



## **Technical Information Sheet**

**TIS No 27: 2012**

# **MODEL RISK ASSESSMENT FOR THE SAFE USE OF LIQUID NITROGEN DEWARs**

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## MODEL RISK ASSESSMENT FOR THE SAFE USE OF LIQUID NITROGEN DEWARS

### INTRODUCTION

Every day dewars containing liquid nitrogen and other cryogenic liquids are used in the workplace or transported by road without incident. BCGA Code of Practice 30 (7) defines 'safe use' practices for liquid nitrogen dewars; this Model Risk Assessment is intended to support CP 30 (7) and provide a structured approach for employers and employees to evaluate related workplace hazards.

This does not constitute a comprehensive assessment of all workplace hazards as required under the Management of Health and Safety at Work Regulations (2) and additional specific risk assessments may be required, e.g. manual handling (BCGA TIS 17 (12)).

Note: the principle of this risk assessment can be applied to other cryogenic liquids such as argon, helium and oxygen, however, these other substances may introduce additional hazards specific to their own chemical or physical nature which will then require further evaluation.

Employees handling liquid nitrogen using dewars are likely to encounter one or more of the following significant hazards:

- Oxygen depletion, asphyxiation
- Contact with the liquid, cold burns
- Slips & trips, fogging / ice / wet flooring
- Muscular / skeletal damage
- Noise, hearing loss / damage caused by pressure relief / venting valves
- Pressure, eye / hand damage
- Trapping / cuts / abrasions, due to working parts on vessel

Each hazard requires specific control measures at each stage of the task; from obtaining the liquid nitrogen from the storage place to decanting.

Five separate model risk assessments have been produced considering the following activities:

- 1 - Storage of liquid nitrogen dewars.
- 2 - Moving liquid cylinders from store to decant areas.
- 3 - Decanting of cryogenic liquid from storage vessel to a dewar.
- 4 - Decanting of cryogenic liquid from a dewar.
- 5 - Transport of cryogenic liquid dewars.

For instructions on how to use the model risk assessments refer to " What to Do" page.

#### Notes:

It should be noted that this model risk assessment does not cover:

1. The detailed calculations required for safe storage / moving / decanting / use in a confined space. A separate risk assessment must be carried out if moving vessels in lifts.
2. Specific assessment of hazards associated with fixed tank cryogenic storage, except where the hazards are directly associated with the filling of dewars.

## HOW DO YOU RATE RISK?

Risk is a combination of the likelihood of an incident occurring and the severity of the injury or loss due to the incident.

The Likelihood versus Severity Matrix below is a means for rating risk.

### Likelihood / Severity Matrix

		Risk Rating		
LIKELIHOOD	High	Medium	High	Severe
	Medium	Low	Medium	High
	Low	Insignificant	Low	Medium
		Low	Medium	High
		SEVERITY (LOSS)		

**Likelihood:** Based on the precautions / controls in place to prevent an incident occurring.

<b>High:</b>	Where no precautions are put in place and the employee can only avoid an incident by following verbally communicated procedures - which typically are only short term. No physical barriers or controls in place.
<b>Medium:</b>	Limited physical barriers or controls in place. The employee can only avoid an incident by working carefully, following training, work instructions and safety procedures.
<b>Low:</b>	Physical barriers or engineering controls such as Flashback Arrestors and Non Return Valves in place to minimise the likelihood.

**Severity:** The degree of injury to the employee or third party, or the cost of loss due to property damage.

#### Personal Injury

<b>High:</b>	Death or disabling injury.
<b>Medium:</b>	Serious injuries requiring medical treatment and time off from work.
<b>Low:</b>	Minor injuries.

		Business Size	
		Large	Small
<b>High:</b>	Where the cost of the incident would exceed:	£100,000	£20,000
<b>Medium:</b>	Where the cost of the incident is between:	£10,000 & £100,000	£2000 & £20,000
<b>Low:</b>	Where the cost of the incident could reasonably be expected to be less than:	£10,000	£2,000

## HOW TO CARRY OUT THE ASSESSMENT

The risk assessment should be carried out by persons who have been trained in the use of liquid nitrogen dewars and understand the concept of risk assessment.

