Hazards associated with the gas system and how to mitigate them

Do not enter the gas shack if the rotating red light at the entrance is on. This warns of an oxygen deficiency.

**In General the Gas Mixing shack can be a hazardous place – BE AWARE OF YOUR ENVIRONMENT.**

There are hazardous gas detectors that will cut off any gas flow at 10% of the lower explosive limit and oxygen deficiency monitors that will alarm if there is a less than 19% oxygen level.

**Gas bottles are a hazard to move. Breaking the stem on a gas bottle can cause flying debris**

Never move a bottle without the cap fastened. Always earthquake brace bottles at two points in the place they are to be used or stored. Always keep control of the bottle with two hands while moving.

**The gases used in the calibration routine present a cryogenic hazard.**

Be certain that the bottle is plumbed into the correct gas circuit and the fittings are tight before opening. When removing a bottle be certain to valve off the gas; At the bottle first, at the gas panel second. Slowly bleed the lines before disconnecting.

**There is a marked step up both on to the gas pad and into the gas shack.**

Be aware. It easy to trip while making a step into empty space when coming out of either one.

**Side of racks must be removed.**

To access some of the valves the side of the rack should be removed. This can fall rapidly and cause alarm or an injury. The rack side panel should be supported by one hand while turning the locking screw. Two hands should be used to lift and carry the side panel out of the way.
Transition from Rest (He:Isobutane) to Rest (Helium)

Name: 

Date: ________________ Time: ________________

- Stop monitoring Gain Chamber (stop DAQ, power down HV).
- Select Rest mode.
- Close VVM-45 (circulation loop).
- Open VVM_46 (exhaust).
- Open VVM-44.
- Turn off heater.
- Open VVM-36 (He orifice bypass).
- Increase exhaust purge N\textsubscript{2} flow to 300 l/hr.
- Increase Helium inlet pressure GRADUALLY to 1780 mbar (initially 1600, adjust later).
- Open VVM-88 and VVM-87. Note which is already open ________.
- Set all mass flowmeters to Zero.
- Set circulation flowmeter to 8 lt/min.
- Switch on both compressor regulators. Note which is already on ________.
- Set controller you just turned on to MANUAL, 30%. (adjust later).
- Open Helium hi-flow rotameter one turn (adjust later to > 30 l/min).
- Decrease BPR-1 to minimum(CCW).
- In the Mode panel, activate super user mode.
  - In the valve control panel, switch to VME mode, open VVPC–2, VVPC–3, VVPC–4, VVPC–6, VVPC–7, close VVPC–11
- In the valve control panel, pump panel, Start compressors.
- Immediately adjust BPR-2 to keep circulation pressure in range
- Select “output” sample point.
- Slowly increase He Hi flow rotameter and manual compressor regulator until flush flow is ~40 L/min
- Keep an eye on BPR-2 and circulation pressure.
- *Flush for 3 volume change (8-9 hours) (till HAD sensor in return line reads < 10% LEL).*
- Decrease He inlet pressure to 1000 mbar (nominal value).
- Select Rest mode.
- Open VVM 101.
- Close VVM 44.
- Close VVM 87 or 88, whichever you previously opened (see above).
- Open VVM 45.
- Close VVM 46.
- Switch off compressor regulator you previously turned on (see above).
- Close helium high flow rotameter.
- Close VVM-36.
- Check all mass flowmeters are set to Zero.
- Reduce exhaust N2 flow to 100 l/hr.
- Reset BPR 1 and BPR 2 to nominal (if possible).
- Change alarm level of return line O2 sensor from 0.04 to 10 (stick a note on front panel to remember this).