



Dedicated to a better Brisbane

Industry environmental guide

Storing hazardous chemicals in flood affected areas



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Please note

This guide is part of a series prepared by Brisbane City Council that provides information to help businesses improve their compliance and environmental performance.

This guide provides information relevant at the time of publication. While reasonable efforts have been made to ensure the contents are factually correct, Brisbane City Council does not accept responsibility for the accuracy or completeness of the contents and is not liable for any loss or damage that may occur directly or indirectly through the use of, or reliance on, the contents of this guide.

1

Overview

Hazardous chemicals can cause serious environmental pollution and danger to people during a flood if they are not stored correctly. Businesses in flood affected areas that store hazardous chemicals should follow the advice contained in this guide to protect the environment and community.

What is the purpose of this guide?

This guide provides advice to businesses that store hazardous chemicals in flood-affected areas to help them:

- Be flood prepared.
- Prevent or minimise the pollution of waterways and land during a flood.
- Comply with the *Environmental Protection Act 1994*.

What are my responsibilities under the law?

Businesses that store hazardous chemicals must comply with the *Environmental Protection Act 1994*. This law places a general environmental duty on all individuals and companies to protect the environment and to take all reasonable and practical measures to prevent or minimise environmental harm. This includes a responsibility to store hazardous chemicals in a way that prevents their release to water or land in the event of a flood. Serious penalties exist for not complying with this law.

For more information on your responsibilities please contact Council on **3403 8888**.

What is a hazardous chemical?

Hazardous chemicals are defined in the *Work Health and Safety Regulation 2011* and include chemicals harmful to people and the environment, such as:

- Fuel oil, motor oil, lubricating oil and waste oil.
- Radiator coolant.
- Solvents, degreasers and thinners.
- Paints, lacquers and varnishes.
- Acids and alkalis.
- Pesticides and herbicides.

What is a flood affected area?

Brisbane City Council has a range of free tools and information that can help businesses understand their potential flood likelihood and how to be prepared. These include:

- Interactive Flood Awareness Map - which allows you to check your flood risk to identify the likelihood and sources of flooding that may affect your business.
- Floodwise Property Report - which provides flood information related to building, renovating or fit-outs for your business.

For more information and to access these tools, visit brisbane.qld.gov.au/beprepared, call Council on **3403 8888** or visit your nearest Council Regional Business Centre.

2 Be prepared – flood checklist

Any business that stores hazardous chemicals needs to understand the measures that should be taken before and after a flood to protect people and the environment.

Check your flood risk on-line

See Chapter 1 of this guide for advice on how to check the flood risk of your business on-line.

Prepare your business

- It is highly recommended that you document a Flood Response Plan for your business.
- Document the types, volumes and storage methods of hazardous chemicals stored on site, including a site plan to scale showing the location of the hazardous chemical storages.
- Depending on the volume of hazardous chemicals stored, you may need to install HAZCHEM placards on the entry to the site and the outside of buildings where hazardous chemicals are stored. This is a requirement of the *Work, Health and Safety Act 2011* and will assist emergency services and clean up personnel.
- Train staff: make sure all staff know how to prevent or minimise the release of chemicals stored on site in the event of a flood.



Before a flood event

By taking the following measures before the arrival of floodwater, businesses can significantly reduce the likelihood of their chemical storages becoming damaged, displaced or polluting the environment.

Turn off all electricity to the chemical storage system. This includes all electrical power to dispensers, pumps, turbines, automatic tank gauging consoles, lighting and any other electrical system components.

Take chemical level readings for the chemical storage system. These readings should then be compared to the chemical levels and water levels after the flood has subsided in order to gauge the possible loss of chemical during the flood.

Fill the chemical storage container or tank to weigh it down so it will not move from its original position. Do not fill tanks with water because the water may become contaminated, making it very costly to dispose of.

Secure all openings on aboveground and underground tanks. Make sure all fill caps are in good condition and fastened securely in place and locked. If these fill caps are not tightened properly, tanks will fill with water and release chemicals to the environment. Empty or near-empty aboveground and underground tanks have the potential to float, destroying overlying structures and pipework and releasing chemicals to the environment.

Close all shear valves on pressurised piping. This prevents the release of chemicals to the environment from product dispenser lines.

Cap off any vent pipes. This prevents water from entering aboveground or underground storage tanks and displacing chemicals to the environment.

Place sandbags or large containers full of sand or rock over underground storage tanks. This reduces the chance of storage tanks moving from their original position.



After a flood event

By taking these measures after floodwaters have subsided, businesses can prevent or minimise further damage to chemical storage infrastructure, pollution of the environment and health and safety risks to people. Businesses should take into consideration the site-specific circumstances of their business when considering the following measures. Permission or clearance should also be sought from the relevant authority to re-enter property after floodwaters have subsided to ensure safety for clean-up workers, etc.

Make sure the power is off to any chemical storage related equipment. Pay particular attention to any electrical equipment such as dispensers, pumps, release detection equipment and other devices.

Determine if any product has leaked from the chemical storage facility. This can be achieved by comparing the chemical levels in the system immediately before the flood, with the corresponding levels immediately after the flood. If there is an apparent loss of chemicals into the environment, contact Brisbane City Council or the relevant Queensland government department as soon as possible.

Determine if floodwaters or debris have entered the chemical storage facility. If floodwater has entered underground or aboveground storage tanks, there is a high probability that chemicals have been displaced from the storage tank into the environment during the flood. The floodwater in the storage tank is also likely to be contaminated and will require removal by a licensed regulated waste contractor.

Inspect all electrical systems. Electrical systems must be inspected by a qualified and licensed person. Once the electrical system is operational, return power to the chemical storage facility and its components.

Check the chemical release detection system for proper operation and function. Perform release detection procedures multiple times as soon as possible after the flood to ensure that chemicals have not been lost from the system into the environment.