1	Select the Risk Assessment form for the activity to be risk assessed.
2	Enter details in required fields at the top of the Risk Assessment form.
3	For each <b>Situation / Activity</b> record the existing control measures in place beside each of the applicable recommended control measures.
4	Based on a comparison of the existing control measures in place against the suggested control measures stated carry out risk rating for each situation / activity by entering a rating of <b>Low, Medium or High</b> for both the <b>Severity</b> and the <b>Likelihood</b> .
5	Using the Risk Rating Matrix determine the level of risk and enter the result in the Risk Rating column.  Examples: 1. If Likelihood is <b>Low</b> , and Severity is <b>Medium</b> , Risk rating is <b>Low</b> . 2. If Likelihood is <b>High</b> , and Severity is <b>Medium</b> , Risk rating is <b>High</b> .
6	Decide the result for level of control and enter it onto the Risk Assessment form in the appropriate column ( <b>Result</b> ).  There is a link between the <b>Risk Rating</b> and the <b>Result</b> as follows:  Risk Rating = Insignificant (IR), Result is likely to be Adequately Controlled. Risk Rating = Low Risk (LR), Result is likely to be Adequately Controlled or Minor Residual Risk. Risk Rating = Medium Risk (MR), Result is likely to be Minor Residual Risk or Not Adequately Controlled. Risk Rating = High Risk (HR) or Severe Risk (SR), Result is likely to be Not Adequately Controlled.
7	If the result is " <b>Not Adequately Controlled</b> " decide what action is required to reduce the risk to as low as reasonably practicable (ALARP) and record the same in the <b>Remedial Action</b> column.
8	Do not continue with the activity until risk is reduced to as low as reasonably practicable (ALARP).

## **RISK ASSESSMENT FILTER**

Use this filter if you think that the activity to be assessed is low risk - it will quickly and easily confirm this.

A full risk assessment shall be documented if:

- 1) You believe the activity being assessed involves a significant risk to the operator, those in the immediate area or passers by;
- 2) If any decanting is involved from one vessel to another;
- 3) Further transport by vehicle is required.

Activity name:

Activity description:

Observe the activity being assessed and answer the questions below.

If you answer NO to any of the HAZARD questions, a full risk assessment is required.

If you answer YES to all the questions and you believe the activity to be low risk use this form to record this.

### **Storage area hazard**

- |  |          |
|--|----------|
| 1) Is the area free from obstructions?                       | Yes / No |
| 2) Is the atmosphere being monitored for oxygen depletion?   | Yes / No |
| 3) Is the area secure, only accessible to trained personnel? | Yes / No |

### **Moving a cryogenic vessel hazard**

- |  |          |
|--|----------|
| 1) Is the surface which the load is being moved over even and firm?                        | Yes / No |
| 2) Is the vessel movement on one level without slopes, ramps, steps or escalators present? | Yes / No |
| 3) Is the route free of trapping hazards or restricted spaces?                             | Yes / No |
| 4) Is the route free of lifts and confined spaces?   | Yes / No |
| 5) Are all persons involved in the movement adequately trained employees?                  | Yes / No |

### **General safeguards**

- |  |  |
|--|--|
| 1) Is the activity carried out using a personal oxygen monitor?  | Yes / No   |
| 2) Does the operator wear appropriate cryogenic personal protective equipment?   | Yes / No   |
| 3) Does the location have appropriate lighting, oxygen monitoring and ventilation?   | Yes / No   |
| 4) Has the operator received training in the following:<br>~ Pressure Systems Safety Regulations 2000 (3) (PSSR) awareness?<br>~ Appropriate manual handling training?<br>~ Relevant Codes of Practice / Guidance Notes?<br>~ Gas safety awareness?<br>~ Standard Operating Procedure for decanting liquid nitrogen? | Yes / No<br>Yes / No<br>Yes / No<br>Yes / No<br>Yes / No |
| 5) Is there planned maintenance on all equipment, written records available?   | Yes / No   |
| 6) Are there emergency procedures in place and operators fully trained?  | Yes / No   |

