Carriage of Dangerous Goods by Road
(Model assessment for small quantities of hydrogen and liquid nitrogen)

General
Carrying goods by road or rail involves the risk of traffic accidents. If the goods carried are dangerous, there is also the risk of an incident, such as spillage of the goods, leading to hazards such as fire, explosion, chemical burn or environmental damage.

Dangerous goods are liquid or solid substances and articles containing them, that have been tested and assessed against internationally-agreed criteria - a process called classification - and found to be potentially dangerous (hazardous) when carried. Dangerous goods are assigned to different Classes depending on their predominant hazard.

The carriage of dangerous goods is regulated by The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007 (SI 2007/1573) (CDG 2007) and the European agreement (“Accord européen relatif au transport international des marchandises dangereuses par route”, known as ADR). The regulations are highly prescriptive. Their purpose is to protect everyone either directly involved (such as consignors or carriers), or who might become involved (such as members of the emergency services and public). Regulations place duties upon everyone involved in the carriage of dangerous goods, to ensure that they know what they have to do to minimise the risk of incidents and guarantee an effective response.

Hydrogen and Liquid Nitrogen

Hydrogen is a gas carried under pressure in a closed cylinder. Hydrogen is dangerous because it is highly flammable and, therefore, if it should leak, be overheated or be involved in a fire, it presents a serious fire/explosion risk.

CDG2007 details: Hydrogen, Compressed, UN number 1049, is a class 2 substance, classification code 1F, Transport category 2.

Liquid nitrogen is nitrogen gas which has been refrigerated to the point where it is so cold it turns to liquid. Liquid nitrogen is dangerous because it releases nitrogen gas which is an asphyxiant. Contact with the liquid may cause burns.

CDG2007 details: Nitrogen, Refrigerated Liquid, UN number 1977, is a class 2 substance, classification code 3A, Transport category 3.

If a load of dangerous goods is below the small load threshold for the substances carried there are exemptions from some of the requirements of the regulations. The carriage of these substances will be subject to the small load exemptions from CDG2007 for the quantities specified, 1 litre hydrogen and 20 litre liquid nitrogen, as these quantities are below the small load threshold.

The remaining obligations are:

- General training for driver (ADR 1.3.2).
  o Personnel shall be familiar with the general requirements of the provisions for the carriage of dangerous goods.

- Function-specific training
  o Personnel shall receive detailed training, commensurate directly with their duties and responsibilities in the requirements of the regulations concerning the carriage of dangerous goods.

- Safety training
  o Commensurate with the degree of risk of injury or exposure arising from an incident involving the carriage of the dangerous goods, including loading and unloading, personnel shall receive training covering the hazards and dangers presented by dangerous goods.
    o The training provided shall aim to make personnel aware of the safe handling and emergency response procedures.

- A record should be kept of training (ADR 1.3.3)
- Carry one 2 kg dry powder fire extinguisher or equivalent (ADR 8.1.4.2)
- Stow the dangerous goods properly (ADR 7.5.7)
  o Packages shall not be thrown or subjected to impact.
  o Receptacles shall be so stowed in the vehicle or container that they cannot overturn or fall.
Cylinders shall be laid parallel to or at right angles to the longitudinal axis of the vehicle or container; however, those situated near the forward transverse wall shall be laid at right angles to the said axis.

Short cylinders of large diameter (about 30 cm and over) may be stowed longitudinally with their valve-protecting devices directed towards the middle of the vehicle or container.

Cylinders which are sufficiently stable or are carried in suitable devices effectively preventing them from overturning may be placed upright.

Cylinders which are laid flat shall be securely and appropriately wedged, attached or secured so that they cannot shift.

The load space of the vehicle should be separate from the drivers compartment. The load space should be open or ventilated otherwise the cargo doors of the vehicle shall be marked with the following in letters not less than 25 mm high:

- WARNING
- NO VENTILATION
- OPEN WITH CAUTION

- No smoking in the vehicle and during loading and unloading
- Turn off the vehicle engine during loading and unloading.
- The vessels should be appropriately labelled, including, as a minimum, these signs:

![FLAMMABLE GAS](image1)

and the words “Hydrogen, Compressed, UN 1049” for the hydrogen

![NON-FLAMMABLE COMPRESSED GAS](image2)

and the words “Nitrogen, Refrigerated Liquid, UN 1977” for the liquid nitrogen

**University Requirements**

Further information about the hazards and requirements for liquid nitrogen can be found in [https://www.intranet.bham.ac.uk/university/hsu/documents/hspolicy/hs15/hs312cry.pdf] pages 4-6 and pages 10-11, paras 34 to 39

for hydrogen in [https://www.intranet.bham.ac.uk/university/hsu/documents/hspolicy/20cg.pdf]

and University Policy for *The Carriage of Hazardous Substances by Road* [https://www.intranet.bham.ac.uk/university/hsu/documents/hspolicy/hs15/HS61TRAN.pdf]