Check all equipment. This includes pumps, shear valves, fill pipes and vent lines to ensure they are operating and functioning correctly. It is vital that all components of the chemical storage facility are working effectively before its use recommences after a flood.

Clean and drain all spill buckets and sumps/bunds This includes areas beneath dispensers and above chemical storage containers or tanks. Thoroughly inspect all piping and fittings for signs of damage or potential leaks. Any collected water must be contamination free, contact your local waste management business to get advice on disposal of water or sludge.

Perform a system tightness test for underground chemical storage facilities. This will ensure structural and operational integrity prior to the use recommencing after the flood.

Test all spill buckets and sumps. This will help to ensure that they have remained watertight during the flood.

Test the cathodic protection. This will ensure it is operating properly after the flood.

3 Chemical storage containers, drums and packages

Chemical storage drums, containers and packages can float and be carried off-site by flood waters and can rupture and leak during a flood. This can cause serious or material environmental harm and danger to people during flood clean up. For these reasons, chemical storage containers, drums and packages, including Intermediate Bulk Containers (IBCs), 44-gallon drums and the like, must be correctly stored and secured.

Preventing the escape of chemical storage containers, drums and packages

Businesses in flood affected areas must comply with the *Environmental Protection Act 1994* and take steps to prevent or minimise the risk of chemical containers, drums and packages leaking or moving off-site during a flood. Measures you can take to do this include the following:

- Store all chemical containers, drums and packages, within buildings or structures designed to withstand the forces expected to be experienced during a flood. Do not store chemical containers, drums and packages outside of these buildings or structures, where they could be carried off-site during a flood.
- Store flammable liquids in a fireproof cabinet with a spill tray. These cabinets will also prevent the movement of flammable liquid containers and packages during a flood.
- Clearly label all chemical containers, drums and packages so that they can be easily identified during a flood clean up, to protect the health and safety of workers and the community.
- Store incompatible chemicals separately.
- Inspect chemical containers, drums and packages regularly and replace them if they are rusted, damaged or likely to leak.
- Ensure all chemical containers, drums and packages remain closed with a tight-fitting lid or cap when not in use.





Designing, constructing or upgrading a building for the storage for chemical drums, containers or packages

Buildings, package stores and structures used specifically for the storage of chemical containers, drums or packages in flood affected areas, should be flood resistant and include the following characteristics:

- Avoid the ingress of flood water where possible by elevating the floor level of buildings or structures above the flood level. It is preferable to elevate buildings and structures using engineer designed piles or columns and minimise shear walls below the flood level, if possible. This ensures the space beneath the flood level remains clear of obstructions that could transmit flood loads to the elevated building.
- Where possible engineer design the building and its utility systems to be watertight below the flood level and dry flood-proofed with walls substantially impermeable. Examples of dry flood-proofing methods include, waterproof sealants and coatings on walls and floors, automatic flood shields and doors, backflow prevention valves and sump pumps.

Note: Active flood proofing, sometimes known as contingent (partial) or emergency (temporary) flood proofing, requiring human intervention to implement actions to protect a package store and its contents from flooding should not be used.

- Be engineer designed to withstand flood loads over a period of decades and remain structurally intact during a flood including preventing flotation, collapsing, lateral movement or other structural damage that may cause chemicals to be released during a flood.
- Have engineer designed foundations able to remain intact and fully functional following a flood.
- Breakaway enclosures should be designed to break free without causing damage to the elevated building, the building foundations, building access structures or utility systems.
- Be able to adequately protect chemical containers, drums and packages from the ingress of floodwater and the impact of flood-borne debris.
- Be able to contain all chemical containers, drums and packages within the building or structure during and after a flood.
- Utility connections remain intact or are easily restorable after a flood.
- Be constructed with flood damage resistant materials below the flood level.
- Be easy to clean and repair after a flood.
- Be easily accessible and useable after a flood.

4 Underground storage tanks

Underground storage tanks can lift, move and rupture during a flood and release their contents to the environment if they are not correctly installed and maintained.

This section provides advice for installing new or upgrading existing, underground tanks in flood affected areas, to prevent or minimise the risk of environmental pollution during a flood.

The *Environmental Protection Act 1994* requires the owner and operator of an underground storage tank to take all reasonable and practical measures to prevent the release of hazardous chemicals to the environment during a flood.

There are a number of factors that can contribute to the release of chemicals from an underground tank during a flood, including:

- buoyancy forces acting upon the underground tank caused by floodwaters or saturated soil.
- erosion and movement of soil or structures directly surrounding the underground tank caused by floodwater.
- displacement of chemicals caused by the entry of floodwaters into the underground tank via fill pipes, vent pipes, gaskets, loose fittings, covers, sumps, and damaged tank walls.
- failure of and damage to, electrical equipment associated with the underground tank (such as automatic tank gauging systems, panel boxes, emergency shutoff switches, submersible turbine pumps, dispensers, motors and cathodic protection) caused by floodwater.

The following measures can be used when installing an underground tank to minimise the risk of hazardous chemicals being released to the environment during a flood:

- Increase the burial depth and the amount of pavement above the underground tank. Adding extra weight through additional soil backfill and pavement may be enough to keep the tank from floating or moving from its original position.
- Anchor the underground tank to a concrete slab to counteract buoyancy forces.
- Install concrete anchors, such as deadmen, on opposite sides of the tank, with hold-down straps attached to the slab (see Figure 1).
- Alternative options for anchoring of underground tanks with concrete counterweights are provided in Figure 2 and Figure 3.
- If installing a concrete collar above the tank refer to Figure 4.

Note: In all cases, the tank manufacturer's recommendations are to be observed and seek professional advice from a suitably qualified and experienced engineer.



