Good Safety Practice

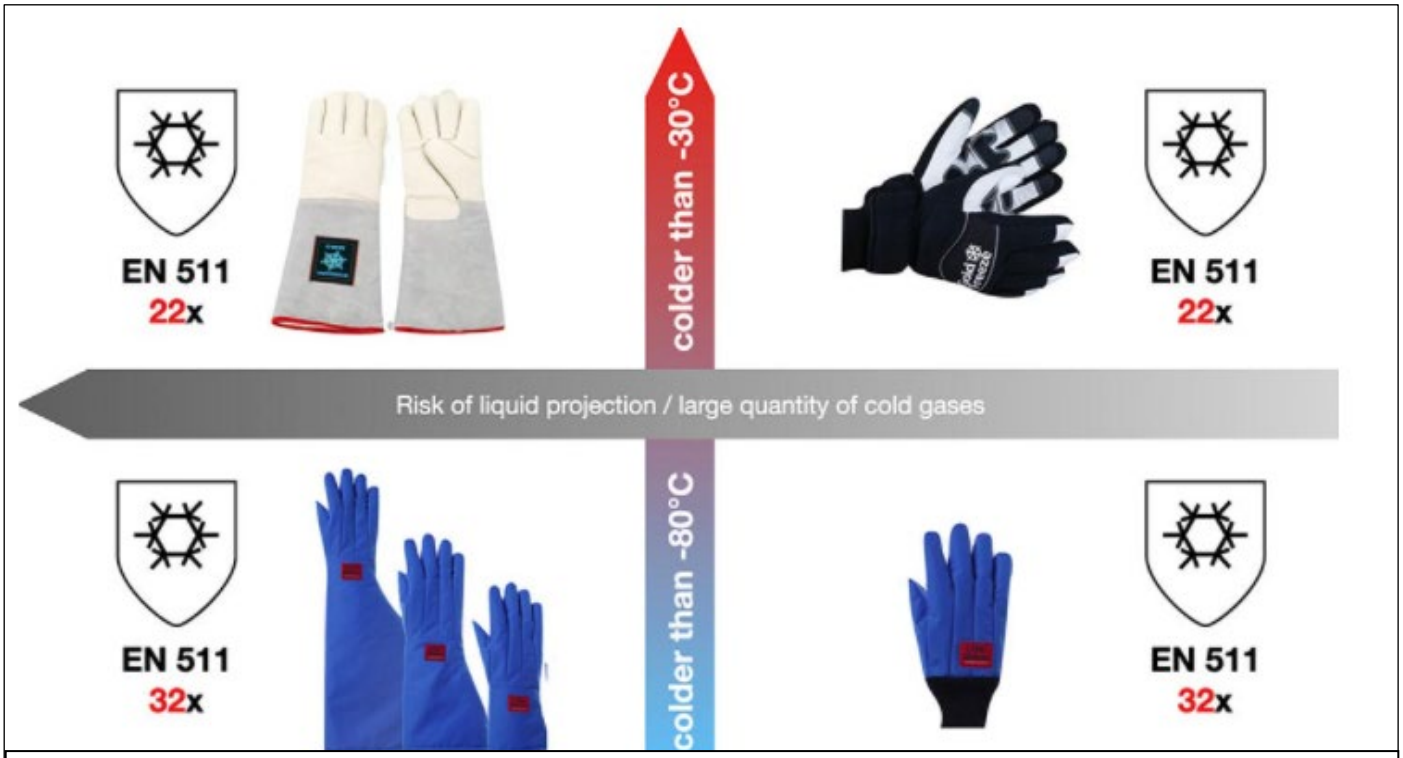
Working with Liquid Nitrogen (LN_2)

1. **Only people who have undergone a specific cryogenics hands-on training are qualified to handle LN2**

2. **Never work alone** while handling LN2. Make sure another person is in reach.

2. Use designated Personal Protective Equipment (**PPE**): cold-resistant gloves, polycarbonate entire face-shield, cold-resistant apron **[Fig.1]**.

