid hazardous chemicals so that they cannot come into contact with one another. Additionally, always ensure the solid hazardous chemical products are kept dry as water/moisture can react dangerously with some solids (e.g. calcium hypochlorite).

Regarding retail packs of hazardous chemicals that are dry solids and on display in the retail area, reactive products should be separated by at least one metre, or by a solid metal partition (i.e. barrier). Inert materials can be stored in between. This is only acceptable for retail packs that are on display in quantities less than those specified in AS3833. An extract from AS3833 Table 3.2 (2007 edition) is shown below.

Dangerous Goods Class and description	Maximum storage quantity kg or L
5.1 Granulated pool chlorine	2000 kg at a general retail shop 4000 kg at swimming pool supply shops
5.1 Other than granulated pool chlorine	1200 kg
8 Corrosives	2000 L Sodium hypochlorite Or 1200 kg or L for others

For quantities larger than those specified in AS3833 table 3.2, more stringent practices apply. This will apply to stock rooms and warehouses where larger inventories are kept for supplying the display area or further distribution. In these situations, incompatible products in packages should be kept apart by at least five metres when Category 2/1B (PG II) products are involved, or at least three metres when Category 3/1C (PG III) products are involved, with the following considerations:

- Hypochlorite solution must be in a separate spill containment area to any acid product.
- Hydrogen peroxide must be stored in its own spill containment area.
- Mixing different concentrated acids can generate heat and acid vapours.
- Spill containment areas (e.g. bunds) must be separated so that no container can topple from one bund into another, and no leak can splash outside its own bund.

The aim of segregating (i.e. sorting) and separating (by distance or barriers) is to prevent incompatible products interacting with each other and causing a hazardous reaction. Achieving separation using an impervious barrier or adequate distance will help prevent this interaction.

If the liquid contents of a package were to spill, how far and where would the liquid travel and what interactions may occur? Determining this will influence the extent of the separation required. The PCBU should determine the most appropriate separation for their products accounting for their reactivity, quantities and storage layout and size. If further information on potential incompatibilities is required, seek specialist advice (e.g. chemical supplier or manufacturer). It is important to be aware of the hazards of incompatibilities when cleaning up spilled materials and residues. Many dry pool chemicals are white powders and do not reveal their reactivity until they come into contact with an incompatible material. Instances have occurred when various white powder residues have been swept up together for disposal only to result in a reaction and resulting fire within the waste container. Incompatibilities must be managed at all times from receipt, storage, handling and disposal to avoid risks to a person's health and safety and damage to the property.

Containing and cleaning up spills from packages

The WHS Regulation requires the workplace to have systems to contain and manage leaks and spills. Additionally, this system must not create a hazard by bringing together incompatible hazardous chemicals. In a retail situation, a spill clean-up kit must be readily accessible in the display area to readily clean up any spills from faulty packages (e.g. a poorly fitting lid) or ones that become damaged.

The following should be part of a spill kit:

- a marked shovel, broom and dustpan, used solely for this purpose to avoid crosscontamination during clean-up and disposal
- waste recovery containers (plastic drums and bags) to collect material
- enough absorbents (such as kitty litter, sand, diatomaceous earth or other proprietary products) to cover the volume of the largest package on the premises. Specialist advice (e.g. chemical suppliers) should be sought for the use of neutralisers in cleaning up spills
- appropriate personal protective equipment such as gloves, safety glasses and protective clothing to avoid contact with the exposed chemicals.

Ready access to spills clean-up equipment is an acceptable spill containment measure for packages with a capacity of 20 litres or less on display in retail areas. Always consider the flow path that a spilled liquid may travel and assess the impacts when deciding on appropriate risk control measures.

Any spills or leaks should be cleaned up immediately. Contaminated or spilt hazardous chemicals should not be returned to their original packaging except for the purposes of disposal or where this will not increase the risk. Waste generated during clean-up needs to be disposed of in a safe manner.

Storing hypochlorite solution in tanks

Retailers often use a tank or multiple tanks for bulk storage of hypochlorite solution allowing the chemical to be dispensed into smaller containers to sell to customers. When a pool chemical retailer adopts this activity, appropriate risk control measures must be in place to control the associated risks. The WHS Regulation (s.363 WHS Regulation) requires that storage and handling system is used only for the purpose for which it is designed, manufactured, modified, supplied or installed. A storage and handling system must also be operated, tested, maintained, installed, repaired and decommissioned having regard to health and safety of workers and other persons (e.g. customers and emergency service workers).

The WHS Regulation (s.363 WHS Regulation) also requires that the PCBU must ensure that sufficient information, training and instruction is given to a person who operates, tests, maintains or decommissions a system for the activity (e.g. dispensing hypochlorite solution) to be carried out safely.

One of the ways to manage the risk from storing and handling hypochlorite solution in tanks is to have the design, construction and installation meet the appropriate Australian Standards. Guidance on the installation of tanks for hypochlorite solution is provided in AS 3780: Storage and handling of corrosive substances.

Figure 3 illustrates the elements of a tank installation incorporating numerous safety features as per AS 3780: Storage and handling of corrosive substances.



Figure 3 - AS 3780 designed tank installation where product is pumped out via an outlet at base of tank (not shown)

The design shows a tank at ground level on a solid concrete base within a masonry bund, requiring a chemical resistant pump to transfer product. This is an acceptable design for industrial facilities and pool chemical retailers.

While the design shown above is the preferred design option, tanks in the retail sector are often elevated to make use of gravity-fed dispensing of hypochlorite solution. An elevated design bypasses the need for expensive chemical-resistant pumps. However, an elevated tank design introduces other hazards which must be managed, and this guide will assist retailers to minimise the risks so as far as is reasonably practicable. The relative costs of erecting and maintaining a properly designed and constructed tank stand should be weighed up against the preferred design illustrated in Figure 3.

Tank location

A tank installation must be separated from the boundary of the workplace to provide sufficient space between bund walls and other structures to allow access for inspections and maintenance and access during emergencies. AS3780 recommends a minimum separation distance of one metre for smaller tanks of up to 3000 litres in a retail premises. This distance should be increased to three metres for larger tanks. This distance must be measured from the top inside perimeter of the bund.

A tank installation must also be separated from public-accessible areas to reduce risk to children and customers and prevent tampering. Where a tank is in an area where mobile equipment (e.g. forklifts, delivery trucks and vans) operate, the tank must be protected from impact damage (e.g. bollards).