Figure 1. Required positioning of concrete 'deadmen' relative to the tank

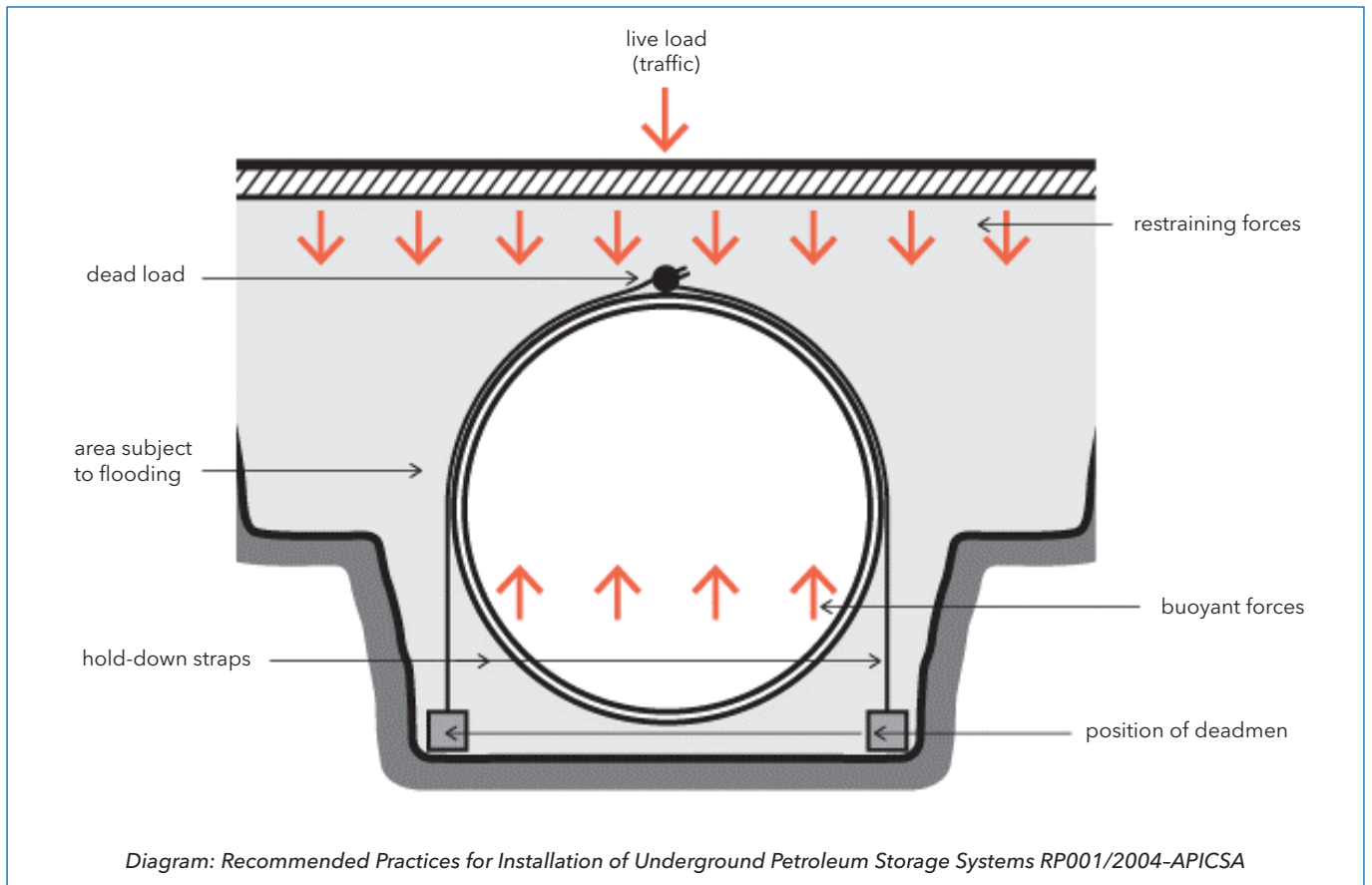


Figure 2. Options for anchoring of underground tanks with poured-in-place concrete counterweights

