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.

Hazards associated with the DCH chiller area and mitigation

The DCH chiller area in the IR -2 hall is in an area that could cause trips or bumps.

Always wear a hard hat in the IR-2 hall. Be careful when walking as there are uneven surfaces and hoses and cables may be temporarily installed on the floor.

The Chiller covers are awkward to handle.

If you must remove the chiller top and side panel then use two hands and plan out a place to put them down before removing them.
Cooling Water Safety System Checklist

This procedure is used to verify that safety sensors and interlocks related to the cooling system are functioning correctly. It is performed once per year, prior to the start of a run. Two people are required for many of the tests. A separate procedure is used to test gas system alarms.

Names: ____________________________________________________________

Date: ______________________________________________________________

You will need the VWR or Cole Parmer humidity meter and a straw for Step 6.

Preliminary

○ Inform Shift supervisor and anyone else in control room and electronics hut that sensor testing is under way and that false alarms will occur. Post signs on annunciator panel.

○ Verify HV is not interlocked (interlock light should be off). Disable O2 alarm if necessary.

○ Verify LV is on

○ Attach copy of SIAM logic table

Start Rear Bulkhead Humidity Tests

The humidity monitors take a while to stabilize, so we start by removing the panels and exposing the sensors to air

○ Start strip chart with “slow control” and “interlock” humidity readings in EPICS.

○ Open bottom panels at 6 and 7 o’clock.

○ Unscrew bracket holding humidity sensors to expose the lower one to air.

○ Place hygrometer in bulkhead.

Test Chiller Flow Switches

The flow switches on the chiller lines interlock the power for the LV supply and also ramp down the LV to zero, using SIAM #4

○ SIAMs 2, 3 and 4 are all green.

○ Annunciator “chiller” alarm is off

○ Stop flow by closing manual valve on electronics supply line. You should see green light on thermister flow switch go red.

○ Open manual valve slowly.

○ Verify SIAM input 3-0 is tripped

○ Verify SIAM input 3-1 is tripped

○ Verify SIAM input 4-0 is tripped

○ LV power supply is OFF
- Annunciator “chiller alarm” is flashing in control room.
- Annunciator “chiller alarm” is flashing in electronics house.
- Reset all trips.
- Reset annunciators in control room and electronics house.
- Verify LV power supply is on.

**Test Temperature Switches**

*Electronics supply line temperature switch*

The temperature switch on the chiller supply line is set to trip below 11° or above 21° C. A trip triggers an annunciator alarm (SIAM 3) and shuts off the power to the LV power supply (SIAM 4).

- SIAMs 2, 3 and 4 are all green.
- Annunciator “chiller” alarm is off.
- LV supply is on.
- Remove electronic supply temperature sensor from line. (Big sensor on side; remove side cover).

*Supply line—low temperature*

- Place sensor in cool bath. Temperature of bath: ________________
- Verify SIAM input 3-0 is tripped.
- Verify SIAM input 3-1 is tripped.
- Verify SIAM input 3-2 is tripped
- Verify SIAM input 4-0 is tripped
- Verify annunciator “chiller alarm” is red in electronics house.
- Verify annunciator “chiller alarm” is red in counting room.
- Verify LV supply is off.
- Warm up sensor to reset trip.
- Restart system
- Reset all SIAMs
- Reset annunciator
- Verify LV power is on.

*Supply line—high temperature*

- Place sensor in warm bath. Temperature of bath: ________________
- Verify SIAM input 3-0 is tripped.
- Verify SIAM input 3-1 is tripped.
- Verify SIAM input 3-2 is tripped
- Verify SIAM input 4-0 is tripped
- Verify annunciator “chiller alarm” is red in electronics house.
- Verify annunciator “chiller alarm” is red in counting room.
Verify LV supply is off.

Warm up sensor to reset trip.

Restart system.

Reset all SIAMs

Reset annunciator

Verify LV power is on.

**Electronics return line temperature switch**

The temperature switch on the chiller return line is set to trip below 13° or above 23° C. A trip triggers an annunciator alarm (SIAM 3) and shuts off the power to the LV power supply (SIAM 4).

- SIAMs 2, 3 and 4 are all green.
- Annunciator “chiller” alarm is off.
- LV supply is on.
- Remove electronic return line temperature sensor from line. (Back of chiller)

**Return line—low temperature**

- Place sensor in cool bath. Temperature of bath: ________________
- Verify SIAM input 3-0 is tripped.
- Verify SIAM input 3-1 is tripped.
- Verify SIAM input 3-3 is tripped.
- Verify SIAM input 4-0 is tripped.
- Verify annunciator “chiller alarm” is red in electronics house.
- Verify annunciator “chiller alarm” is red in counting room.
- Verify LV supply is off.
- Warm up sensor to reset trip.
- Restart system
- Reset all SIAMs
- Reset annunciator
- Verify LV power is on.

**Return line—high temperature**

- Place sensor in warm bath. Temperature of bath: ________________
- Verify SIAM input 3-0 is tripped.
- Verify SIAM input 3-1 is tripped.
- Verify SIAM input 3-3 is tripped.
- Verify SIAM input 4-0 is tripped.
- Verify annunciator “chiller alarm” is red in electronics house.
- Verify annunciator “chiller alarm” is red in counting room.
Verify LV supply is off.
Warm up sensor to reset trip.
Restart system.
Reset all SIAMs
Reset annunciator
Verify LV power is on.

Test Humidity and Moisture sensors
The moisture/humidity sensors check for water leaks in the bulkhead regions. There are two sensors per end, one of which is used for the moisture interlock (defined as humidity >75%).

Rear Bulkhead
- Check strip chart and verify the two readings are stable.
- Humidity on VWR meter: ________________
- Humidity on interlock DPM (in EH rack B620B-10): ________________
- EPICs humidity: “slow controls”: ________________
- EPICs humidity: “interlock”: ________________
- The above humidity readings indicate humidity sensors are functioning: ________________
- Trip moisture sensor by blowing on it gently through the two drinking straws.
- Humidity on DPM at trip: ________________
- Verify SIAM input 0-1 is tripped
- Verify SIAM input 2-0 is tripped
- Verify SIAM input 3-4 is tripped
- Verify SIAM input 4-3 is tripped
- reattach moisture sensor
- close panel
- reset all alarms and trips

Front Bulkhead
- Open panel; leave for >10 minutes.
- Humidity on omega meter: ________________
- Humidity on interlock DPM (rack B620D-9): ________________
- Humidity in EPICs interlock: ________________
- Humidity in EPICs slow control: ________________
- The above humidity readings indicate humidity sensors are functioning: ________________
- Trip moisture sensor: unscrew from bulkhead and blow on gently.
- Humidity on DPM at trip: ________________
○ Verify SIAM input 0-1 is tripped
○ Verify SIAM input 2-1 is tripped
○ Verify SIAM input 4-3 is tripped
○ reattach moisture sensor
○ close panel
○ reset all alarms and trips

○ Reset O2 alarm in Gas hut, if necessary

○ All sensors and alarms performed as expected in all parts of this test.

Signature: ___________________________ Date: ________________

Additional Comments and Notes: