# NMR CENTER SAFETY PLAN

This safety plan is to be considered an addendum to the Chemical Hygiene Plans of the Boston College Chemistry Department and Boston College. It does not supersede or contradict the Chemical Hygiene Plans of either. Hazards and procedures unique to the NMR Center are identified in this document, and precautions and prohibitions related to those hazards are specified. The safety plan is not to be considered exhaustive, and will be amended as additional hazards or better procedures are identified.

## 1. Electrical Hazards

The NMR spectrometers in the lab operate on either 240 volts AC or 120 volts AC and have several high-voltage DC components, all of which can be hazardous or fatal if accidental electrocution occurs. To prevent accidents, the following precautions and prohibitions shall apply to all NMR users and visitors to the NMR laboratory:

a. No person may access the instruments without proper training and authorization from the NMR Center director and Chemistry Department operations manager.
b. Extreme caution should be used whenever the instruments are being tuned or otherwise used in a way that makes it necessary to be near the console or magnet.
c. No user shall access the instrument panels or spectrometer consoles unless under the observation and guidance of the NMR Center director.
d. Any accumulation of water around or near the instruments should be reported to the NMR Center director and the wet areas should be avoided to prevent electrocution.
e. Any accidental exposure to electricity must be reported to the NMR Center director and the Chemistry Department operations manager.

## 2. Cryogenic Liquids

Liquid Nitrogen and liquid Helium are used in the NMR laboratory and both are extremely hazardous. In order to prevent accidental exposure to liquid cryogens, and to avoid asphyxiation in the event of a magnet quench, the following precautions and prohibitions shall apply to all NMR users and visitors to the NMR laboratory:

a. No person may use cryogenic liquids in the NMR laboratory without first having been trained in the safe handling of such substances.
b. Before using cryogenic liquids in the NMR laboratory, the NMR Center director must be notified. Cryogenic liquids stored in the NMR laboratory are not for general use.
c. Protective clothing including lab coats, gloves and eye-protection will be worn by all individuals whenever handling cryogenic liquids in the NMR laboratory. Persons in the near vicinity may also be required to wear protective clothing if their proximity to cryogenic liquids puts them at risk.

d. In the event of a magnet quench (that is, the sudden evaporation of cryogenic liquids in the magnet), all present must immediately and orderly exit the NMR laboratory. A magnet quench is usually obvious from the loud rushing sound of the evaporated gases escaping the magnet and may displace sufficient Oxygen to cause asphyxiation. Since Helium is less dense than air, exiting the laboratory by crawling on the floor is recommended. Doors to the laboratory should be left open to aid in the dispersal of Helium and Nitrogen gases.
e. Any accidental exposure to cryogenic liquids must be reported to the NMR Center director and the Chemistry Department operations manager.

## 3. Magnetic Fields and Electromagnetic Radiation

Strong magnetic fields and several sources of electromagnetic radiation are present in the NMR laboratory that may present unique hazards to individuals. The following precautions and prohibitions apply to all NMR users and visitors to the NMR laboratory:

a. Users in the NMR laboratory are subject to exposure limits to static magnetic fields like those found in the NMR laboratory. Exposure limits are available through the Boston College Environmental Health and Safety Office.
b. No person may enter the NMR laboratory without authorization from the NMR Center director and Chemistry Department operations manager.
c. Persons with pacemakers, defibrillators, or metal surgical implants or prosthetics must stay at least 6 feet away from the magnets at all times.
d. Personal articles such as hairpins or jewelry must be kept away from the magnets at all times.
e. Metal tools, carts, and gas cylinders must be kept away from the magnet at all times.

## 4. Glass Tubes and Evacuated Storage Dewars

The following precautions and prohibitions apply to all NMR users and visitors to the NMR laboratory:

a. NMR Tubes must be handled with extreme caution. They are thin-walled glass and can cause dangerous wounds. Never force an NMR tube into the NMR spinner holder and never force the cap on or off an NMR tube.
b. Evacuated storage dewars are present in the probes on all the spectrometers, and are sometimes used externally around spectrometers. These are very dangerous when broken as the vacuum can cause implosion. Always make connections to storage dewars carefully and without force. External storage dewars should always be wrapped in plastic mesh or tape to prevent flying glass if they are broken.
c. Broken glass should be cleaned up under the supervision of the NMR Center director and should be disposed of in approved glass waste containers.
d. All injuries related to broken glass must be reported to the NMR Center director and Chemistry Department operations manager.

## 5. Chemical Hazards

The following precautions and prohibitions apply to all NMR users and visitors to the NMR laboratory:

a. NMR Solvents must be handled as specified in the Chemical Hygiene Plan of Boston College. Because there are no fume hoods in the NMR laboratory, samples requiring a hood for safe handling must be prepared outside of the NMR laboratory.
b. Chemical spills or accidental exposure to NMR solvents must be reported to the NMR Center director and Chemistry Department operations manager.
c. Material Data Safety Sheets are available for all standard and calibration samples used in the NMR laboratory.

## 6. Physical Hazards

The following precautions and prohibitions apply to all NMR/EPR users and visitors to the NMR laboratory:

a. Stairways to magnets must be used with extreme caution. In particular, the portable stairs used with the Gemini 2000-400 spectrometer and the stepstool used for the INOVA 400AS spectrometer can be very unstable when not used correctly.
b. Care must be taken to avoid overturning of the magnets. No person should ever lean on the magnets or pull on the magnets when getting up or down from the floor (as when tuning the magnets). They are not stable and can be overturned easily.
c. Cryogenic storage dewars can also be overturned quite easily. They should never be pulled from the top, but rather from the handles provided.
d. All injuries related to physical hazards in the NMR laboratory must be reported to the NMR Center director and the Chemistry Department operations manager.