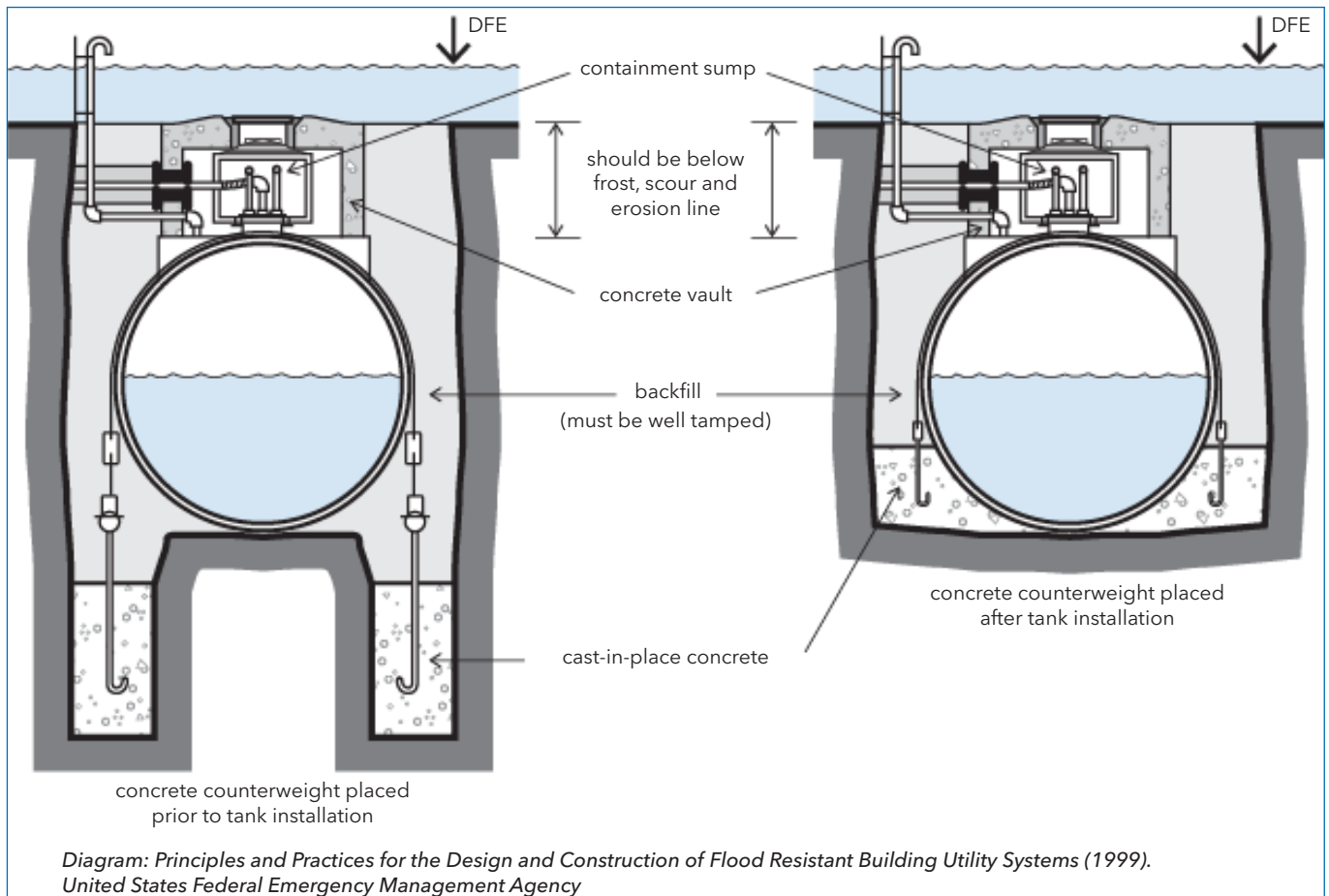


Figure 3. Securing a tank to an anchor belt embedded in a concrete counterweight

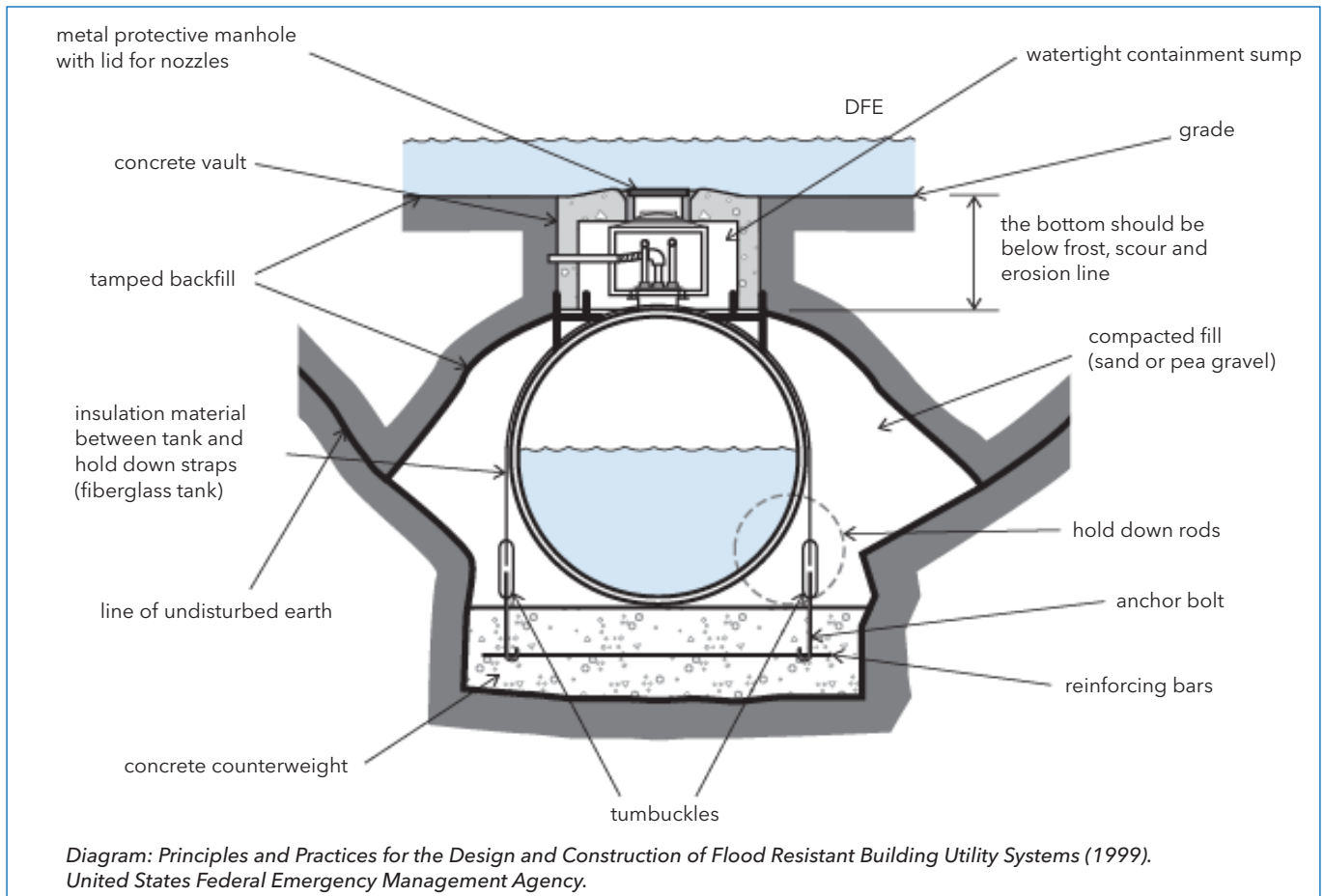
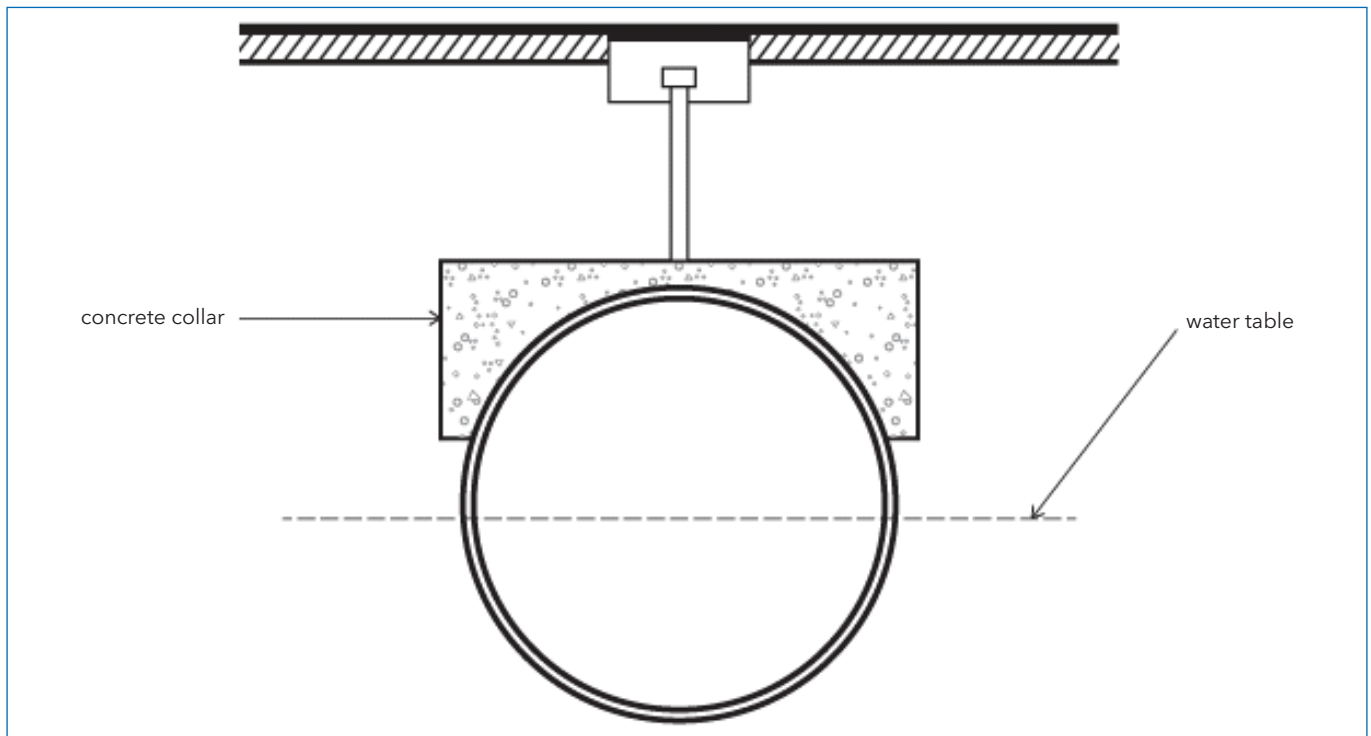


