Duty of Care Associated with Operating Ammonia Refrigerated Plants

Presenter: Craig Willis

B.E.(Mech)(Hons), MAIRAH, GradIE Aust.

Australian Institute of Refrigeration Air Conditioning And Heating

WorkSafe VICTORIA Victorian WorkCover Authority

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Definition of Duty Of care Principles

- *To ensure the health, safety and welfare of all employees and others who come on to the work place.*
- *Take measures to control Risks*
- *Create opportunity for Cooperation between employees and the employer to review health and safety issues.*

Issues of compliance with the Standards

- *A guide for common work practises.*
- *Work Safe Inspectors may use such standards, in references to common work practises.*
- *Alone is not a Legal requirement.*

BUT

- *Where Federal or State legislation adopts a standard it has the force of law.*

Work Safe VICTORIA Victorian WorkCover Authority

STANDARDS Australia

These Requirements are made under Authority Of the Section 45B of the Explosives and Dangerous Good Act 1961, WA Gov.

Department of Industry and Resources

1.0 GENERAL

Ammonia is a gas with a distinctive pungent odour which can be detected by smell below 5 ppm. It is colourless, lighter than air in ambient conditions and chemically reactive. The most important health hazard is eye and respiratory tract irritation. Ammonia is flammable at concentrations between 16-25% by volume in air.

The design, installation, testing and operation of ammonia refrigeration systems shall comply with AS/NZS1677.2:1998 - Refrigeration Systems (Part 2: Safety Requirements for Fixed Applications). Section 2.0 (below) is essentially a summary of the relevant requirements of Australian Standard AS/NZS1677.2. It is considered unlikely that a person will be able to satisfy the requirements of this Standard purely by reference to this Guidance Note, therefore it is strongly recommended that AS/NZS1677.2 be reviewed in depth.

For every refrigerant system using ammonia as a refrigerant and holding more than 50L of liquefied anhydrous ammonia, it is required that a person, *competent and experienced* in the field of anhydrous ammonia refrigeration systems (see definition above), inspects the system and produces a written report, at the licensee's expense, indicating findings and recommendations in relation to compliance with AS/NZS 1677.2. This report shall be made available upon request to an Inspector of the Explosives and Dangerous Goods Division. If the refrigerating system does not fully comply with the requirements of AS/NZS 1677.2, the report must give a detailed explanation on how future compliance can be achieved or an equivalent level of safety is achieved.

Fixed installation refrigerant systems holding more than 50L of liquefied anhydrous ammonia shall be licensed in accordance with Regulation 4.1 of the Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.

The segregation distances and separation distances of the ammonia containers shall comply with Regulation 4.7 of the Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.

Australian Standards

- *AS 1677. part:1 :Refrigerant Classifications*
- *AS 1677. part:2 :Safety requirements for a fixed application.*
- *AS1200:Pressure vessels, heat exchanges and pressure pipe work.*
- *AS 3666:Air handling & water systems of buildings – Microbial control.*
- *AS 2022:Protection clothing*

Risk management issues

- ***Training***
- ***Hazard Identification***
- ***Maintenance***
- ***Ammonia Storage capacity***
- ***Plant Location***
- ***Australian Standard Compliance.***

Emergency procedures within the plant itself

- ***24 hour monitoring***
- ***Formulated plan with local authorities***
- ***Details on Hand:***

✓ ***Key isolation valves***

✓ ***Electrical main switches***

✓ ***Emergency stop buttons***

✓ ***Plant room layout***

Ammonia as a dangerous good

RESPECT

- ***Occupational Health & safety***
- ***Flammability***
- ***Environmental***

Occupational Health & safety

- ✓ ***Training***
- ✓ ***Personal Protective Equipment.***
- ✓ ***Emergency plans***
- ✓ ***Training***

Ammonia Leak

Q. Is Ammonia Lighter than air

A. Yes it is….As a gas

Q. Can it be Heavier than air

A. Yes it can….As an aerosol

Q. Should I wash down a liquid spill.

A. NO.. Ammonia as a liquid spill will boil off slowly due to is large latent heat. Adding water will cause the liquid to boil rapidly and form aerosols.

The effect of ammonia concentration

Vapour Concentration (p.p.m. V/V)	General effect	Exposure
25	*Odour, detectable by most persons*	*Max. for 8 hour working period*
100	*No adverse effects for average worker*	*Deliberate exposure for long periods not periods*
400	*Immediate nose and throat irritation*	*No serious effect after ½ - 1 hour*
700	*Immediate eye irritation*	*No serious effect after ½ - 1 hour*
1700	*Convulsive coughing severe eye nose and throat irritation*	*Could be fatal after 30 minutes*
2000-5000	*Convulsive coughing severe eye nose and throat irritation*	*Could be fatal after 15 minutes*

Flammability

Concentrations of ammonia mixed with air can become flammable

The required concentrations 16-25% per volume of air and as little as 8% per volume of air if also mixed with oil.

Elements that reduce the threat of an explosion:

- ***High concentrations of ammonia around 160,000 p.p.m***
- ***High ignition temperature of +651deg C***
- ***Low flame propagation and low flame stability***
- ***Detectable at low concentrations***
- ***Plant room ventilation***

Environmental

- ✓ Ozone Depletion potential (ODP) of Zero.
- ✓ Doesn't directly contribute to Global Warming.
- ✓ Biodegradable
- ✓ Highly energy efficient

Thank you

Any Questions??

References

1) Department of Industry and Resources W.A Government: Guidance Note S322 REV 3: Requirement for refrigeration system using Anhydrous Ammonia as Refrigeration.

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3) Workcover.nsw.gov.au: What is duty of care.

4) Ammonia as a refrigerant: ASHRAE, April 2002

5) Ammonia Spills in New York State: Health Substances Emergency Events Surveillance, New York State Department of Health, Bureau of Toxic Substance Assessment, September, 2000.

6)DA21 Application Manual: Ammonia Refrigeration, AIRAH 2000.

7)Ammonia refrigeration safety - an overall approach. By Ian Wilkie: Pub AIRAH Journal July 1994.

About WorkSafe

John Rodda

Getting the message out

WorkSafe
VICTORIA

Operating Ammonia Refrigeration Plants

- lack of maintenance
- qualified persons doing the maintenance
- SCBA and qualified persons
- wind direction devices
- confined spaces
- Emergency Management for the emergency services

More information

- **Call** WorkSafe Advisory line for compensation and health and safety questions
  - 1800 136 089
- **Visit** our website for future guidance www.worksafe.vic.gov.au
- **Use** your support networks
  - Industry and professional associations
  - Unions

Questions?

Ammonia Training
Plant Operations Level 1 and Level 2 courses now Available

Australian Institute of Refrigeration Air Conditioning And Heating

Contact:

Ms Heather White

Ph:03 8623 3000

Mobile:0435 669 903

Email: heather@airah.org.au

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