## REFERENCES

- |   |   |
|---|---|
| 1) SI 1996 No. 341                      | The Health and Safety (Safety Signs and Signals) Regulations 1992.  |
| 2) SI 1999 NO. 3242                     | The Management of Health and Safety at Work Regulations 1999.   |
| 3) SI 2000 No. 128                      | The Pressure Systems Safety Regulations 2000.   |
| 4) HSE L 64                             | Safety signs and signals. The Health and Safety (Safety Signs and Signals) Guidance on Regulations.   |
| 5) ECE/TRANS/215                        | European Agreement concerning the International Carriage of Dangerous Goods by Road. (ADR).   |
| 6) BCGA Code of Practice 27             | Transportable vacuum insulated containers of not more than 1,000 litres volume.   |
| 7) BCGA Code of Practice 30             | The safe use of liquid nitrogen dewars up to 50 litres  |
| 8) BCGA Guidance Note 2                 | Guidance for the storage of gas cylinders in the workplace  |
| 9) BCGA Guidance Note 3                 | Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders.                                      |
| 10) BCGA Guidance Note 11               | Reduced oxygen atmospheres. The management of risk associated with reduced oxygen atmospheres resulting from the use of gases in the workplace. |
| 11) BCGA Leaflet 1                      | Guidance for carriage of gas cylinders on vehicles.   |
| 12) BCGA Technical Information Sheet 17 | Model risk assessment for manual handling activities in the industrial gas industry   |

## FURTHER READING

### **Regulations:**

SI 1999 No. 2001                      Pressure Equipment Regulations 1999

### **European Industrial Gases Association (EIGA) - [www.eiga.eu](http://www.eiga.eu):**

EIGA IGC Doc 103/03/E              Transporting gas cylinders or cryogenic receptacles in enclosed vehicles.

EIGA campaign documents on transport of gas cylinders and receptacles in non-dedicated vehicles.

### **Health & Safety Executive (HSE):**

HSE INDG 163                      Five steps to risk assessment.

HSE INDG 308                      The safe use of gas cylinders

### **Other:**

Liquid Nitrogen Safety Data Sheet.

Manufacturers operating instructions for tank / vessel and / or dewar.

Standard Operating Procedure for decanting liquid nitrogen.