Figure 4. Use of a concrete collar above the tank to counterbalance buoyancy forces



Note: Counteracting buoyancy forces may also be achieved by installing a concrete collar above the tank. The concrete collar together with the weight of the tank, the weight of overbearing soil and surface coverings shall be calculated to counteract the buoyancy forces exerted by the tank.

5

Aboveground storage tanks

Aboveground storage tanks in flood affected areas must be secured against floatation and lateral movement in the event of a flood. The forces caused by (potentially moving or surging) floodwater, can easily result in damage or displacement of aboveground tanks and the release of hazardous chemicals to the environment.

The *Environmental Protection Act 1994* requires the owner and operator of an aboveground storage tank to take all reasonable and practical measures to prevent the release of hazardous chemicals to the environment during a flood.

This section provides advice for installing new or upgrading existing, aboveground tanks in flood affected areas, to prevent or minimise the risk of chemical release to the environment.

Locate vertical tanks so that the top of the tank extends above the maximum expected flood level by at least 30% of the allowable storage capacity of the tank.

- If in a location that is not subject to velocity flows, horizontal tanks can be secured to a concrete slab installed in the ground using suitable materials (see Figure 5). Alternatively, tanks may be secured to concrete counterweights located on opposite sides of the tank using straps or tie downs.
 - Elevate above ground tanks above the defined flood level on a platform designed to provide adequate protection against the force of the floodwaters and associated debris in a velocity flow area (see Figure 6).
 - Design posts and columns to have deep concrete footings embedded below expected erosion and scour lines. The required depth of the footing will be dependent on the geology and identified hazards at the site. Cross-brace piles, posts or columns to withstand all expected forces such as velocity flow, wave action and wind. Cross-bracing should be parallel to the direction of flow to allow for free flow of debris.
 - Anchor the tank to a platform using straps capable of restraining the tank against strong winds and flood forces. Construct straps of non-corrosive material to prevent rusting.
- Vaulted tanks (including vent pipes) should:
 - a. be made of a primary steel tank coated with a layer of lightweight concrete, which may then be contained within a secondary steel tank.
 - b. be secured to a concrete slab and have secure beams welded to the secondary or outer tank.
 - c. have piping located below the expected flood level on the downstream side of the tank, which is either securely strapped to the tank or contained in a secondary protective shaft that includes the vent pipe from the vault tank, which extends above the expected flood level.
 - Where floodwater is modelled to be of low velocity, elevation of the tank may be achieved by using compacted fill to raise the level of the ground above the expected defined flood event (refer to Figure 7).
 - Vertical and horizontal tanks should be protected from flood debris impact and velocity flow by:
 - a. protective walls which:
 - are higher than the expected flood level.
 - absorb the bulk impacts of flood debris and floodwater velocity flow.
 - include drainage holes at the base of the walls; or
 - b. concrete guard posts which are constructed at equal distances apart to surround the tank to protect it from flood debris.