Tank design and construction

Retailers use polyethylene tanks to store hypochlorite solution because of their relatively low cost and ready availability. Other options are available, such as dual laminated PVC fabricated tanks or fibre reinforced plastic tanks. Regardless of the tank selected, the tank must be fit-for-purpose for the storage of hypochlorite solution. If a polyethylene tank is installed, added assurance is provided when the tank is designed, constructed, and certified in accordance with AS/NZS 4766: Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals.

If a tank is certified to meet AS/NZS 4766, the risk of premature failure is minimised and helps to ensure its long-term performance for the intended application. This is achieved by incorporating tank design analysis and independent verification by a qualified professional engineer. A feature is the one-piece seamless construction from the rotational moulding process. This construction process eliminates welds which introduce a potential source of failure depending on the weld quality. Purchasing a certified tank helps to demonstrate that the risks to people, property and the environment associated with a tank selection are minimised.

The certification identification verifies that the AS/NZS 4766 requirements have been met. For example, the tank must be manufactured from virgin polyethylene base resins, and not from recycled or reprocessed materials. These materials could introduce contaminants which could accelerate the plastic ageing process leading to premature failure.

Before purchasing a tank, consider that the tank capacity (size) will not only be influenced by cost and product throughput, but by the location (indoors/outdoors) and available space to accommodate the required safety features (e.g. bund size).

Is your tank's design and construction certified? Look for markings with:

- manufacturer's name or registered trademark
- tank capacity and maximum specific gravity of contents
- maximum design service temperature
- date (month and year) of manufacture
- serial number
- standard identification (i.e., AS/NZS 4766) or statement of compliance.

Tank installation

All tanks must be installed in accordance with the tank manufacturer's instructions. If the instructions are not followed, any guarantee provided with the tank may be voided and may compromise the safety and long-term performance of the installation.

Before installing the tank, check that it has not been damaged in any way (no impacts, deep scores, or rough surfaces). Check the outlet fittings. If they have been welded in, ensure the welds are circular and do not run in vertical or horizontal lines.

When installing a tank on a stand, ensure the support system and bund are appropriately designed and constructed. The tank stand should be designed by a professional engineer to ensure it can:

- withstand the weight of a full tank
- withstand the expected wind loadings when installed in an outdoor location
- be secured to the ground and the tank to the stand for outdoor installations to prevent it being blown over during storms and high winds or effected by flood water where applicable.

The engineer's certified design plans must be kept as a record.

The structure must be strong enough to support the weight of the tank and its contents at the maximum fill level. For example, 1000 litres of hypochlorite solution may weigh 1.2 tonnes (1200 kilograms) or more.

The construction materials for a tank stand must be non-combustible and corrosion resistant, for example:

- Columns constructed of masonry materials, such as core-filled block work on a solid concrete foundation making up the bund floor, can be used to support a platform for the tank. Coating the masonry will provide an impervious barrier preventing liquid penetrating porous brickwork.
- If the platform is made of hardwood, the tank should be placed on a seamless base. The base can be laid using a 12 mm thick fibre-cement sheet fixed to an adequately designed platform. The bearer spacing's should be verified by a professional engineer. This is the preferred design rather than placing the tank directly onto hardwood bearers.
- If steel construction materials are used, the steel should be protected against corrosion with a suitable protective coating and be maintained to maximise longevity and prevent premature replacement. Areas where liquid could potentially penetrate and promote corrosion (e.g. at the points where a steel frame is bolted to the concrete bund floor) should be checked and maintained on an ongoing basis.

Regardless of the construction materials used, the platform on which the tank sits:

- must be level
- should be coated with an impervious coating to protect the structure
- must fully support the entire base of the tank, with no part of the tank overhanging the platform.

Figure 4 illustrates several design features described above, supporting the AS 3780 requirements for design and construction requirements for a tank.

Elevated polyethylene tank installation guidelines

If using a stand, ensure the structure is strong enough to support the weight of the tank and its contents. For example, 1000 litres of hypochlorite solution weighs over one tonne.



Figure 4 - a polyethylene tank on masonry supports

Tank level indication

A graduated liquid-level indicator, with the safe-fill level clearly marked on the level-indicating device, must be installed to determine the liquid level within the tank. A tank must not be filled beyond its safe-fill level.

The safe-fill level differs from the maximum fill level which is the highest level reached before it overflows. The safe-fill level is less than the maximum fill level and is set to prevent an overflow when product is pumped in from a tanker truck. The safe-fill level should be set to accommodate extra volume that resides in the filling lines after receiving the required amount of product. The safe-fill level may also accommodate extra liquid that may result from a slight delay in manually stopping the filling operation.

There are several options available to indicate the liquid level including:

- Use a translucent tank indoors, which may eliminate the need for a separate level indicator device if the liquid level can be reliably seen through the tank wall. The safe-fill level will still need to be marked on the tank.
- Provide a float-based device to indicate the liquid level.
- Use an independent high-level, float-type alarm, with an audible or visible alarm at the tanker vehicle unloading point for a higher level of safety.

Regardless of the method used, the tanker vehicle driver should be able to see the level indicator during unloading operations. If the driver cannot see the level indicator, an assistant must be provided (i.e.an 'assisted delivery') to monitor the filling process, watch the level indicator, and communicate with the driver to prevent overfilling.

Where a sight tube has been fitted, it must:

- have an isolation valve on the line that connects the sight tube to the tank below the liquid level
- be protected from being damaged
- not be made of glass (clear PVC tubing is acceptable but may need periodic replacing as it ages)
- be located within the bund.

Overflow lines

An independent overflow line of at least 1.5 times the diameter of the filling line must be installed to discharge at ground level, in full view of any person filling the tank, i.e. driver or staff assistant. For a typical 40mm or 50mm diameter filling line, an 80mm diameter overflow pipe is adequate. Also fitting a tank with a high-level alarm, and an extra-high level cut-off device, capable of stopping the filling operation, serves as an engineering control to enhance safety.

Venting

The tank must have a dedicated vent opening (independent of the overflow pipe) to ensure that pressure within the tank is controlled during transfer operations. Vents must be

inspected and maintained to prevent blockages by corrosive residues or deposits and protected against ingress of rain if outdoors.

The vent pipe should lead from the highest point in the tank and be at least 50mm in diameter. Where a manhole is relied on for venting for indoor installations, ensure it is fitted with a suitable mesh barrier to prevent ingress of extraneous materials.

