NATIONAL HIGH MAGNETIC FIELD LABORATORY

NHMFL

FLORIDA STATE UNIVERSITY

SAFETY PROCEDURE

SP-6

TITLE: DEWAR DISK RUPTURE

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1.0 PURPOSE

1.1 This safety procedure shall be used by all job site personnel at the NHMFL.

1.2 This procedure establishes policy and procedure in the event a dewar pressure relief disk ruptures.

1.3 NHMFL's policy is to provide and maintain a safe and healthful working environment. The safety and health of employees and users are the inherent responsibilities of each employee, management and all levels of supervision.

1.4 This procedure defines the specific reporting procedures and actions required by NHMFL personnel and users following over-pressurization and subsequent rupture of a dewar pressure relief disk.

2.0 SCOPE

2.1 This Safety Procedure shall be used by all personnel at the NHMFL in order to protect NHMFL employees, users, and contractors who may be working in the vicinity of cryogenic liquid dewars.

2.2 This document applies to all personnel working on equipment or systems which are under the control of NHMFL.

2.3 This procedure shall be used in conjunction with all other applicable operating and safety procedures

3.0 RESPONSIBILITIES

3.1 OPERATORS

The Plant Operator shall ensure that the actions required by this safety procedure are followed during dewar filling operations.

Personnel shall observe all safety and occupational health precautions applicable to their duties.

3.2 SUPERVISORS

Supervisors shall ensure that safety and occupational precautions are observed in their work areas.

Supervisors shall ensure that all employees under their authority understand and follow the guidelines presented in this procedure.

3.3 NHMFL

The NHMFL will ensure that all plant operators are provided with the proper tools, equipment, protective clothing, and training necessary for the safe implementation of this procedure.

3.4 OTHERS

Personnel at the NHMFL who witness or notice actuation of a cryogenic liquid dewar rupture disk shall ensure that the immediate personnel hazard associated with atmospheric release of the liquid is minimized.

Personnel utilizing dewars in the magnet cells shall ensure that the actions required by this safety procedure are followed in the event that a dewar rupture disk bursts.

4.0 GENERAL INFORMATION AND PRECAUTIONS

4.1 Dewars are pressurized vessels used for cryogenic liquid storage and are filled from the Helium Recovery, Purification, and Liquefaction System or from the nitrogen fill station. Filled dewars may be supplied by venders.

4.2 The dewar design includes two over-pressure reliefs and an over-pressure rupture disk. The over-pressure reliefs lift at 1 PSIG and 10 PSIG respectively. If vessel pressure increases, the rupture disk will relieve vessel pressure to the atmosphere. Actuation of the rupture disk occurs at approximately 80 PSIG.

4.3 In the event that the dewar rupture disk does relieve excess internal liquid to the atmosphere; the immediate vicinity of the dewar will have a high concentration of low temperature vapor.

4.4 Gas release to the atmosphere may possess an asphyxiation threat to personnel in that area. The most likely immediate personnel hazard associated with dewar rupture disk operation is frostbite burns resulting from contact with low temperature gas.

4.5 Evaporating cryogenic liquids in the presence of combustible materials is also a fire hazard. Air will condense on exposed surfaces of equipment, such as vaporizers and piping, containing liquid or cold gas. Nitrogen, having a lower boiling point than oxygen, will evaporate first, leaving an oxygen enriched condensate on the combustible material surface.

4.6 Access to the evacuated area shall not be allowed until the buffer zone is relaxed by the On-scene Supervisor or Plant Operator.

DO NOT ATTEMPT TO SAVE THE REMAINING DEWAR LIQUID INVENTORY

4.7 In the event of a major release of cryogenic fluids, a great potential for asphyxiation due to oxygen deprivation exists in areas of poor air circulation or confined spaces.

4.8 Never touch uninsulated pipes or vessels containing liquefied gas or the cold vapor issuing from it. Both can cause severe frostbite, and the skin may adhere to the cold surface.

5.0 PROCEDURAL GUIDELINES

5.1 In the event that a dewar releases cryogenic liquids to the atmosphere via the rupture disk, all personnel in the immediate vicinity are required to evacuate to a safe distance.

5.2 Ensure that all personnel in the immediate area are informed about the dewar disk rupture.

5.3 Rupture disk actuation may be identified by increased background noise levels and condensation of air around the escaping gas as evidenced by the appearance of a white, fog-like plume.

5.4 Moderate gas inhalation may cause headache, drowsiness, dizziness, excitation, vomiting, respiratory discomfort, and unconsciousness.

5.5 MINOR LEAKS

5.5.1 Initiate system shutdown of the system, placing the dewar in a safe condition, using normal operating procedures.

5.5.2 While avoiding the released cryogenic fluids, disconnect the dewar from the system. If personal safety is in doubt, do not attempt further operations and evacuate the affected area. If evacuation of the space is necessary, the dewar rupture is considered a major leak.

5.5.3 Remove the dewar to the nearest open OP/MD building door and allow the gas to be relieved to the atmosphere.

5.6 MAJOR LEAKS

5.6.1 Immediately evacuate the area containing the dewar.

5.6.2 Report the dewar failure to the Control Room Operator.

5.6.3 Establish a buffer zone around the affected area.

5.6.4 Verify that adequate ventilation exists in the affected area.

5.6.5 If the status of adequate ventilation is unknown, contact the Control Room Operator.

5.6.6 The Control Room Operator will ensure that adequate ventilation exists in the affected area.

5.7 MAJOR LEAKS ASSOCIATED WITH DEWARS CONNECTED TO MAGNETS WITHIN THE MAGNET CELLS

5.7.1 Immediately evacuate the area containing the dewar.

5.7.2 If leaving an energized magnet cell, push the EPS emergency shutdown switch to trip the DC power supplies.

5.7.3 Report the dewar failure to the Control Room Operator.

5.7.4 Establish a buffer zone around the affected area. Normally this barrier will be located at the entrance to the affected magnet cell.

5.7.5 The Control Room Operator will ensure that the DC power supplies have been tripped and that adequate ventilation exists in the affected area.

6.0 PROCEDURE REFERENCES

6.1 LIQUID CRYOGEN'S: Volume I Theory and Equipment
K. D. Williamson, Jr. and Frederick J. Edeskuty
CRC Press, 1983

6.2 Helium Material Safety Data Sheet

6.3 Model CMSH series multishielded liquid helium containers information literature