3.1 This designated PPE should be applied in addition to the regular lab PPE.



3.2 **Fig. #1:** Cold-resistant glove types for handling equipment designated for LN_2 storage (-80ºc) (bottom panel), and gloves suitable for handling equipment for deep freezers (top panel, -30ºc). All recommended gloves carry European (EN) test used to assess the thermal protection the gloves offer against cold hazards.

3.3 EN 511 includes 3 tests: 1. Convective Cold: What temperature can a pair of gloves be used in? This test explains how a glove will react to the air temperature around it; 2. Contact Cold: What temperature can an item that you are handling be? This test explains how cold the items that you are handling can be before you'll start to feel the cold; 3. Water Permeability: Are your gloves waterproof? A simple binary test: yes or no. These three tests can be found either on the back of the glove, in the conformity statement, or in the product listing. A glove will receive the following scores: the higher score offers better resistance.

Test	Levels	Remarks
Convective Cold	0 - 4	Level 0 = the glove has failed the test.
Contact Cold	0 - 4	N/A = the wasn't tested to that parameter.
Water Penetration Test	0 or 1	A glove can only a achieve a 'pass' (=1) / 'fail' (=0) in the waterproof test.

4. LN_2 Shuttling

4.1 Always wear designated **PPE** prior to shuttling.

4.2 Manual shuttling of Dewars is allowed using designated **wagons**.

4.3 Shuttling of LN_2 Dewars of any size is allowed to qualified personnel:

4.3.1 Up to 5 L shuttling Dewars – a qualified person is someone who has gone through the safety unit's theoretical cryogenics training and a designated on-the-bench training form an experienced person in his/her lab.

4.3.2 Dewars larger than 5 L will only be shuttled by personnel who have undergone both the theoretical as well as the practical cryogenics training of the safety unit.

4.4 Dewars will always be shuttled in a **vertical** position.

4.5 Try and make sure the designated shuttling path is smooth and prioritize an open and **ventilated path**.

4.6 Shuttling LN_2 Dewars in an **elevator** –

4.6.1 Avoid as much as possible.

4.6.2 Always use the service elevator.

4.6.3 An LN_2 Dewar shuttled in an elevator will be shuttled alone carrying a sign, which says:

"**SHUTTLING OF LN_2, DO NOT ENTER ELEVATOR**".

4.6.4 A qualified person will receive the LN2 Dewar shuttle on the correct floor.

.1

5. **LN_2 Filling**

5.1 Always fill from a large / pressured Dewar into a smaller / atmospheric pressured Dewar.

5.2 The main faculty Dewar will be filled only by the vendor in collaboration with the building's maintenance engineer.

5.3 The alternating Dewars located on every other floor will be filled by the faculty's maintenance personnel by a qualified person.

5.4 Small lab Dewars will be filled by qualified personnel.

5.5 Always use the designated filling tube and insert it to the designated Dewar. It is strictly forbidden to hold the filling tube without proper PPE.

5.6 Work slowly and be concentrated.

5.7 Open valve B and fill no more than 80% of the Dewar's volume.

5.7.1 Upon spillage – immediately shut off the filling valve.

5.8 When filling is done – close valve B > unplug the filling tube from the filling Dewar.

5.8.1 Close the Dewar you've just filled to prevent entrance of moisture, which could turn into an ice plug.

5.9 Always leave the filling position tidy and clean.

5.10 In any case of doubt or imminent danger – evacuate yourself > warn others > notify the Security & Emergency Unit + the faculty's administrator and/or building's maintenance manager.

6. Storage of LN_2 in the lab

6.1 Never store LN_2 Dewars in **cold rooms**.

6.2 Storage of LN2 Dewars is allowed only in **ventilated** areas, not on passages / corridors.

6.3 Every LN2 Dewar must carry a **UN** signage.

6.4 Designated **PPE** must be always intact and accessible in the lab.

6.5 **Operating instructions** will be places near the LN2 Dewar and will be updated annually.