Figure 5. Securing an aboveground tank to a concrete slab or counterweight

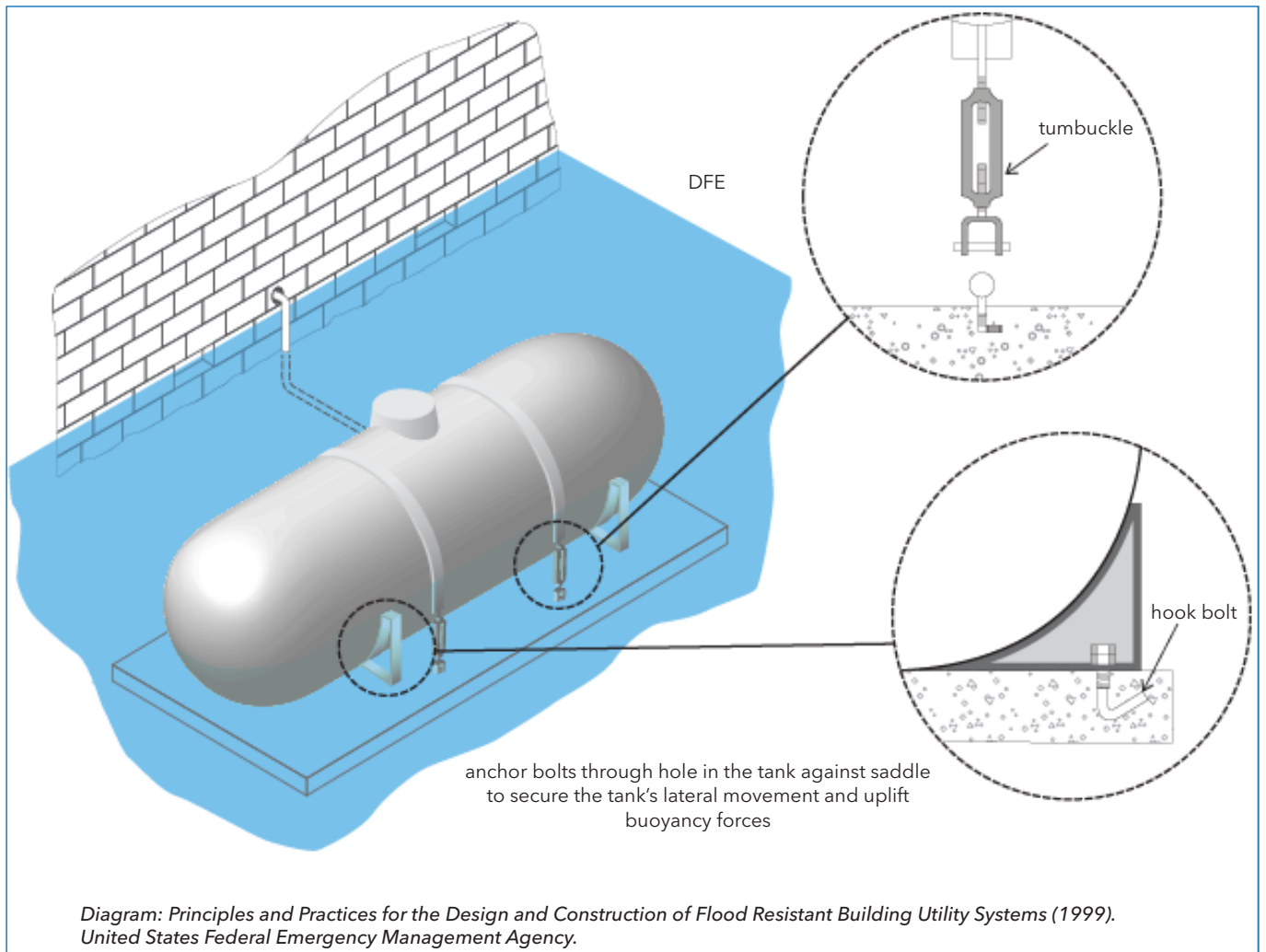


Figure 6. An elevated tank secured to a platform raised above the defined flood event