## Model Risk Assessment: Storage of liquid nitrogen dewars

Assessment Date

Assessed by

Location

Reviewed by

Workplace / Premises Description

Review Date

No.	Situation / Activity	Hazard	Persons Affected	Recommended Control Measures	Existing Control Measures	Likelihood L-M-H	Severity L-M-H	Risk Rating	*Result M-A-N	Remedial Action Plan
1	Storage of dewars containing liquid nitrogen.	Storage of liquid nitrogen dewars in a room / building could result in oxygen depletion / asphyxiation under product vent, use or leak conditions.	Persons within the storage area or other areas nearby.	1.1	Store dewars in a sheltered but well ventilated location, ideally outdoors under a canopy.					
				1.2	Store away from excessive sources of heat. Storage area should be located away from workplace transport traffic and site drains.					
				1.3	Dewars shall be kept clean and free from oil and grease at all times.					
				1.4	In order to prevent the formation of ice plugs ensure that protective caps are in place and in good condition.					
				1.5	If outdoor storage is not possible the storage area shall be sufficiently ventilated to ensure oxygen concentration is maintained above 19.5 %, taking into account normal evaporation of all dewars within the room and above 18 % taking into account the complete spillage of the largest dewar. Consider forced ventilation. See Annex 3,4,5 of <b>BCGA CP 30</b> (7) for calculation guidance.					
				1.6	Pressurised dewars and those fitted with liquid withdrawal devices shall be fitted with a pressure relief device. Monitor pressure levels and vent in a safe location as required. Consider piping relief devices to a safe location outdoors.					
				1.7	For indoor storage areas use a fixed oxygen monitor linked to audible and visual alarm to detect oxygen depletion below 19.5 %.					
				1.8	Consider possible product release or spillage situations. Cold nitrogen gas is heavier than air and will accumulate at low level. Extra precautions are required for basement rooms, rooms with ventilation at high level and rooms with pits, ducts or trenches in the floor.					
				1.9	All relevant staff shall be trained in proper gas safety awareness and in particular specific hazards related to oxygen depletion. Refer: <b>BCGA GN 11</b> (10).					
				1.10	Use personal oxygen monitors to detect oxygen depletion below 19.5 % when operating liquid dewars.					
		1.11	Dewars should be stored in a secure lockable enclosure that prevents access to unauthorised persons. Enclosure should be designed and constructed from appropriate, robust, materials suitable for the location and possible risks e.g. palisade to prevent theft or access by unauthorised persons such as children. Refer: <b>BCGA GN 2</b> (8).							
		1.12	Display warning notices at access points to the storage area (in accordance with Safety Signs and Signals Regulations 1996 (1)) e.g. product warning, use of PPE, "No naked flames", "No smoking" and "No Access for Unauthorised Persons" Refer: <b>BCGA GN 2</b> (8), <b>BCGA CP 27</b> (6) & <b>HSE L 64</b> (4).							
		1.13	Dewar storage area to be designed fit for purpose and maintained in good order, i.e. use of non-combustible materials; not used to store flammable materials such as packaging; alarmed fire / smoke detector; use of fire breaks. Refer: <b>BCGA GN 2</b> (8).							
		Access to liquid nitrogen dewars by unauthorised personnel could result in release of product leading to oxygen depletion / asphyxiation or cold burns.								
		External fire or heat impacting on dewars in storage could cause catastrophic failure of the dewars or boil off of contents .								

2	Manual handling of liquid dewars.	Manual handling injury or damage to property if liquid dewars are handled incorrectly.	Persons or equipment in close proximity to the dewars.	2.1	Design storage such that liquid supply is permanently piped in with supply line for remote tanker filling and delivery line for dewar filling. Refer <b>BCGA CP 27 (6)</b> .						
				2.2	Dewars are heavy and need to be handled with care. Dewars over 25 litres are generally equipped with permanently installed wheels or trolley. If no wheels are fitted use purpose designed trolley, handcart or overhead hoist. Do not walk, roll or "trundle" by hand. Refer <b>BCGA GN 3 (9)</b> .						
				2.3	Storage floor should be flat level surface. Any gradients used for access or drainage shall be very shallow and drain covers / grating shall be avoided where dewars are to be manoeuvred.						
				2.4	All relevant staff shall be trained in proper handling and use of PPE with dewars.						
				2.5	Dewars fitted with wheels shall be secured by integral wheel brakes, chain or other device.						
				2.6	They shall be kept as near to their correct orientation as possible during transportation and when in use.						
3	Mechanical handling of liquid cylinders.	Mechanical impact or dropping of liquid cylinder results in injury to persons or damage to property.	Persons or property in the vicinity of the liquid cylinders.	3.1	Mechanical lifting devices such as FLT's or hoists shall only be used to lift / move dewars that are either designed for purpose or properly secured in a purpose designed lifting / transport device such as a pallet. Some dewars have lifting lugs or slots for FLT forks.						
4	Management of empty liquid cylinders intended for routine transport.	Unintended release of gas or liquid resulting in oxygen depletion or cold burns.	Persons or property in the vicinity of the gas cylinders.	4.1	Ensure the dewar is completely empty and warmed to ambient temperature before storage. Close any valves and ensure caps are in place, mark as empty and store in designated storage area until ready to return to vendor. Always return empty cylinders to the gas supplier, or agent, as soon as is reasonably practicable.						
				4.2	Dewars should never be considered as completely empty as they may contain residual gas. Hence the safety precautions applied to full dewars should also be applied to empty dewars.						
5	Maintain an inventory of liquid cylinders.	Injury to Fire and Rescue Service personnel due a lack of knowledge of what cylinders are present in the fire zone.	Fire and Rescue Personnel in the fire zone.	5.1	Users must always maintain an up to date inventory of cylinders stored on site (location and quantity). This information may be requested by the emergency services in the event of an incident. Refer: <b>HSE L64 (4)</b> .						
6	Emergency conditions.	Uncontrolled escape of product resulting in oxygen depletion, cold burns, fire / explosion.	Fire and Rescue Personnel in the vicinity. Property in the vicinity.	6.1	Emergency procedures must be in place e.g. the isolation of gas, shut down of all ignition sources, evacuation of area. Employee training of the emergency procedures. Information made available for visitors.						
		Fire / excessive heat could cause damage to product and the uncontrolled release of product.	Fire and Rescue Personnel in the vicinity. Property in the vicinity.	6.2	Emergency preparedness for dewars to be vented in an emergency - this could be achieved through the use of try-cock / vent exhaust, the product should be piped away to a fixed safe external location.						
		Product liquid spillage to site drainage causing damage to drain.	Damage remote from release.	6.3	Storage of dewars should be kept away from site drains.						
<b>Key to Result:</b> M = Minor Residual Risk (monitor) A = Adequately Controlled N = Not adequately Controlled (stop work and improve controls)											