Pipe work and fittings

Certain features should be included into pipe work and fittings to prevent failures in valves and connections which are the leading cause of leaks of hypochlorite solution in tank installations. Features include:

- All components attached to the tank, and used to fill or empty the tank, must be resistant to attack by hypochlorite solution. For example:
 - use pipes constructed of chlorinated PVC (cPVC) or unplasticised PVC (uPVC) and solvent welded with suitable gap-filling cement
 - use Viton, Hypalon or EPDM⁴ gaskets in joints not threaded joints
 - use PVC ball valves or rubber-lined diaphragm valves
 - flexible clear PVC tubing may be used for sight tubes, or as short length flexible connectors, however, these must be positioned within a bunded area and have an isolation valve positioned between it and the bulk tank
 - polypropylene plastic is readily affected and will not last long
 - do not use metal (includes stainless steel) fittings anywhere where it will remain in contact with hypochlorite solution to avoid contamination from metallic components ((e.g. Nickel and Copper). Metal contaminants cause decomposition of the hypochlorite releasing gaseous oxygen. If this occurs in a sealed system, overpressurisation can occur. Very small amounts of an incompatible metal will result in large amounts of product decomposition and oxygen formation
 - chemical suppliers and component manufacturers should be consulted about suitable pipe work and fittings.

Avoid using 'domestic plumbing' type valves, as the PVC used in construction of many of these valves, and the general design of the valves, are often not suitable for hypochlorite solution. PVC valves should have solvent weld or flanged ends and be fitted with Viton or PTFE seals. EPDM gaskets may require more frequent replacement.

• For an outlet fitted at the base of the tank, an isolation valve must be fitted to isolate the tank from the pipe work and dispensing system. The open and shut positions on this valve must be obvious.

The tank isolation valve should be kept closed when not undertaking dispensing activities. This will require the isolation valve to be readily accessible. Note: using a chemical-resistant pump to dispense product can overcome the need for any outlet at the base of the tank (avoids any penetrations of the tank wall below the liquid level).

- The tank manufacturer may recommend a flexible coupling between the tank isolation valve and the fixed pipe work. If a flexible connection is needed, it must be:
 - constructed of a material that is chemically resistant to hypochlorite solution (e.g., EPDM)

⁴ EPDM refers to a synthetic rubber material, Ethylene Propylene Diene M-class (Methylene) polymer.

- replaced in accordance with the manufacturer's recommendations for service with hypochlorite solution.
- A flexible coupling fitted with mating flanges will help to ensure any movement in the pipe work does not transfer stresses onto the tank wall. Pipe work connected to this must be adequately supported and anchored to prevent movement. Flexible hoses should not be used.
- Pipes or supports must not be directly attached to the tank.
- All liquid lines must be fitted with a shut-off valve through which liquid is transferred into or out of the tank.
- All pipe work must be above ground to allow visual inspection and help prevent the risk of environmental contamination.

Fittings should be provided to enable transfer hoses and filling lines to be drained before decoupling them. A 'T-piece' illustrated in Figure 5 can be used for draining lines with a spill pot used to collect liquid residues from the drain valve.



Figure 5 - a drain/inlet kit general assembly for draining lines

- Over time, the breakdown of hypochlorite solution releases gas which has the potential to over-pressurise closed systems (e.g. between closed valves). However, if this is an issue for a particular installation, ways to prevent this include:
- sloping pipe work to drain liquid or allow any gas formed in pipes to escape
- assessing unavoidable high points, dead-ends or sections between closed valves to determine the need for venting any trapped gas.
- A fixed pipe, filling through the top of the tank must be used. A siphon breaker must be provided if the fill tube extends below the surface of the liquid.
- Tank installations including all pipe work must be protected against damage from impacts. Physical barriers like railings, guards, bollards, or posts must be installed to protect against impacts from falling items from racks and shelving, or vehicles and mobile plant such as forklifts or pallet jacks or tanker vehicles.

Spill containment for a tank

The WHS Regulation requires the workplace to have systems to contain and manage leaks and spills. A tank is the primary containment system for a liquid product, whereas a 'bund' surrounding the tank provides a secondary, or 'backup', containment system. The bund:

- serves to contain liquid in the event of a failure of the tank, pipe work or fittings
- restricts the spread of spilled liquid and minimises damage and contamination to the surrounding area
- allows spilled product to be recovered in a controlled way.

The bund must be liquid-tight to hold the spilled liquid until it is cleaned up, which could take hours or even days in remote locations. The bund walls must also be strong enough to withstand the hydrostatic pressure of the product when full. A bund constructed of concrete-filled block work lined with a suitable epoxy, fibreglass resin or synthetic rubberised coating is suitable.

The risks associated with the entry and exit of the bund, including both normal conditions (inspection and maintenance) and emergency conditions, must be managed. The arrangement of pipe work needs to be part of the design consideration. That is, the layout should not be tight and cramped to make it difficult for inspection and maintenance to be conducted. AS3780 recommends a minimum clear distance around a tank of one metre.

The bund must:

- have a capacity of at least 110 per cent of the tank capacity
- be maintained to ensure watertightness, i.e. cracks repaired and protective coatings maintained
- be kept clean, free from foreign material and not used as additional storage as illustrated in Figure 6.



Figure 6 - poor practice where bund contains extraneous material and has not been kept clean and clear.

Substances that might react dangerously with the contents of a tank must not be directed into or stored within the tank's bund.

Avoid including a drain fitted with a valve in the bund wall as these may be inadvertently left open, compromising the integrity of the containment system. Indoor tanks should not require a drain. Spilled liquid can be pumped out using equipment such as a manually operated pump or a chemical (hypochlorite solution) resistant mechanical pump. Tanks located outdoors must manage the ingress of rainwater. The use of roof structure can minimise this problem by directing water away from the bund. An active pumping system (water pump) can be considered here in place of a drain valve to remove rainwater from the bund. The tank installation must be protected from unauthorised access, whether indoors or outdoors. Security may be installed specifically for the tank installation or other site security systems may be adequate.

What should the distance be between a tank and the bund wall?

AS3780 stipulates a minimum distance between the tank wall and the inside wall of the bund to assist with inspection and maintenance and capture leaks under hydrostatic pressure. The distance between the tank shell and the bund wall should be at least half the height of the tank that extends above the bund wall, whether it is on a tank stand or not. For tanks over 3000 litres, at least a distance of 1 metre is recommended. For smaller capacity tanks, this distance can be less than 1 metre, but should still allow space for inspection and maintenance. Figure 7 illustrates this requirement. Where bund walls are too close to the tank shell, the use of deflector screens or shields may be used to direct leaks completely into the bund.



Figure 7 illustrates the minimum distance that should be between the tank and the bund wall

These need to be transparent for inspection purposes, and be suitable for the environmental conditions the screens are subjected to (e.g. wind forces). If the tank has been constructed in accordance with AS/NZS 4766, shields may be restricted to fittings/pumps only, thereby avoiding the need for deflector screens that fully enclose the tank installation. Where larger deflector screens are considered necessary, a shower curtain type made of suitable grade durable plastic, or clear plastic sheeting fixed in place or combination of both may be suitable. If fixed, provision must be made to readily remove panels for inspection and maintenance allowing for safe ingress and egress.

Alternative tank designs

An alternative tank design (shown in Figure 8) is the 'cup and saucer' type, which is a plastic tank placed within a plastic tub or truncated tank. While this type of design may be made to meet many of the operational requirements identified in this guide, they are not fire resistant.

A properly constructed core-filled masonry bund (with no drain valve fitted), may offer up to four hours fire resistance. This will mean hypochlorite solution is more likely to be retained during a building fire and will help minimise the risks to emergency service workers and aid clean-up activities. A fire-resistant bund will also minimise the likelihood of hypochlorite solution interacting with acid products that may be released from damaged packaging during a building fire.



Figure 8 - a 'cup and saucer' type design

The fire risk must be considered in the design of the tank installation to minimise the risk as far as reasonably practicable.

Tank maintenance guidelines

The WHS Regulation requires that a storage and handling system is installed, operated, tested, maintained, and repaired having regard to health and safety of persons. Tank installations must be regularly maintained to ensure the safe operation and long-term performance of the tank.

The strong oxidising properties of hypochlorite solution can affect the long-term performance of the tank. The concentration of the free chlorine, size and thickness of the tank, frequency of filling and emptying (flexing of the tank shell), temperature and exposure to sunlight will influence the performance of plastic tanks.

To maintain the safe operation of a tank installation, the following maintenance activities should be undertaken:

- The exterior and the interior of polyethylene tanks should be visually inspected on a regular basis. For example, look for cracking, impact marks, a brittle appearance or colour change. Replace the tank if any scores are deeper than 1.5 mm or 10 per cent of the wall thickness. Pay particular attention to areas around the tank fittings, the corners, any ribs and the base. A bright light should be used to inspect the interior of the tank from the inspection hole.
- Fittings and gaskets should be inspected for leaks and signs of general deterioration.
- Chemical storage tanks should be replaced rather than welded or repaired.
- The tank should be flushed every six months.
- A logbook detailing the inspection process and dates should be kept.
- If there is any doubt about the ongoing integrity of the tank, the tank manufacturer or a competent person should assess its fitness for service.

Examples of poorly designed tank installations

The following photographs show tank installations that do not meet the AS 3780 requirements for storage of corrosive liquids in tanks.



Figure 9 (a)



Figure 9 (b)



Figure 10

Figure 9 (a) and (b)

- Pipe work connected to tank is unsupported putting stresses on the tank. A failure here where the pipe penetrates the tank, will lead to the tank being emptied as the tank penetration is at the bottom of the tank. It is also higher than the bund wall height and too close to the bund wall. Hydrostatic pressure will push a leak at this point beyond the bund wall making it ineffective.
- Observe the poor quality of platform provided for the tank – hardwood bearers are used with an unprotected ply base which is degraded (delaminating) losing its structural integrity.
- The bund wall is again too close to and below the tank. The building wall provides a screen but will not direct any liquid back into bund. Flexible hose connection has been inserted which has deteriorated.

Figure 10

- The bund wall is close to the tank. The interior of the bund and platform should be protected using an impervious coating.
- The tank is relatively exposed with no security for the yard making it susceptible to vandalism and tampering.
- Poor housekeeping exists around the tank with long grass present. Combustible materials like cardboard boxes, empty containers, empty pallets or long grass can present a fire hazard. Plastic tanks offer little resistance to heat and flame.
- Collection of rainwater in the bund must be managed.



Figure 11

- Pipe work, e.g., fixed fill lines, is non-existent with no shut-off valve at the nozzle on the end of the dispensing hose.
- Entire base of tank is not supported as the base extends beyond edge of platform (undersized).
- Interior of the bund and the undersized timber platform are lacking a protective, impervious coating.
- Tank wall is close to the edge of bund wall and the tank penetration is at a higher level than the bund wall.

Figure 11

Managing bulk deliveries of hypochlorite solution

When a tank is installed for storage of hypochlorite solution, significant hazards are introduced when the product is pumped from a tanker vehicle into the tank. These include:

- overfilling the tank
- failures of components in the pipe work during filling
- disconnecting hoses filled with corrosive liquid.

The associated risks must be assessed and controlled. This should be assessed in consultation with the supplier and their carrier company.

The unloading area

The unloading area for the tanker vehicle should be:

- near the tank to be filled
- free of obstructions such as industrial bins, or pallets of newly delivered stock
- free from access by pedestrians and other traffic during unloading.

The position of the tanker vehicle for unloading should be arranged so that it can drive away in a forward direction. The need for a tanker vehicle to reverse should be avoided.

Managing spills during the transfer process should be done in consultation with the supplier. Things to consider include the:

- maximum spill size
- possible consequences of a failure occurring during the transfer process
- location of stormwater drains in the vicinity of the parked tanker vehicle.

In the event of an incident, spilled liquid will travel towards the drains in the area. The stormwater system must be protected against contamination.

If a dedicated unloading area cannot be provided with appropriate spill control, discuss with the supplier how to protect stormwater inlets and public areas from contamination possibly by temporarily placing drain mats and booms during the transfer process as shown in Figure 12.

A staff member trained in the product transfer procedure can help the delivery driver as an 'assisted delivery'. This would occur from the time that the first delivery connection is made until the last hose has been disconnected. An assisted delivery helps the delivery driver to:

- prevent unauthorised access to the transfer area
- prevent overfilling
- assist in an emergency.

The use of flexible hoses



Figure 12 - temporarily isolating a drain with an impervious mat

The flexible hose, used to connect a tanker vehicle to the filling point, should be restricted to six metres. A longer hose (must not exceed 10 metres) may be used if adequate controls are in place, based on a documented risk assessment that assesses the quality of hose connections (camlocks should be attached with stainless steel compression bands), and spills resulting from a hose disconnection.

