

## 7.8 Thermal Hazards

Infrequently, liquid nitrogen is used by vacuum technicians when removing or installing components into the vacuum system. It has two purposes: (1) a source of dry nitrogen gas, which when piped into the vacuum chamber at just above ambient pressure provides a positive gas flow out of the system and prevents contamination from the surrounding air; and, (2) the cooling source for vacuum cold traps. We do not expect these uses of liquid nitrogen to be needed for SPEAR3 operations.

If the vacuum system or a portion of it were to become contaminated, it is standard practice to “bake out” the line or component to 150° C in order to drive off the contaminants. A typical “bake out” might last 2-3 days. Contamination in this case is usually moisture from the air, oil from fingerprints or other residues from cleaning operations. Bake out cannot be done *in situ* and the chamber would have to be removed from the accelerator in order to bake it out. Hot areas are posted with warning or caution signs during bake outs.

### Initiating Event

Vacuum chamber maintenance or replacement is performed.

### Method of Detection

Observation by personnel performing work.

### Preventive/Mitigating Features

These activities are conducted solely by trained vacuum technicians. For SPEAR3 the only possible source of liquid nitrogen will be from closed dewars. Technicians are instructed to use eye protection and gloves when decanting liquid nitrogen. This prevents possible splash injuries to the eyes.

### Consequences

A spill or leak of these materials out of their primary container will not result in a significant injury or illness and will have little or no effect on the environment. The consequences would be extremely low.

### Likelihood

The probability of a spill or leak occurring during the installation or operation of the accelerator is unlikely.

### Risk

The risk from this operation is acceptable.