Copy of Chat from Essentials Webinar on Chlorine Gas and Land Use Planning with Responses from OIR

AS2927 is not mentioned! Is this standard applicable to the planning or entirely ignored?

> We view standards as a minimum baseline for compliance with WHS legislation and they may not constitute control of risk so far as reasonably practicable in many circumstances. Separation distances recommended in standards are generally inadequate for land use safety planning.
>
> AS2927:2019 (note 3 to table 6.1) recommends additional measures (e.g., containment building, scrubber etc.) when chlorine installations are located with 400m of sensitive land use. It appears WA Water Corp adopted this in their standard for chlorine buildings.
>
> We've been more conservative, selecting 850m as the distance beyond which a fatality caused by the release of the contents of one drum is unlikely. This is also covers "vulnerable" land use (schools, aged care, hospitals) which is not differentiated from sensitive land use in the standard.
>
> We are working with qldwater to develop a planning guideline for chlorine facilities which will take into account QLD planning legislation and other relevant info like AS2927.

Is there a certain quantity of Sodium hypo (neat concentration) that triggers a HCF classification?

> Sodium hypochlorite solution is not a Work Health and Safety Regulation (WHSR) schedule 15 chemical so there is no threshold. Hypo does have a vapour liquid equilibrium with chlorine gas, but the chlorine vapour pressure is low. It must be mixed with a large quantity of acid to liberate chlorine gas and is much lower hazard. There have been incidents where a hypo tank has had acid pumped into it by mistake – operators using both acid and hypo must have controls in place to minimise this risk.

2.5 tonnes - that is our maximum manifest quantity

> That is 10% of WSHR schedule 15 and should be notified to WHSQ, if not already: https://www.worksafe.qld.gov.au/safety-and-prevention/incidents-and-notifications/hazardous-chemical-notifications

Desiré Gralton from qldwater – please see:

https://qldwater.com.au/public/Disinfection-Options-Discussion-Paper.pdf?downloadable=1

This discussion paper provides local government decision makers with information to help them make informed choices about disinfection options for their water and sewerage schemes. It addresses the pros and cons of disinfection using chlorine gas, bulk liquid sodium hypochlorite, on-site generated sodium hypochlorite, and solid calcium hypochlorite.

> Perhaps this could include on-site chlorine generation? It's similar to on-site hypo but instead chlorine gas is extracted from the electrolyser and piped into the eductors. Only a tiny amount of chlorine gas is contained in the vacuum piping.
>
> On-site hypo generation could alleviate the hypo quality and supply issues for remote sites. There are also guides for managing sodium hypochlorite degradation which should be considered before switching to chlorine.

Is there cost savings to be made if you were to generate chlorine on site? Sounds power intensive.

> The operator would need to compare the costs of chlorine gas supply vs capital & operating cost of onsite generation. Safety considerations may override additional cost of on-site generation if the facility is too close to sensitive land use. I don't think it uses much power compared to pumping water or sewage aerators for example.

Could you share the link to the WaterCorp building standard please?

> https://www.watercorporation.com.au/About-us/Suppliers-and-contractors/Resources/Design-standards
>
> https://pw-cdn.watercorporation.com.au/-/media/WaterCorp/Documents/About-us/Suppliers-and-contractors/Resources/Design-standards/DS70-01-Chlorine-Buildings.pdf?la=en&rev=4a45e5c194cc468f9be1db7cde30869a&hash=9F14785170BAEFA169668C488354D46A&_gl=1*1tz7t8p*_ga*ODUzNDk5NjQwLjE3MTA4ODgwNjQ.*_ga_XS0K8Z5E0Y*MTcxMDg4ODA2NC4xLjAuMTcxMDg4ODA5NS4yOS4wLjA.

Relating back to the potential increased transport of chlorine to sites- Does anyone in the chat have practical experience relating to how the chlorine drums are generally delivered to an existing facility? Thinking along the lines that most likely point of drum rupture would be an unloading incident at the water treatment site.

