

NDMRB-RA-092

Risk Assessment: Hydrogen Gas

Scope

Hydrogen is a flammable, colourless, odourless, compressed gas packaged in cylinders at high pressure. It poses an immediate fire and explosive hazard when concentrations exceed 4%. It is much lighter than air and burns with an invisible flame. High concentrations that will cause suffocation are within the flammable range and must not be entered. Cylinder storage locations should be well protected, well-ventilated, dry, and separated from combustible materials. Cylinders should never knowingly be allowed to reach a temperature exceeding 52°C.

Cylinders of hydrogen should be separated from oxygen cylinders or other oxidizers by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high having a fire resistance rating of at least 1 hour. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling or being knocked over. Protect cylinders from physical damage; do not drag, roll, slide or drop. Use a suitable hand truck for cylinder movement. Post "No Smoking or Open Flames" signs in the storage areas. There should be no sources of ignition. All electrical equipment should be explosion proof in the storage and use areas. Storage areas must meet national electric codes for class 1 hazardous areas.

HANDLING: Do not "open" hydrogen cylinder valve before connecting it, since self-ignition may occur. Hydrogen is the lightest gas known and may collect in the top of buildings without proper ventilation. It may leak out of a system which is gas-tight for air or other gases. Leak check system with leak detection solution, never with flame. If user experiences difficulty operating cylinder valve, discontinue use and contact supplier. Use only approved CGA connections. DO NOT USE ADAPTERS. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

This replaces TDI-RA-030

Name of assessor:	Andrea Keepence-Keyte – Laboratory Manager	Date of Assessment:	Oct 2014	Review Date:	Every 3 years
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Risk Matrix:

Risk Matrix		Likelihood			
		High	Medium	Low	Negligible
Consequence	Severe	High	High	Medium	Effectively Zero
	Moderate	High	Medium	Medium/low	Effectively Zero
	Insignificant	Medium/Low	Low	Low	Effectively Zero
	Negligible	Effectively Zero	Effectively Zero	Effectively Zero	Effectively Zero

Risk Assessment:

Hazard (Cause and consequence)	Affected Groups	Existing controls	Risk	Further Action
<p>Hydrogen is an asphyxiant. It should be noted that before suffocation could occur, the lower flammability limit of hydrogen in air would be exceeded possibly causing both an oxygen-deficient and explosive atmosphere. Exposure to moderate concentrations may cause dizziness, headache, nausea and unconsciousness. Exposure to atmospheres containing 8-10% or less oxygen will quickly bring about unconsciousness without warning leaving individuals unable to protect themselves.</p> <p>Lack of sufficient oxygen may cause serious injury or death.</p>	Staff and Students	<p>Hydrogen cylinders are kept in a well-ventilated area and controlled release is made using a hydrogen regulator</p> <p>Only trained users allowed of this canister</p> <p>Hydrogen is only used in small amounts and must be used in experiments in a fume hood.</p> <p>Ensure that only a hydrogen regulator is used with the cylinder and check regularly for leaks.</p>	Medium	Training to be provided before the use of hydrogen
<p>Fire.</p> <p>Hydrogen is a highly flammable gas that burns with an invisible flame</p>	Staff and Students	<p>Hydrogen is kept separately from all other gases and from any sources of ignition. Hydrogen is ignited with low ignition energy, including static electricity.</p> <p>Only balloon filled amounts are used in the laboratory.</p> <p>No naked flames and no smoking in the vicinity of hydrogen</p>	Medium	<p>Ensure that staff are adequately trained.</p> <p>Ensure that staff are fully aware of the hazards associated with hydrogen</p>

<p>Use of a compressed gas:</p> <ul style="list-style-type: none"> • Impact from the blast of a gas cylinder explosion or rapid release of compressed gas • Impact from parts of gas regulators that fail, or any flying debris • Impact from falling cylinders • Manual handling injuries (Musculoskeletal Disorders) 	<p>Staff and students</p>	<p>All of the risks of using a compressed gas are outlined and highlighted in NDMRB-SOP-001 and NDMRB-RA-065</p> <p>These risk assessments and SOP's must be read and understood before using any compressed gases.</p>	<p>Medium</p>	<p>Ensure that all staff who use compressed gas of any description, including hydrogen, read and understand the SOP and RA that have been highlighted.</p>
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Signed By Author:

Approved by (sign and print):

Reviewed by:

Review date: