WHAT THE CHANGES TO THE CHLORINE GAS STANDARD AS 2927 MEAN FOR YOU

Christopher Howard, *Senior Portfolio Manager,* Ixom
Nathan McCluskey, *Chemical Systems Manager,* Ixom

ABSTRACT

Communities across Australia rely on effective water treatment and disinfection to ensure they can drink water and interact with local waterways without the risk of illness. Disinfection using chlorine gas is one of the most common, reliable and effective means of disinfecting municipal water. The Storage and Handling of Liquefied Chlorine Gas standard AS2927 has undergone a revision by Standards Australia in consultation with industry users of chlorine, emergency services and regulators. This standard was released on the 20th of December 2019.

The previous revision of this standard was reviewed and released in 2001. Since that time there has been a number of changes to equipment available and used in chlorine installations, and other changes in industry relevant to the operation of chlorine installations. The updated standard incorporates these changes to ensure ongoing relevance and improved safe handling of chlorine gas.

The purpose of this paper is to provide an overview on what has changed in the standard and practical guidance on how it impacts water operators' installations. It will also cover the support that is available for water operators and managers to assist them in meeting the requirements of the new standard and continuing to manage their operations safely.

1.0 INTRODUCTION

AS/NZS 2927:2001 The Storage and Handling of Liquefied Chlorine Gas has undergone a revision by Standards Australia in consultation with industry, users of chlorine, emergency services and regulators. This standard was released on the 20th of December 2019. This paper highlights some key changes relevant to chlorine users.

The previous revision of this standard was reviewed and released in 2001. Since that time there have been a number of changes to equipment available and used in chlorine installations, and other changes in industry relevant to the operation of chlorine installations. The updated standard incorporates these changes to ensure ongoing relevance.

Since the release of the standard, Ixom's Chemical Risk Management Team has conducted a number of site installation audits on chlorine installations. These audits are used as a gap analysis to allow users to identify non-conformances as a consequence of changes in the standard, or previous non-conformance. Closing these gaps are an important way to reduce the hazards associated with the storage and handling of chlorine gas.

2.0 DISCUSSION

The following document outlines some of the key changes in the AS2927:2019. This is not an exhaustive list of all changes and Ixom recommends a full review in context each installation.

2.1 Separation Distances

The previous separation distance table has been replaced with 3 separate tables, depending on whether chlorine is

- Stored with cap nuts and valve covers in place
- Connected for use at an installation
- Additional separation distances when chlorine is used at a public pool

A larger number of chlorine quantities are specified in these tables. This table uses a risk-based approach to determine appropriate separation distances depending on the risk posed by a chlorine installation type to an individual.

The use of system designs which pose a lower risk of a leak, such as vacuum systems or emergency shutdown systems, reduces the risk posed to individuals and therefore shorter distances are allowed.

The previous credits that were applied for the use of leak detectors and mechanical ventilation have been replaced with the use of vacuum regulator systems, automatic shutoff devices and scrubber systems.

2.2 Transit Storage

Section 3 Transit Storage is a new chapter that details requirements of transit storage areas, where chlorine is temporarily stored on vehicles during transport from the point of supply to point of delivery for a period of 12 hours to 5 days. This primarily reference the Australian Dangerous Goods code.

The reason for this change is to minimize handling of containers, allowing a reasonable time frame with appropriate controls in place, to reduce the risk of handling incidents.

2.3 Storage and Handling Areas

Section 4 Storage and Handling Areas is a new chapter clarifying the requirements for areas where chlorine is stored but not used.

The intent of the change is to give clear advice for locations that only store chlorine gas.

2.4 Specific Requirements for Pools

Section 5 Requirements for Chlorine Installations at Public Swimming Pools was created to detail the requirements for public pools.

Due to the proximity of the public to chlorine installations at pools, and the wide range of public including sensitive populations (such as children and the elderly) that present

complications in an evacuation compared to a controlled site, a number of equipment controls have been implemented. Many of these controls are already in place at most pool installations. These include the use of leak detectors, automatic shutdown systems, vacuum regulators, and wind direction indicators.

2.5 Chlorination Equipment

Various updates have been made to the standard to reflect vacuum systems and other equipment that has developed since the 2001 revision of the standard.

A key point to note is the requirement that vacuum regulators are not to be used as isolation devices. Individual valves are required for this purpose.

2.6 Pressure relief lines

Changes include:

1. Clarification of location of discharge points.
2. Discharge points are to be located 200-300mm above floor level to prevent chlorine passing a person's breathing space when falling to ground.
3. If the termination point is indoors a chemical absorbent canister is required to mitigate any releases (such as small releases due to changes in vacuum conditions).

If a system has a capacity of more than 15kg per hour a risk assessment is required to determine the location of the vent and whether a leak detector is required at that location

2.7 Ventilation requirements

There have been significant additions to both natural and mechanical ventilation requirements in the 2019 revision.

A number of additional allowable configurations for natural ventilation have been added.

Mechanical ventilation systems can be operated either to vent off and dilute a leak, or to turn off and contain a leak. The selection of which will depend on a risk assessment completed on the installation.

Other changes include:

1. Adjustments to the required capacity of the system, which is now fully dependent on the floor area.
2. Addition of air velocity requirements
3. Additional details on the location of air intakes and exhausts

2.8 Leak Detectors

The updated standard requires the use of leak detectors in all chlorination rooms and all rooms where chlorine is connected for use. Detectors are not mandatory at storage only locations but are recommended.

Chlorine alarms must be monitored at all times. Weekly manual tests of sensor elements can be replaced by daily self-checks by sensors which have this capability. A full system test conducted monthly of all alarms and associated equipment.