Over a longer distance, an extended permanent filling line must be installed to reach the fill point. A transfer hose from the tanker vehicle must not run across any area with vehicular access unless adequate precautions have been taken to prevent vehicles from driving over the hose or striking its connections.

Transfer hoses are generally provided by the tanker vehicle making the product delivery. Transfer hoses must be visually inspected, and hydrostatically tested in compliance with the ADG Code⁵. Hoses that fail inspections or tests must be disposed of immediately or repaired and retested prior to reuse. This is the responsibility of the supplier (i.e. operator of the tanker truck) which is regulated under the ADG Code and the Queensland transport legislation.

The following features must be included into the system design to assist with the safe transfer of hypochlorite solution from a tanker vehicle:

- A fixed transfer pipe must be installed for filling the storage tank from the tanker vehicle. The fill connection point must have a suitable connector such as a male camlock fitting to fit the supplier's flexible hose fitting. The connection point:
- should be 900 mm from ground level
- must be suitably anchored and supported to guard against movement
- must also be protected from accidental damage
- If longer fixed transfer pipes are required, the supplier must be consulted about the need for an additional 'T-piece' to assist in draining the filling line or transfer hose before decoupling (refer to pipe work section).

 $^{^{5}}$ ADG Code refers to the Australian Dangerous Goods Code, available at $\underline{ntc.gov.au}$.

- A safety shower (or a plunge bath) and eyewash facilities (complying with AS4775) must be available for the delivery driver and staff handling chemicals. Figure 13 shows an example combination safety shower and eye wash unit. The unit should be easily accessible. As a guide, it should be within seven metres of (but not closer than two metres) to the fill point.
- A hose, long enough to reach all parts of the unloading area and connected to a tap, should be available.

Before commencing the transfer process, ensure:

- the storage tank has the capacity to hold the proposed quantity to be transferred
- entry to the unloading area is restricted, and barriers and signs are erected where required.

Dispensing hypochlorite solution into packages

Dispensing hypochlorite solution into containers creates significant hazards at pool chemical retail outlets particularly when the containers are provided by the customer for filling 'on-demand'. These hazards can be controlled by:

- using a fit-for-purpose container that is suitably labelled
- using a container that is not contaminated with an incompatible product, e.g. acid which will result in an immediate and violent reaction generating relatively large volumes of chlorine gas
- wearing appropriate safety equipment and checking the suitability of the container before filling
- filling the containers to the right level to prevent overfilling, spilling, and splashing corrosive liquid during dispensing and handling activities.



Staff and customers have been hospitalised after being overcome by chlorine gas. The cause is typically the addition of hypochlorite solution to containers contaminated with acid.

The best way to ensure the container-filling is done under the safest conditions is to avoid filling containers 'on-demand', and instead pre-pack the hypochlorite solution in packages. Pool chemical retailers that do provide an 'on-demand' dispensing service must:

- develop and document a container policy outlining the acceptance and rejection criteria for containers supplied by customers and make customers aware of the policy
- always check that an empty container provided by a customer is fit-for-purpose container suitable for hypochlorite solution
- ensure that the container is labelled appropriately (Note: The Australian Pesticides and Veterinary Medicines Authority (APVMA) has specific labelling requirements for pool chemicals as described in the text box below)
- always inspect empty containers to ensure they have not been used for any other purpose (e.g. check pH of any residues to ensure acid is not present)
- provide a dedicated area for filling containers and use a permanently fixed barrier system to prevent customers from entering the area



Figure 13 - an example of a combined eyewash and safety shower unit for emergencies

- provide adequate training and supervision to ensure staff adhere to appropriate safe work procedures for filling containers
- ensure there is ready access to a spill clean-up kit.

The APVMA is the federal government agency responsible for the registration of agricultural, veterinary, pool and spa chemicals. The supply of products governed by the Agricultural and Veterinary Chemicals Code Act 1994 that are not registered with the APVMA constitutes an offence. This includes pool and spa chemicals under the Agricultural and Veterinary Chemicals Code (Listed Chemical Product – Home Swimming Pool and Spa Products) Standard 2014. All hypochlorite solutions supplied for use in pools or spas require an approved label to be attached to the product prior to, or at, the time of supply. This label includes the necessary warning, safety and use directions. The label must be evaluated and approved by the APVMA prior to its use within the Australian marketplace. An APVMA approved label includes the APVMA registration number of the product. This number is a five-digit code prefaced with either APVMA or NRA. To confirm a label, and associated product, is registered with the APVMA, please access the APVMA public chemical database, PUBCRIS. Individual supply outlets may wish to seek their own registration and approved label. To facilitate this, the APVMA has developed a streamlined application process. Full details of the registration process for a listable chemical product may be found either through the APVMA website, or by contacting (02) 6770 2300 or enquiries@apvma.gov.au. If you are concerned in relation to the validity of a label, please contact APVMA compliance on 1300 700 315 or compliance@apvma.gov.au. Further information is available at www.apvma.gov.au

Spill containment for dispensing into packages

An assessment should be made of the maximum spill size that could occur during dispensing and control measures put in place to minimise their impact.

In addition to the main shut-off valve for the tank, liquid lines from the tank should be fitted with a dead-man type shut-off valve at the nozzle, through which liquid is transferred out of the tank. An alternative means, such as a dispensing device that restricts the spill volume and prevents a continuous flow from the tank, is acceptable. Containers should be placed in a spill tray for filling. A spill clean-up kit should be provided in the vicinity of the dispensing area that provides an adequate amount of absorbent material for the maximum spill volume. Specialist advice (e.g. chemical suppliers) should be sought for the use of neutralisers in cleaning up spills.

4 Other risk controls

There are several ways to control the risks associated with hazardous chemicals. Some control measures are more effective than others. Control measures can be ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of control.

As a PCBU, you must always aim to eliminate a hazard and associated risk first. If this is not reasonably practicable, the risk must be minimised by using one or more of the following approaches:

- substitution
- isolation
- implementing engineering controls.

If a risk then remains, it must be minimised by implementing administrative controls, so far as is reasonably practicable. Any remaining risk must be minimised with suitable personal protective equipment (PPE). Administrative control measures and PPE do not control the hazard at the source. They rely on human behaviour and supervision and when used on their own, tend to be the least effective ways of minimising risks. Previous sections in this guide describe a range of higher-order risk control measures. The following sections describe additional risk controls to manage any residual risks to workers and other persons, assisting the PCBU to meet their safety obligations.