> We consider the most likely cause of a large leak to be a dropped or impacted drum. The drums shell is very strong and unlikely to be breached if dropped from a few metres, but the drum valves could be sheared of if impacted. The drum valves are protected by being recessed in the dished drum ends. Drums / drum valves could be damaged by wayward forklift tines or other vehicle impact. It's hard to predict all the ways drum could be mishandled.
>
> Other sources of smaller leaks could be poorly made yoke connection, damaged seals, operator error e.g., opening valve before securing yoke. There are also some corrosion mechanisms on the drum valves – I have sent Georgina at qldwater a paper on this.

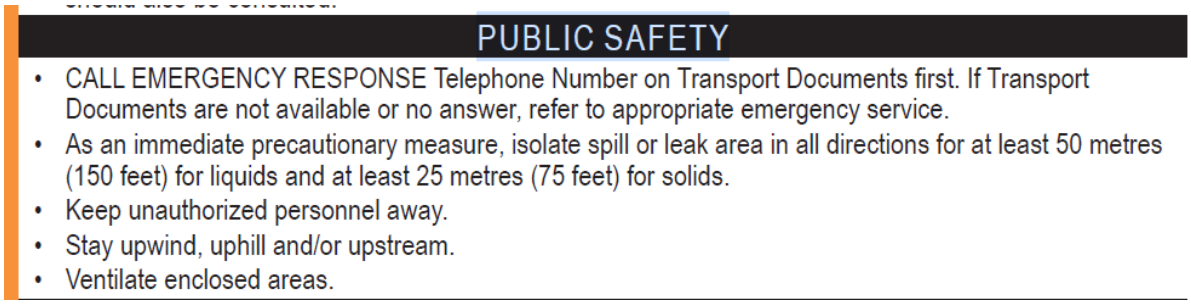
Does this prevent new residential development within 850m of an existing treatment plant which stores 3 drums of chlorine gas? Would constructing a shed as in the case study allow approval?

> Not yet, we review council planning schemes when they are being renewed and recommend a separation distance of 850m whether it's a new water treatment facility or development near an existing one. This applies to any facility with one or more 920kg drum noting that the worst-case incident is a total loss of the contents of one drum, so more drums doesn't significantly increase the off-site consequences. As drums are handled individually, I'm not aware of a mechanism that could damage more than one drum at a time – perhaps if a few drums involved in a fire they could rupture?
>
> This is a recent practice has not yet been adopted in any council planning scheme – it's a long term goal (10+ years) to have simple and clear separation requirements in council planning schemes.
>
> In the meantime, new installations of 3 or more drums are assessed through state planning review (State Code 21). There isn't much preventing encroachment on existing facilities as councils are generally unaware of the hazards. We are trying to improve that through education and QLD Water could help us with advocacy on that.
>
> A containment building and scrubber may be an appropriate solution if separation distances can't be achieved, depending on a holistic analysis of the particular situation – we can't really generalise on that.

There are a number of ways drums delivered by truck can be unloaded and the drums transferred to the storage room.

On the number of trucks issue, if you go to hypo you are transporting mostly water and will have more trucks transporting a dangerous chemical with a risk of a tank leaking and the risks of spills during unloading.

> Spills of 12% sodium hypochlorite will typically not liberate large amounts of toxic chlorine gas unless mixed with acid.
>
> As a way of comparing the hazards between hypo and chlorine gas I've excerpted the respective actions from the Australia and New Zealand Emergency Response Guidebook 2021:
>
> For Sodium Hypochlorite there is a generic response:



PUBLIC SAFETY

- CALL EMERGENCY RESPONSE Telephone Number on Transport Documents first. If Transport Documents are not available or no answer, refer to appropriate emergency service.
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 metres (150 feet) for liquids and at least 25 metres (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate enclosed areas.