The number and location of leak detectors must be determined based on a risk assessment of likely leakage points at the installation.

2.9 Wind Direction Indicators

Wind direction indicators are now mandatory at all installations where chlorine is connected for use.

2.10 Emergency Response Plans

Emergency services are to be consulted in the development of emergency response plans. Emergency plans require steps to mitigate or stop the leak or the impact of the leak. Emergency plans must be tested on a periodic basis

2.11 Personal Protective Equipment

Goggles worn during connection and disconnection activities must be gas tight.

The requirement for chemical resistant gloves has been replaced with gloves to mitigate the risk of thermal injury from a leak whilst maintaining manual dexterity.

If personnel completing connections and disconnections are not wearing SCBA, they must be provided with an escape canister or cartridge respirator. Note lone workers completing these activities must wear SCBA.

2.12 Medical Examination

Section 8 has been updated so that those using SCBA should undergo an examination. Persons with a history of asthma or respiratory disease should have their exposure risk assessed by an occupational hygienist and reviewed by a physician.

2.13 Personnel Training

Section 8 has been updated to include awareness of chlorine hazards in site inductions.

It also requires that training shall provide for revalidation of skills and knowledge for periods not exceeding 3 years and whenever changes occur on site, or if the operator has not performed the tasks within the previous 18 months under a formalised system.

2.14 Management of Change

A new clause has been added to specify that a management of change system is required for chlorine installations. This includes temporary repairs under a management of change process.

2.15 Compliance Findings

Since the introduction of the updated standard, Ixom's Chemical Risk Management team has conducted approximately 100 site audits. A summary and ranking of the most common opportunities for improvement has been prepared in the table below. The AS 2927 sections are ranked by the number of improvement opportunities identified in the Ixom AS2927 audits.

Table 1 - ranking of AS 2927 sections by # of Ixom audit corrective actions

Ranking (most to least)	Item	Comment
1	Leak detector location based on risk assessment	A new requirement of the 2019 revision of the standard.
2	Emergency plans tested within the last 2 years	A new requirement of the 2019 revision of the standard.
3	Mechanical ventilation inlet velocity	A new requirement of the 2019 revision of the standard.
4	Pressure relief location 200-300mm	A new requirement of the 2019 revision of the standard.
5	Medical examinations and assessments	Requirement of previous standard
6	MoC in place	A new requirement of the 2019 revision of the standard.
7	Correct gloves worn	The previous standard required chemical resistant gloves, which did not allow for sufficient dexterity when connecting vacuum regulators.
8	Regulators not used as isolation device	A new requirement of the 2019 revision of the standard.
9	Escape respirators available	A new requirement of the 2019 revision of the standard.
10	Mechanical ventilation volumetric capacity	Requirement of previous standard
11	Training within 3 years	A new requirement of the 2019 revision of the standard.
12	Gas tight goggles or SCBA worn	Requirement of previous standard
13	MoC compliant	A new requirement of the 2019 revision of the standard.
14	Alarm systems tested monthly	A new requirement of the 2019 revision of the standard.
15	Compliant Natural Ventilation configuration	Requirement of previous standard
16	Separation Distances	Predominantly due to proximity to flammables, non-compliant pools due to updated separation distances, or previous non-conformances to 2001 separation distances
17	Leak detectors tested weekly (or fitted with daily self test)	Requirement of previous standard
18	Wind direction indicators	A new requirement of the 2019 revision of the standard for all connected chlorine sites.
19	Leak detectors installed where required	A new requirement of the 2019 revision of the standard for all connected chlorine sites.

3.0 CONCLUSION

The chlorine gas standard AS 2927 is an invaluable resource for chlorine gas users as it provides guidance on how to use this important chemical safely. Since its last revision in 2001 there has been a number of changes to equipment available and used in chlorine installations, and other changes in industry relevant to the operation of chlorine installations. The 2019 standard update incorporates these changes to ensure more relevant advice for operators on managing chlorine gas safely.

Ixom recommends that all customers review the updated standard and assess how it may impact your installation.

Resources are available to assist water treatment operators with compliance. As a key partner in the development of the 2019 standard, Ixom can assist with implementation of the 2019 standard at your facility by;

1. Conducting an audit to the 2019 standard, identifying any gaps or opportunities for improvement, and recommending actions.
2. Conducting training of your workforce and contractors on the safe handling of liquefied chlorine gas, connection/disconnection procedures, and maintenance of chlorine systems.
3. Creating, reviewing and/or updating emergency response plans in line with relevant standards and legislation.
4. Facilitating emergency exercises to test emergency response plans, as both desktop simulations and field exercises.
5. Conducting risk assessments of chlorination facilities to identify hazards on site not otherwise identified or managed in AS 2927.
6. Provision of chlorine related safety equipment, such as Chlorguard® Automatic Shutoff Devices, drum lifting beams, cylinder trolleys, cylinder transport trailers, capping kits and spares, and chlorination facility upgrades (design and/or construct).

For further information on these services or other support you require contact your Ixom Account Manager or email chemical_risk_management@ixom.com

4.0 ACKNOWLEDGEMENTS

The authors would like to thank the members of the AS 2927 standard review panel for their work developing this important resource and industry for providing their feedback on the standard through the public comment stages.

Finally, the authors would also like to thank water operators and other chlorine gas users who have already had their systems audited to AS 2927 for their focus on improving the safe use of chlorine gas.

5.0 REFERENCES

SAI Global (2019), AS 2927:2019 - The Storage and Handling of Liquefied Chlorine Gas