Safety signage

The WHS Regulation has requirements for safety signs. These must warn of the particular hazard, or state the responsibilities of a particular person in relation to the hazardous chemicals such as:

- advise of restricted access areas
- specify personal protective equipment requirements
- identify locations of fire extinguishers
- identify locations of spill clean-up kits or detail spill clean-up procedures.

The signs should be readily recognisable, understandable, and durable. A few examples are illustrated below.



Use of personal protective equipment

The WHS Regulation has requirements for personal protective equipment (PPE). It should be noted that PPE is the lowest order risk control measure in the hierarchy of controls and must only be used to control any risks that remain after implementing higher order controls (e.g. engineering, substitution and isolation controls) so far as is reasonably practicable.

PPE must be used by staff when dispensing hypochlorite solution to control the residual risk that remains when dispensing corrosive liquid and prevent possible skin and eye contact with the chemical. Contact can produce skin sensitisation in predisposed people and will cause severe eye damage if splashed on to the eye. The product's SDS describes the appropriate personal protective equipment to wear for handling hypochlorite solution and includes:

- chemical goggles
- a full-face shield may be required for supplementary eye protection but never for primary protection
- chemical protective gloves (e.g. PVC)
- safety footwear or rubber safety gumboots
- trousers or overalls worn outside the boots, to avoid spills entering
- a PVC apron.

Information, training and instruction

The WHS Regulation has requirements for providing information, training and instruction having regard to the nature of the work carried out by a worker, nature of the risks and the control measures implemented. All staff handling hazardous chemicals must be provided with appropriate supervision, education, and training to give them the skills and knowledge they need to perform their jobs safely. The training should cover:

- hazards and risks associated with the use, storage and handling of hazardous chemicals and the duties to be performed
- safe work procedures relating to the use, storage and handling of hazardous chemicals
- how to locate and use an SDS
- the reasons risk controls have been implemented, how they work and their maintenance
- the correct use, care and maintenance of personal protective equipment
- spills clean-up procedures and first aid.

The training programs should consider any specific skills, work experience, physical or intellectual disability, language, literacy level and age of all staff being trained. Periodic refresher training should be provided to maintain and further develop staff skills and knowledge of chemical hazards.

To keep track of who was trained when, retain a record of this and the nature and content of the training and instruction.

Emergency plans

Regardless of controls put in place to prevent incidents occurring in the workplace, they can still occur. For example, people can be exposed to chemicals and require immediate medical treatment, a fire can start, or a loss of containment can occur. It is therefore necessary to be prepared for any foreseeable incident.

The WHS Regulation requires all workplaces to prepare an effective emergency plan for the workplace. This must provide for the following:

- emergency procedures that include:
- an effective response to an emergency
- evacuation procedures
- notification procedures to advise emergency services organisations at the earliest convenience
- medical treatment and assistance
- communication procedures between the person coordinating the emergency response and all persons at the workplace.
- testing procedures, and how often they will be done
- how relevant workers will be provided with information, training and instruction about implementing the emergency procedures.

An emergency plan for a pool chemical retailer would be expected to have identified emergency situations including a building fire, a chemical reaction that generates chlorine gas, a large leak or spill of product such as hypochlorite solution from a tank installation or during a product transfer from the supplier's tanker truck delivery process.

You must submit a copy of your plan to QFES when a manifest quantity is exceeded.

If the workplace stores and handles hazardous chemicals more than the specified manifest quantity, the WHS Regulation requires the emergency plan to be provided to QFES. The person must revise the plan in accordance with any recommendations the primary emergency services organisation provides about its effectiveness.

Further information on emergency planning is available in the following documents:

- Managing risks of hazardous chemicals in the workplace code of practice 2021
- AS 3780: The storage and handling of corrosive substances.
- AS 4326: The storage and handling of oxidising agents.
- AS/NZS 3833: The storage and handling of mixed classes of dangerous goods in packages and Intermediate bulk containers.

Fire protection

The WHS Regulation has requirements for fire protection and firefighting equipment, which must have regard to the fire load from the hazardous chemicals, fire load from other sources, and compatibilities of substances at the workplace.

Fire protection at a pool chemical retailer is required due to the often-considerable amount of oxidisers (Class 5.1 products) stored at the premises. Oxidising agents are not necessarily combustible themselves but will increase the fire intensity. A fire may not initially involve the

hazardous chemicals (e.g. electrical fault), but an escalation and increased intensity may result if they are involved. The risk of escalation can be minimised by:

- controlling access
- controlling on-site procedures and activities
- maintaining good housekeeping by clearing extraneous combustible materials from the site
- managing the incompatibilities and potential contaminants.

Pool chemical retailers must be provided with fire protection and firefighting equipment that are compatible with the hazardous chemicals, and effective in the control of incidents involving the types and quantities located on site. A dated written record must be kept of the latest testing results and maintenance of fire protection equipment until the next test is conducted.

A pool chemical retailer should have a minimum of one dry powder or carbon dioxide-type fire extinguisher for putting out fires in mechanical or electrical equipment, and at least a water or foam type fire extinguisher or a hose reel. Extinguishers, other than water-type, are intended to put out fires in electrical or mechanical equipment but will not provide enough cooling to prevent decomposition of the oxidising agents or re-ignition of any combustible materials present.

Location of fire extinguishers

Each fire extinguisher must be located in a conspicuous and readily accessible position, as outlined in <u>AS 2444: Portable fire extinguishers and fire blankets—Selection and location</u>.

Do not locate these in positions where they are subject to deterioration, e.g. corrosion from being placed near corrosive liquids, or where access could cause a hazard to the user, as displayed in Figures 14 (a) and (b).



Figure 14 (a) - a fire extinguisher close to a corrosion hazard.

Extinguishers are poorly located- too close to product or not readily accessible.



Figure 14 (b) - a fire extinguisher in a difficult to reach position.

Extinguishers should be:

- located along normal paths of travel and near exits
- clearly indicated by placement of the location sign
- be mounted at the appropriate height (see figure 15).

A single sign may be used to indicate multiple extinguishers in one location, even if different types are grouped together. The extinguisher, or extinguisher location sign, should be clearly visible from a distance up to 20 metres in all directions of approach. Where a cabinet or enclosure is used, the open door should not be in the path of travel to an exit or doorway.