## Model Risk Assessment: Moving liquid cylinders from store to decant area

Assessment Date

Assessed by

Location

Reviewed by

Workplace / Premises Description

Review Date

No.	Situation / Activity	Hazard	Persons Affected	Recommended Control Measures	Existing Control Measures	Likelihood L-M-H	Severity L-M-H	Risk Rating	*Result M-A-N	Remedial Action Plan
1	Manual handling of liquid cylinders from store to decant area.	Manual handling injury or damage to property if liquid cylinders are handled incorrectly.	Persons or equipment in close proximity to the cylinders.	1.1	Design decant source and supply such that liquid cylinders are fixed in position with piped supply to decant area. Refer: <b>BCGA CP 27</b> (6).					
				1.2	Liquid cylinders are heavy and need to be handled with care. Cylinders over 25 litres are generally equipped with permanently installed wheels or trolley. If no wheels are fitted use purpose designed trolley, handcart or overhead hoist. Do not walk, roll or "trundle" by hand. Refer: <b>BCGA GN 3</b> (9).					
				1.3	Planned route from storage to decant area should be flat level surface, minimum distance, clear of obstructions, equipped with suitable access doors, have adequate lighting and must not pass ignition sources or excessive heat. Any gradients used for access or drainage shall be very shallow and drain covers / grating shall be avoided where liquid cylinders are to be manoeuvred. Refer: <b>BCGA GN 3</b> (9).					
				1.4	All relevant staff shall be trained in proper manual handling and use of PPE with liquid cylinders. Refer: <b>BCGA GN 3</b> (9).					
				1.5	Manoeuvring large liquid cylinders can be difficult even on a flat surface. Evaluate handling activity and where appropriate use more than one person or specify mechanical handling device.					
				1.6	Liquid cylinders fitted with wheels shall be secured by integral wheel brakes, chain or other device.					
2	Mechanical handling of liquid cylinders.	Mechanical impact or dropping of liquid cylinder results in injury to persons or damage to property.	Persons or property in the vicinity of the liquid cylinders.	2.1	Mechanical lifting devices such as FLT's or hoists shall only be used to lift / move liquid cylinders that are either designed for purpose or properly secured in a purpose designed lifting / transport device such as a pallet. Some liquid cylinders have lifting lugs or slots for FLT forks.					
				2.2	All relevant staff shall be trained in proper mechanical handling and use of PPE with liquid cylinders.					