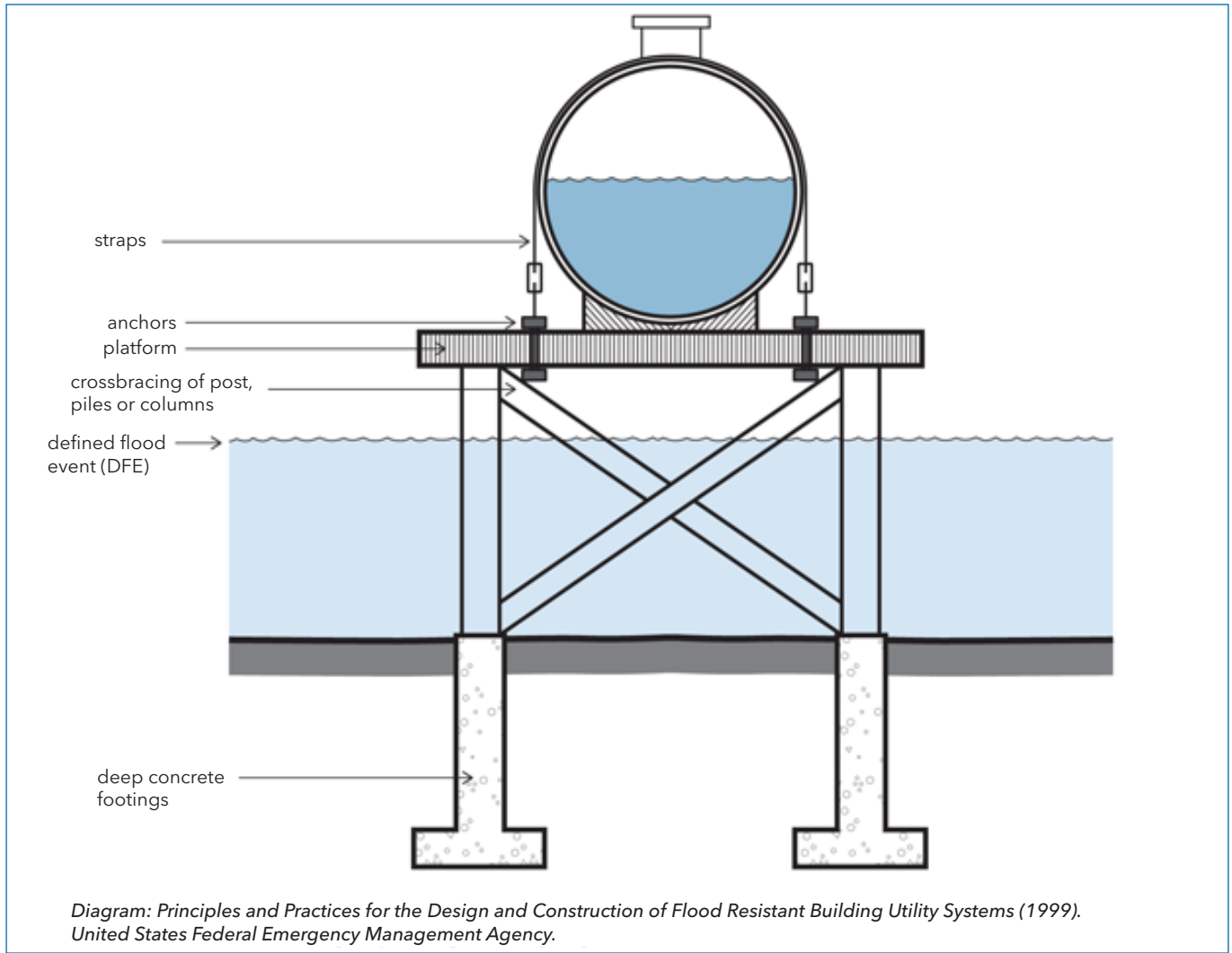
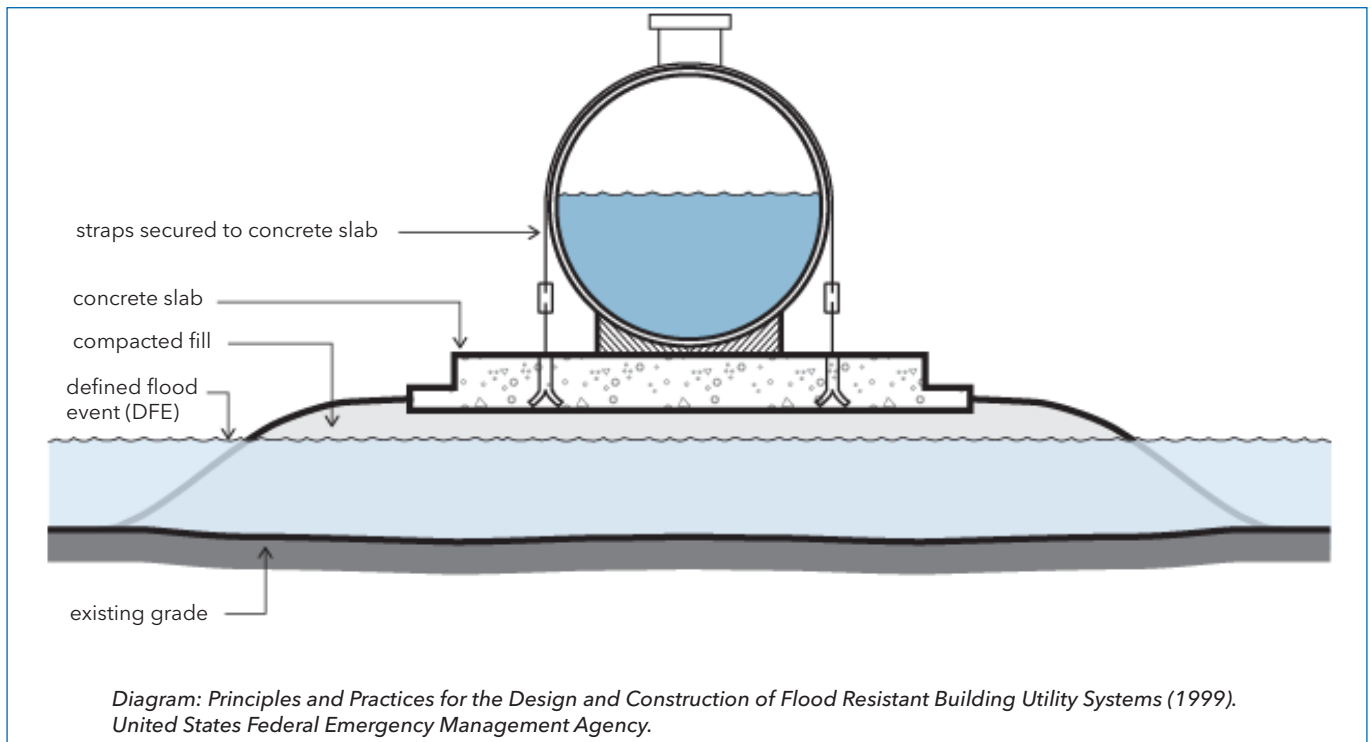


Figure 7. Securing an aboveground tank to a concrete slab or counterweight



6 Pipework

Pipework connected to underground or aboveground storage tanks can break and rupture during a flood, releasing hazardous chemicals to the environment.

This section provides advice on measures that can be used to prevent or minimise flood damage to pipework connected to underground and aboveground tanks. These measures can reduce the risk of release of hazardous chemicals to the environment during a flood:

- Pipework should be located above the flood level where possible. If it is not possible to elevate the whole length of a pipeline above the flood level, the pipe should be protected by:
 - a. strapping it to the downstream side of a vertical support structure, such as the structural support for the tank or the wall of a building;
 - b. burying it well below the expected scour and erosion line.
- Alternatively, vertical above-ground fuel lines can be provided with a protective utility shaft. This can be made of concrete, metal or rigid plastic pipe. They should extend above the expected flood level. Ideally, the protective shaft should be watertight, however if this is not possible, drainage holes should be provided at the base of the shaft. The flexibility of the fuel lines must not be compromised by using the protective utility shaft.
- Pipework should be designed to penetrate buildings, tanks and associated equipment at points above the flood level where possible.
- Vent pipes should be terminated above expected flood levels. This is important because floodwater entering through a vent pipe will potentially settle at the bottom of the storage tank, pushing hazardous chemicals out into the surrounding environment.
- During a flood, uneven settlement of a storage tank can occur due to soil saturation. Such movement can cause rigid, metallic pipe connections (such as fuel lines) to break off. Providing adequate flexibility for pipework reduces the likelihood of them rupturing and releasing hazardous chemicals into the environment. Protective secondary containment should ensure pipework flexibility whilst preventing the entry of floodwaters into the tank.
- Fuel dispensers, chemical pumps and associated equipment should be located above the expected flood level. This may be achieved by elevating equipment on an accessible deck or platform above the expected flood level.
- Automatic shut-off valves should be installed on all product pipework to prevent contamination where pipework breaks or disconnects from a storage tank during a flood.



References

Australian Standard AS1627: Metal finishing - preparation and pre-treatment of surfaces.

Australian Standard AS1940: The storage and handling of flammable and combustible liquids.

Australian Standard AS3754: Safe application of powder coatings by electrostatic spraying.

Australian Standard AS3780: The storage and handling of corrosive substances.

Australian Standard AS3833: The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers.

Australian Standard AS4114.1: Spray painting booths, designated spray painting areas and paint mixing rooms - Design, construction and testing.

Australian Standard AS4114.2: Spray painting booths, designated spray painting areas and paint mixing rooms - Installation and maintenance.

Australian Standard AS4326: The storage and handling of oxidising agents.

Australian Standard AS4361: Guide to lead paint management.

Australian Standard AS4452: The storage and handling of toxic substances.

Brisbane City Council (2015) Industry environmental guide for surface coating.

Brisbane City Council (2015) Industry environmental guide for motor vehicle smash repair.

Brisbane City Council (2015) Industry environmental guide for concrete batching.

ISO 14001, Environmental Management Systems - Specifications with guidance for use.

Queensland Department of Justice and Attorney - General (2013) Abrasive Blasting Code of Practice.

Queensland Department of Justice and Attorney-General (2013) Spray Painting and Powder Coating Code of Practice.

Commonwealth legislation

National Environmental Protection (National Pollution Inventory) Measure 1998.

Queensland State legislation

Environmental Protection Act 1994

Environmental Protection Regulation 2019

Environmental Protection (Water and Wetland Biodiversity) Policy 2019

Transport Operation (Marine Pollution) Act 1995

Work Health and Safety Act 2011

Brisbane City Council legislation

Brisbane City Plan 2014

Flood prepared inspection form

Business name:	Date:
Site address:	
<ul style="list-style-type: none"> • This inspection form should be tailored to suit the site and activities. • The inspection should be a visual inspection of all areas of the site. • As you work through the checklist, any item indicated as a 'No' should include an action to rectify. 	

Check item	Yes	No	N/A	Comment
Do you have a Flood Response Plan for the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have an up-to-date record of all hazardous chemicals stored at the site, including the type of chemicals, the volume stored and how they are stored?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the entry to the site and the outside of buildings where hazardous chemicals are stored, correctly placarded with HAZCHEM signs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all hazardous chemical storage tanks, containers, drums and packages clearly labelled?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all chemical storage tanks, containers, drums and packages structurally intact and not leaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are there any visible chemical spills anywhere at the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are hazardous chemical pipework, connections and automatic shut off valves intact, in good working order, with no leaks or damage?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all hazardous chemical storage containers, drums and packages stored within a suitable building or structure to prevent them being carried offsite by flood waters?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the chemical storage tank or structure able to resist flotation, collapse or permanent lateral movement during a flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Check item	Yes	No	N/A	Comment
Will you need to relocate any hazardous chemical containers, drums or packages to higher ground prior to a flood? If yes, do you have a written procedure and are staff trained to do this?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Will you need to restrain hazardous chemical containers, drums, packages or tanks, or fill them to weigh them down and limit their movement during a flood? If yes, do you have a written procedure and are staff trained to do this?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Will you need to put heavy items on top of underground storage tanks prior to a flood? If yes, do you have a written procedure and are staff trained to do this?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Have unnecessary chemicals and empty containers been removed from the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have a written procedure and are staff trained, to ensure all chemical storage tanks, containers, drums and packages are closed with a tight-fitting lid or cap, prior to a flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have a written procedure and are staff trained, to turn off the electricity to the chemical storage system, including dispensers, pumps, turbines, automatic tank gauging consoles and lighting, prior to a flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have a written procedure and are staff trained, to record chemical levels in storage tanks prior to a flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have a written procedure and are staff trained to close shear valves on pressurised piping, prior to a flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do you have a written procedure and are staff trained, to seal or cap vent pipes for aboveground and underground storage tanks to prevent water ingress, prior to a flood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Person conducting inspection:	Signature:
Site Management Representative:	Signature:
Notes:	



Dedicated to a better Brisbane

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