Figure 15 - sign positioned to indicate location of fire extinguishers.

Records

Keeping records of the risk management process:

- demonstrates potential compliance with the WHS Act and Regulation
- demonstrates how decisions about controlling risks were made
- · assists in targeting training at key hazards
- provides a basis for preparing safe work procedures
- allows you to more easily review risks following changes to legislation or business activities
- demonstrates to others (regulators, investors, shareholders, customers) that work health and safety risks are being managed.

The detail and extent of recording will depend on the size of your workplace and the potential for major work health and safety issues. It is useful to keep information on:

- the identified hazards, assessed risks and chosen control measures (including any hazard checklists, worksheets and assessment tools used in working through the risk management process)
- how and when the control measures were implemented, monitored, and reviewed
- who you consulted with
- relevant training records
- plans for changes.

The records that must be kept are:

- a register with a list of all hazardous chemical products including the SDS
- testing of fire protection equipment (e.g. fire extinguishers and hose reels)
- for manifest quantity workplaces, a current manifest and site plan.

WHSQ recommends that records are kept of risk assessments, training activities, maintenance of storage and handling systems as part of a safety management system for managing risks at the workplace.

5 Mobile service operators

Retailers may operate a mobile service to conduct water treatment services at various locations. This type of field service requires service technicians to carry a range of water treatment chemicals in their vehicle, as they conduct their mobile service activities. This introduces unique risks for the safe storage and handling of the hazardous chemicals. For example, preventing interaction of incompatible substances. The following section provides guidance on a few key issues of chemical safety associated with providing a mobile service.

Managing incompatibilities

Chemical reactivity and stability risks are still required to be safely managed in vehicles. Separation must be achieved to ensure reactive combinations do not interact (e.g. hypochlorite solution and acid). Separation at a workplace is achieved by distance or barriers to minimise the possibility of interaction between reactive chemicals. However, distances of one metre or three metres is problematic in a van and doesn't help much in a roll-over type incident. Labelled 'overpacks' that are secured to the van, into which you can place a particular chemical container, can be effective. Such an overpack serves as a physical barrier, isolating the chemical in case of vehicle incident or leaking container. Suitable absorbent should be available (e.g. kitty litter) along with the product SDS, and supported with training to be aware of hazards and spill clean-up procedures.

Vehicle placarding

Under the special provisions for tools of the trade in Queensland's transport legislation⁶ allowance has been made for smaller quantities being transported and not having to meet the full requirements of the ADG Code which normally requires shipping documentation and vehicle placards. The special provisions apply to dangerous goods that are not transported as part of transporting business (e.g., freight company), but are transported by a person who intends to use them for a commercial purpose (e.g., mobile pool servicing) and in a quantity less than 500 kg or L. This quantity is for usual types of pool water treatment chemicals such as class 5 and 8, Packing Group II and III classifications.

Under the special provisions, the dangerous goods must be packaged and labelled appropriately, and loaded, secured, segregated, unloaded and otherwise transported in a way that ensures its packaging remains fit for its purpose and risks are eliminated and if not practical, minimised to the greatest practicable extent.

There is also a restriction of 250 kg or L placed on the quantity of dangerous goods (Class 3, 4, 5, or 6) that can be transported in the passenger compartment of a vehicle or in an enclosed space that is not separated from the passenger compartment.

⁶ Refer to Transport Operations (Road Use Management – Dangerous Goods) Regulation 2018, Section 7 Special provisions for tools of trade and dangerous goods for private use. Information is available at. <u>Transporting dangerous goods for personal or 'tools of trade' use | Business Queensland</u>.

6 Using a residence for storage of hazardous chemical products

In Queensland, the WHS Act applies whether hazardous chemicals are stored at a workplace or a non-workplace such as a residence (Refer to Schedule 1-Application of the Act). The WHS Regulation additionally limits the quantities of identified materials/goods that can be stored and handled at a non-workplace before the Part 7.1 applies. That is, a non-workplace (e.g. domestic residence) can store and handle up to the quantities specified in Table 328 and be exempted from Part 7.1 requirements. The limits for pool chemicals are:

- Pool chlorine and spa sanitising agents 100 kg or L
- Hypochlorite solution (pool chlorine)
 100 L
- Others including corrosives (acid)
 100 L

Once these thresholds are exceeded, all provisions of Part 7.1 in the WHS Regulation will apply in addition to general provisions. That is, provisions for, placarding, spill containment, labelling of containers, register, safety signs, protecting against damage, fire protection, and installation and operation of tanks will apply.

Business activities at a residence may have implications in regard to local council approvals and insurance policy coverage. Check with your local authority regarding the operation of a business at a residence and check the details of your insurance policy to ensure your policy is appropriate.

Useful references

Legislation:

- Work Health and Safety Act 2011
- Work Health and Safety Regulation 2011

Supporting codes of practice:

- Managing risks of hazardous chemicals in the workplace
- How to manage work health and safety risks

The following standards are available from SAI Global, publishers of Australian Standards available at <u>www.standards.org.au</u> (Ph: 1800 035 822):

- AS 3780: The storage and handling of corrosive substances
- AS 4326: The storage and handling of oxidising agents
- AS/NZS 3833: The storage and handling of mixed classes of dangerous goods in packages and Intermediate bulk containers
- AS/NZS 4766: Polyethylene storage tanks for water and chemicals

The following information papers are available at worksafe.qld.gov.au:

- Placarding for storage of hazardous chemicals
- Manifest requirements for hazardous chemicals

This guide and FAQs are available at the dedicated web page for pool chemical retailers at <u>Pool chemical retailers | WorkSafe.qld.gov.au</u>

Further information on hazardous chemical safety and the GHS is available from worksafe.qld.gov.au and swa.gov.au.

For more information visit worksafe.qld.gov.au or call 1300 362 128.

Attachment 1 – Register

Example of a hazardous chemicals register. Keep a copy of each up-to-date safety data sheet (SDS) from the Australian manufacturer or importer with this page to form a compliant register. Note that WHS laws require the name of the hazardous chemical along with the current SDS to form a register. Other columns of information shown here may be helpful and are at the discretion of the workplace.

Name of hazardous chemical (Mandatory inclusion along with the SDS)	GHS classifications	DG class / sub-risk	PG*	UN No**	Date of SDS	Risk assessment number	Comments

*PG- packing group either I, II or III available from the SDS (section 14) when classified as a dangerous goods.