3	Venting of nitrogen from liquid cylinder while in transit.	Venting of gas or liquid resulting in local area oxygen depletion or cold burns.	Persons or property in the vicinity of the gas cylinders.	3.1	Liquid cylinders are subject to constant heat-in leak resulting in pressure rise over time. Periodically cylinder pressure may need to be lowered to to prevent venting of gas from relief valves. To avoid unplanned venting in transit personnel shall check cylinder pressure before leaving storage area and vent excess pressure using prescribed storage area equipment and procedure.						
				3.2	Additional precautions are to be taken when in a confined space and / or lifts. Refer: <b>BCGA CP 30</b> (7), Section 8.2.						
				3.2	All relevant staff shall be trained in proper gas safety awareness, procedures for storage and handling of liquid cylinders and specific hazards related to oxygen depletion. Refer: <b>BCGA GN 11</b> (10).						
<b>Key to Result:</b>		<b>M</b> = Minor Residual Risk (monitor)	<b>A</b> = Adequately Controlled	<b>N</b> = Not adequately Controlled (stop work and improve controls)							



## Model Risk Assessment: Decanting of cryogenic liquid from storage vessel to dewar

Assessment Date

Assessed by

Location

Reviewed by

Workplace / Premises Description

Review Date

No.	Situation / Activity	Hazard	Persons Affected	Recommended Control Measures	Existing Control Measures	Likelihood L-M-H	Severity L-M-H	Risk Rating	*Result M-A-N	Remedial Action Plan
1	Placing dewar into service.	Wrong dewar being used for gas required and uncontrolled pressure rise due to rapid liquid evaporation. Uncontrolled product release.	Individual filling the dewar and anyone else in the vicinity.	1.1	Check that all appropriate documentation for the particular container and accessories is available.					
				1.2	Check that valves, relief devices and accessories are appropriate for the intended service and that they are clean and free from damage and ice.					
				1.3	Check that all valves are easy to operate, check manual valves operate correctly.					
				1.4	Checks should be made for leaks on all pipeworks and fittings.					
				1.5	Check that the pressure indicator is correct for the intended service.					
				1.6	Check that the fill-connection is appropriate for the product being filled and free from dirt, oil and grease.					
2	Dewar filling from bulk storage.	Overfilling of dewar. Product release (asphyxiation / oxygen enrichment). Overpressure.	Individual filling the dewar and anyone else in the vicinity.	2.1	Correct PPE is to be worn, safety glasses, gloves, shoes, overalls to be outside of shoes & sleeves to be rolled down, ear protection to be used if required.					
				2.2	At no time must the vessel and dewar be left unattended during the filling procedure.					
				2.3	Space is to be left to replace lids / tops on open dewars to prevent spillage.					
				2.4	Tanks that are filled inside shall have their vent directed to a safe location.					
				2.5	The filling hose should be purged before filling commences and the dewar should be filled through the fill or liquid-valve.					
				2.6	After filling fill-hoses shall be isolated and vented before disconnection. The container, pipework, valves and fittings should be checked for leakage and to ensure that the pressure and level-gauges function.					
<b>Key to Result:</b> M = Minor Residual Risk (monitor)    A = Adequately Controlled    N = Not adequately Controlled (stop work and improve controls)										



## Model Risk Assessment: Decanting of cryogenic liquid from a dewar

Assessment Date

Assessed by

Location

Reviewed by

Workplace / Premises Description

Review Date

No.	Situation / Activity	Hazard	Persons Affected	Recommended Control Measures	Existing Control Measures	Likelihood L-M-H	Severity L-M-H	Risk Rating	*Result M-A-N	Remedial Action Plan
1	Pouring from the open top dewar.	Spillage, cold burns, gas release.	Person pouring from the dewar.	1.1	PPE to be worn, safety glasses, shoes, gloves.					
				1.2	Valves are to be identified before pouring commences to allow for quick shut off in an emergency.					
				1.3	Gas monitors are to be present in area.					
				1.4	Prefill checks are to be carried out before pouring commence e.g. is container suitable for product, are valves fully functional, leak tests on pipework.					
				1.5	Transporting tilting and pouring trolleys are to be obtained.					
				1.6	If decanting into narrow necked openings use suitable funnel to reduce spillage.					
				1.7	Warm vessels will cause rapid evolution of gas until they are cooled down. Only pour small amount into the funnel to let it cool down before filling properly. Pour slowly.					
2	Decanting from dewar to another vessel.	Spillage, cold burns, gas release due to receiving vessel not being designed for purpose.	Person carrying out the decant operation and others in the vicinity.	2.1	The receiving vessel must designed for use with cryogenic liquids, labelled and secured during decanting.					
				2.2	If receiving vessel is sealed it shall be fitted with a pressure relief device set at the design pressure of the vessel.					

**Key to Result:** M = Minor Residual Risk (monitor)    A = Adequately Controlled    N = Not adequately Controlled (stop work and improve controls)



## Model Risk Assessment: Transport of cryogenic liquid dewars

Assessment Date

Assessed by

Location

Reviewed by

Workplace / Premises Description

Review Date

No.	Situation / Activity	Hazard	Persons Affected	Recommended Control Measures	Existing Control Measures	Likelihood L-M-H	Severity L-M-H	Risk Rating	*Result M-A-N	Residual Action Plan
1	Transportation of dewars.	Moving load due to vehicle collision could seriously injure driver, passengers or members of the public.	Vehicle driver, passengers, passers-by, emergency services or property in the vicinity of the vehicle.	Atmospheric pressure dewars are not covered by the UK Carriage of Dangerous Goods Regulations (EU ADR (5)), however, pressurised containers may be covered. The regulations only apply to the transport of cylinders using commercial vehicles and NOT the carriage of cylinders in private vehicles. The transport of any gas vessel in an enclosed vehicle is dangerous, hence the use of an open vehicle or trailer is strongly recommended. If a closed vehicle must be used then the following precautions need to be taken. Refer to <b>BCGA Leaflet 1</b> (11) for further information.						
				1.1	Ensure that dewar valves are closed and not leaking. If dewar is open top variety then transport in a ventilated vehicle appropriate for the likely boil off rate.					
				1.2	Avoid transporting dewars in the passenger compartment.					
				1.3	Dewars must be adequately secured against moving and should be in an upright position during transport. Consider the forces involved in a traffic accident.					
				1.4	The number of Dewars to be transported should be limited to the strict minimum.					
				1.5	Ensure the space occupied by the dewars is well ventilated and, if a private vehicle is being used, then it is always good practice to apply some form of signage to inform the emergency services that gas cylinders are being carried on board.					
				1.6	The journey should be kept as short as possible and dewars should be removed from the vehicle soon after arrival at the destination.					
				1.7	Do not leave dewars stored in vehicles. If the dewars must be left in a vehicle for short periods then ensure vehicle is in a secure / safe parking area and locked.					
				1.8	<b>Never</b> transport dewars with other devices hoses, regulators etc. fitted.					
2	Empty dewar abuse / waste.	Cold parts	Persons or property in the vicinity of the dewar.	2.1	Empty dewars should be stored in a secure area.					
3	Manual handling of dewars.	Manual handling injury or damage to dewar if handled incorrectly.	Persons or equipment in close proximity to the dewar.	3.1	Large dewars are heavy and need to be handled with care. If you are moving large dewars then use a suitable cart. Sealed dewars must never be rolled as this may damage the internal mechanism and cause leaks or loss of vacuum. Refer: <b>BCGA GN 3</b> (9).					
				3.2	Do not drop dewars and never try to catch a falling dewar.					
				3.3	Dewars may be left free standing if they are stable in this condition. Refer to manufacturers recommendation.					
<b>Key to Result:</b> M = Minor Residual Risk (monitor)    A = Adequately Controlled    N = Not adequately Controlled (stop work and improve controls)										