### Safe Work Procedure

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| **Task/Activity/Plant/Equipment:**  **Transport Of Cryogenic Substances By Vehicle/ Road** | | | |
| **Location: sample** | | **RA Number:** | |
| **SWP Number:** sample | **SWP prepared by:** | **Date:**  28/5/2019 | **Review Date:**  28/5/24 |

### man17man22man02[Image result for dangerous goods](https://www.bing.com/images/search?q=dangerous+goods&id=FDC111000FCD8F1E7763BE6C4FD1253475A105FB&FORM=IARRTH)

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| **HAZARDS** |

### *Refer to Risk Assessment*

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| Asphyxiation due to oxygen depletion |  |
| Cold contact burns with carbon dioxide or liquid Nitrogen |  |
| Explosion from expanding vapours |  |
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| **PRE-OPERATIONAL SAFETY CHECKS DO NOT USE DEFECTIVE OR FAULTY EQUIPMENT** |

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| 1 | PPE must be available – insulated gloves, eye protection (or face shield) and enclosed shoes in case of a spill or emergency |
| 2 | Never place cryogenic substances in a sealed container where gases cannot escape.  Due to sublimation to a gaseous state this will lead to the container exploding. |
| 3 | Only use containers designed to hold cryogenic substances (e.g. use dewar flasks – do not use normal thermos flasks) |
| 4 | Never use or store in confined spaces –including inside closed vehicle cabins or walk in fridge or freezer rooms. |
| 5 | **Recommend use of a portable oxygen monitor in the vehicle where possible when undertaking longer trips e.g. outside of metropolitan area.** |

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| **OPERATIONAL SAFETY** |

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| 1 | **PPE**  Insulated gloves, eye protection and enclosed shoes must be used when handling cryogenic material, for example when packing materials for transport.  PPE should be carried in vehicles when transporting cryogenics in case there is a spill or accident. |
| 2 | **Containers**   * Liquid Nitrogen - containers designed for the use with liquid Nitrogen must be used (i.e. must be made of material able to withstand very low temperatures) and must NOT be sealed tightly, containers must be vented. * Carbon Dioxide (Dry Ice) - the package must be vented or able to permit the release of carbon dioxide gas.   **Note**- these coolants expand rapidly – pressure will build up causing the container to explode if gas is unable to escape.   * All containers must be appropriately labelled and indicate that they contain a cryogenic (see section 5). * **Note -** This is in addition to any labelling required for Genetically Modified Organisms or Biohazards. * Ensure dry ice is packed between the secondary and outer package. |
| 3 | Liquid Nitrogen must **NOT** be transported by road in an enclosed vehicle –It is recommended that a designated transport company be engaged to transport ANY LIQUID N2. |
| 4  A  B  C  D | Dry Ice (Carbon Dioxide)-    **Vehicle selection:**   * Transporting of specimens using dry ice in a normal (cabin) vehicle should be avoided where possible. * Do Not use a hatch back style car. * If using a normal cabin vehicle (i.e. with a boot) cannot be avoided, then the dry ice and related materials must be placed in the boot section. * As boots and the cabins are often not air tight, the cabin must be **well ventilated at all times**.   This will require leaving windows open.  The Air Conditioner must **NOT** be on recirculate but on fresh air.   * Note –good ventilation applies during parking and travelling. * Where possible do not leave the dry ice in the car. Remove packages from vehicle as soon as possible. * If dry ice is left in a parked vehicle for a period of time, then the vehicle must first be vented. To vent ensure air flow is turned on and directed to the floor of the cabin and all doors opened. * Transport in normal (cabin) vehicles should only be for trips within the metropolitan area. * For longer trips it is preferred that a utility cab (with external tray/ area) be used for transporting unless other risk management strategies are put in place e.g.   + **The use of a portable oxygen monitor, or**   + 2 hr stops of the vehicle and venting of the cabin.   **Additional Risk Factors**  Several factors can change / speed up the generation of carbon dioxide gas from dry ice;   * Higher temperatures (hot day) * Container type * Size of the dry ice pellets or bricks. * Length of time package is transported.   For this reason where the risk is higher e.g. longer trips, the specific requirements of each project should be risk assessed to ensure risk mitigation strategies are sufficient for those tasks that are being undertaken.  **Warning signs or Carbon Dioxide exposure**  People transporting dry ice should be aware of the early warning symptoms of exposure that could include any of the following;   * Tingling in extremities or ringing in ears, stiffness, drowsiness, shortness of breath, blue tinge to extremities, muscle weakness and nausea.   If you feel unwell or suspect a build-up of carbon dioxide:   * Stop the vehicle as soon as possible and get out. * Ventilate the vehicle – open all doors and windows. * If you suspect a gas build up in a parked vehicle do not get in until well ventilated.   Warning- Dangerous levels of carbon dioxide can build up in an unventilated car in less than 15 min that can lead to asphyxiation.  **Additional transport precautions:**   * Containers must be restrained in the vehicle to prevent spillage. * Private Vehicles MUST not be used – in an event of an accident your insurance company may not cover you. * You MUST not use public transport – as cryogenics are considered as dangerous goods. * Consideration should also be given to the substitution of dry ice for road transport of perishable samples to a method that does not pose an asphyxiate gas risk.   This includes:   * Transport with a refrigerated cooler brick, gel or wet ice if the samples are sealed from water intrusion. * Lyophilisation (freeze drying) of the samples where morphological properties do not need to be retained. |
| 5 | Transport requires the goods to be packaged as in accordance with Australian Code of Transport for Dangerous Goods and this includes making sure that the containers are appropriate for the content and labelled.    Example of Labelling:  **UN 1845 CARBON DIOXIDE or DRY ICE, SOLID, AS COOLANT.**   * Indicate the net weight (kg) of the dry ice * A miscellaneous dangerous goods Class 9 label is also required. [Image result for dangerous goods](https://www.bing.com/images/search?q=dangerous+goods&id=FDC111000FCD8F1E7763BE6C4FD1253475A105FB&FORM=IARRTH) |

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| **POST-OPERATIONAL** |

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| 1 | Containers with cryogenics must be removed from the vehicle as soon as possible. |
| 2 | Cryogenics must not be disposed of down sinks or in bins. It must be placed in well ventilated area e.g. fume hood to evaporate. |
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| **FORBIDDEN** |

### *Are there examples of known prohibited uses (for Plant/Equipment)? Could there be temptation to use the equipment for jobs it is unsuitable for.*

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| 1 | Must not use sealed containers that are not suitable, containers must be capable of venting or allow gas to be released. |
| 2 | Must not be stored in a confined area- including walk in fridge/ freezers and cabins of vehicles. |
| 3 | Must not handle cryogenic material without appropriate PPE |
| 4 | Liquid Nitrogen must not be transported in a standard cabin vehicle. |

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| **MAINTENANCE** |

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| 1 | All containers used to transport cryogenics should be regularly checked to see that they are fit for purpose and in good working order. Checks should include that they are not cracked or damaged. |
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| **REFERENCES (EG. MANUFACTURER’S MANUALS / AUSTRALIAN STANDARDS)** |

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| 1 | Australian Code for the Transport of Dangerous Goods by Road or Rail Dec 2016 |
| 2 | ChemWatch |
| 3 | WHS Risk Management Procedure |

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| Authorised by Supervisor: |  |  |  |
| *Name* | *Signature* | *Date* |

**Declaration**

I hereby state that I have read and understood the Safe Work Procedure on the previous page, and will abide by the operating requirements.

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| Name | Signature | Date |
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