**UN No. refers to the 4-digit United Nations number for the product also available from the SDS (section 14) when classified as dangerous good

Attachment 2 – Example risk assessment

This example risk assessment for hazardous chemicals shows the kind of approach a small business, such as a pool chemical retailer, might take using the storage and handling of hypochlorite solution as an example. It is a generic risk assessment and should only be used as a guide to help businesses think through some of the hazards, and the steps to take to control the risks associated with those hazards. The example risk assessment provided here identifies several hazards from the bulk storage of hypochlorite solution in an indoor polyethylene storage tank. The table describes, in a systematic way, what can go wrong, who and what can be harmed, the risk control measures that should be in place versus what is currently in place to enable the gaps to be identified. This process can be used for the range of hazards present at a pool chemical retailer.

Hazards identified …What can happen?	Description of outcomes Who and what may be harmed and how?	Risk control measures to be considered… What needs to be done? (Consider guides, standards, legislation)	Existing risk control measures… What are you already doing?	Controls to be implemented… What further action is necessary? When and by whom?	Date completed
Storage in a tank Leak/spill from the plastic storage tank or pipe work and fittings such as valves.	Loss of up to 3000 L (tank capacity) product from tank exposing people, property and the environment.	 Provide suitable fit-for-purpose tank installation (AS 4766 certified tank) with suitable fit-for-purpose pipe work and fittings. Provide secondary containment (bund) with capacity to hold 3300 L (110 per cent) of the tank capacity. Bund structurally sound, and water-tight to prevent spread of lost product. Install pipe work and fill point within bunded area. Inspect and do preventative maintenance on the tank, pipe work, fittings and bund. Develop spills clean-up procedures and clean-up equipment. 	 Tank quality unknown and over five years old. Bund in place with 110 per cent of the tank capacity, but bund walls less than one metre from tank. Pipe work and fill point installed within bunded area. Spill clean-up procedure developed. Spill clean-up equipment and personal protective equipment (PPE) provided adjacent to tank bund. 	 For each item to be actioned, assign responsibility and required completion date, e.g. Manager, 12/05/20XX. Replace tank with a tank certified fit-for-purpose for hypochlorite solution storage, and ensure installation complies with relevant standards and guides. Install splash guards over fittings to direct leaks into bund. Develop tank installation inspection and maintenance programs for all components and bund and log activities. Develop spill clean-up procedure to address a bund filled with product where product needs to be pumped out. 	

Hazards identified What can happen?	Description of outcomes Who and what may be harmed and how?	Risk control measures to be considered… What needs to be done? (Consider guides, standards, legislation)	Existing risk control measures… What are you already doing?	Controls to be implemented What further action is necessary? When and by whom?	Date completed
Dispensing Leak/spill during filling containers from product dispenser fitted to outlet of tank. Interaction of spilled product with incompatible chemicals causing a hazardous reaction. Reaction when on- demand filling of customer-supplied containers.	Worker and others exposed to corrosive product. Exposure of staff or customer to reaction products (e.g. toxic chlorine gas). Exposure of staff or customer to reaction products (e.g. toxic chlorine gas).	 Isolate dispensing area from public area/access. Provide and maintain PPE as per SDS. Fit isolation valve between tank and dispenser. Provide spill containment and clean-up equipment for dispensing area to cope with foreseeable spill size (e.g. 25 L). Include dispensing equipment in inspection and maintenance program. Provide staff training on wearing PPE, safe filling and clean-up procedures and first aid. Provide access to safety shower and eye wash station. Ensure adequate separation between containment areas for hypochlorite solution and incompatible products (e.g. acids, hydrogen peroxide solutions, sulphites). Develop container acceptance policy. Use fit-for-purpose containers for hypochlorite solution. Implement inspection process for containers. Isolate dispensing area from public area and prevent public access. Use of SDS PPE during dispensing. Ready access to a safety shower/eye wash station. Staff training on policy, inspection and filling procedures. 	 PPE provided and maintained. Isolation valve fitted between tank and dispenser. Dispenser design limits quantity of spill to 25 L. Spill tray present and spill kit with absorbent located adjacent to dispensing area. Staff trained on filling procedures via informal on-the-job training. Segregation policy for incompatible products in place. Staff training to address reactivity hazards and segregation rules. Access to safety information (SDS) provided in work area. PPE as per SDS provided and maintained. Staff training on filling process. 	 Erect physical barrier and signage to restrict access to dispensing area. Develop inspection and maintenance program to include dispensing device and fittings. Develop and document staff training to address PPE, clean-up and first aid. Install safety shower/eye wash station located in work area for staff and delivery driver. Locate SDS in work area. Provide training on SDS content, hazards and risk controls. Assess risks before receiving new product lines. Develop and document container acceptance policy. Develop and document staff training to cover container policy and filling procedure. 	

Attachment 3 – Incompatibility chart

As a general guide, always keep liquid hazardous chemicals apart from the hazardous chemicals that are solids, so that they cannot come into contact with one another. Additionally, always ensure the solid hazardous chemicals products are kept dry as water/moisture can react dangerously with some solids.

The chart below provides guidance on the incompatibilities between the liquid products. For further information seek specialist advice (e.g. chemical suppliers).

Liquid products	UN No.	Hypochlorite solution	Hydrochloric acid	Sulphuric acid<51%	Hydrogen peroxide solution
Hypochlorite solution	1791	С	KEEP APART	KEEP APART	KEEP APART
Hydrochloric acid	1789	KEEP APART	С	KEEP APART	KEEP APART
Sulphuric acid Less than 51% acid 'Non-fuming pool acid'	2796	KEEP APART	KEEP APART	С	KEEP APART
Hydrogen peroxide, aqueous solution with not less than 8% but less than 20%	2984	KEEP APART	KEEP APART	KEEP APART	с

Separation of liquid pool chemical products in retail packs at a retail premises



This combination of products can be stored together.

KEEP APART	Keep apart indicates that this combination of products is reactive and these products should be prevented from coming into contact with each other. The combinations of products in packages identified should be kept apart by at least five metres when Packing Group II materials are involved or at least three metres when Packing Group III materials are involved with the following considerations:
	 hypochlorite solution must be in a separate bunded area to any acid product hydrogen peroxide must be stored in its own bunded area mixing concentrated acids can generate heat and acid vapours bunded areas must be separated so that no container can topple from one bund into another and no leak can splash outside its own bund.