For chlorine gas, specific evacuation and protection distances are recommended:

UN No.	Guide	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package) First ISOLATE in all Directions Metres (Feet)	SMALL SPILLS Then PROTECT persons Downwind during DAY Kilometres (Miles)	SMALL SPILLS Then PROTECT persons Downwind during NIGHT Kilometres (Miles)	LARGE SPILLS (From a large package or from many small packages) First ISOLATE in all Directions Metres (Feet)	LARGE SPILLS Then PROTECT persons Downwind during DAY Kilometres (Miles)	LARGE SPILLS Then PROTECT persons Downwind during NIGHT Kilometres (Miles)
1017	124	Chlorine	60 m (200 ft)	0.3 km (0.2 mi)	1.4 km (0.9 mi)	Refer to table 3		

TABLE 3 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES FOR LARGE SPILLS FOR DIFFERENT UANTITIES OF SIX COMMON TIH (PIH in the US) GASES

TRANSPORT CONTAINER	First ISOLATE in all Directions metres	(Feet)	Then PROTECT persons Downwind during DAY Low wind (6 mph 10 km/h) km	(Miles)	Moderate wind (6-12 mph 10 - 20 km/h) km	(Miles)	High wind (12 mph > 20 km/h) km	(Miles)	NIGHT Low wind (6 mph 10 km/h) km	(Miles)	Moderate wind (6-12 mph 10 - 20 km/h) km	(Miles)	High wind (12 mph > 20 km/h) km	(Miles)
	UN1017 Chlorine: Large Spills													
Rail tank car	1000	(3000)	10.1	(6.3)	6.8	(4.2)	5.3	(3.3)	11	(7)	9.2	(5.7)	6.9	(4.3)
Highway tank truck or trailer	600	(2000)	5.8	(3.6)	3.4	(2.1)	2.9	(1.8)	6.7	(4.3)	5.0	(3.1)	4.1	(2.5)
Multiple ton cylinders	300	(1000)	2.1	(1.3)	1.3	(0.8)	1.0	(0.6)	4.0	(2.5)	2.4	(1.5)	1.3	(0.8)
Multiple small cylinders or single ton cylinder	150	(500)	1.5	(0.9)	0.8	(0.5)	0.5	(0.3)	2.9	(1.8)	1.3	(0.8)	0.6	(0.4)

The current AS2927 recommends not having drums being lifted over other connected drums when transferring. A lot of older buildings/systems don't have this capability.

This seems to be an argument to upgrade the existing arrangement to minimise risk so far as reasonably practicable as required by work health and safety legislation.

Do you have the information on major releases or minor for Australia?

No, ideally the water industry bodies would collate this info. We'd need to undertake a research project to gather such information.

How do we make changes without base knowledge?

In my response below, I'm assuming this comment is in relation to the lack of chlorine incident statistics -

Catastrophic hazardous chemical incidents are rare and the available incident data is incomplete. The small sample sizes are not sufficient for making statistical inferences about the likelihood of incidents in the future.

Under WHS law, it isn't necessary to have statistical evidence about the likelihood of an incident, only that it is reasonably foreseeable. The best we can do is identify the hazards and risks and implement controls to eliminate or minimise the risks. The damage mechanisms we have discussed (dropped drum, connection errors, corrosion) are reasonably foreseeable and should have controls in place.

A plane crashing into a chlorination building in most locations is an example of something that is not "reasonably foreseeable" and does not need additional controls. However, it should be noted some existing facilities have been located near the ends of runways where the statistical chance of a crash is significant. Perhaps alternatives to chlorine gas should be considered at these facilities. Appropriate planning should avoid the ends of runways for the development of new facilities.

Elimination is the highest on the hierarchy of controls and safer alternatives to chlorine should be considered wherever reasonably practicable, this is a clear requirement and core principle of WHS legislation. Isolation / separation is next on the hierarchy while engineering controls are lower.

Water providers should be aware of their duties under the WHS Act and manage risk as required by Chapter 3 of the Work Health and Safety Regulation: https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2011-0240#ch.3