STANDARD OPERATING PROCEDURE

Handling Liquid Nitrogen

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Minimum Personal Protective Equipment Required: Cryogenic gloves, eye protection, skin and body protection (long pants, lab coat, and closed toed shoes)

Risks: Severe frostbite, explosions if liquid N_2 is in a closed container, asphyxiation if working in a poorly ventilated space.

Special Handling:

- ✓ Use cryogenic fluids only in well-ventilated areas.
- ✓ Store and transport liquid nitrogen in liquid nitrogen carriers

Protocol/Procedure:

1. Confirm that the oxygen sensor is on and is not alarming before starting to work
2. Place the liquid N_2 hose into the plastic Dewer flask
3. Open valve to the liquid N_2 tank slowly to minimize the risk of splashes.
4. Do not fill container more than 80% full
5. Close the valve and place the end of the hose into an empty Dewer
    a. This will avoid damage to the flood from the extreme cold, and
    b. Prevent the end of the hose from being damaged
6. To minimize transport of the liquid N_2, work in the soil extraction room unless there is no room
7. Keep the lid on the Dewer when not actively using the liquid N_2 to prevent excess evaporation
8. Rotate the lid so the spout is exposed when pouring liquid N_2 to minimize splashing
9. Pour liquid N_2 slowly to avoid over spilling and splashes

Low oxygen alarm:

The oxygen sensor is set to alarm if oxygen levels drop to 19.5%. Adverse effects begin to occur at 19%.

If the alarm sounds, immediately leave the room. Keep the door to the room open to allow increased air flow.

Oxygen Sensor:

The oxygen sensor is a small yellow device hanging on the wall above the long bench.

The display will show the remaining life of the unit (24 months in the image) and the gas being monitored (O_2)

If the O_2 level drops to less than 19.5%, the unit will beep, lights will flash, and the unit will vibrate.

Every 24 hours, the sensor should be zeroed (the unit will display a gauge symbol and a hand in the lower left and right corners when it is time to zero the unit).

Zero Procedure:

1. Move the sensor out into the hallway
2. Press and hold the pushbutton until a 5 second countdown is displayed, and then continue to hold until the countdown is complete.
3. When the countdown is complete, the Zero procedure begins and ZErO is displayed.
4. When Zero is successful, PASS and then CAL ? is displayed.
5. Wait for the detector to enter normal operating mode after a 5 second countdown.
6. The unit has been zeroed and can be returned to the soil extraction room.
7. If Zero is not successful, FAIL is displayed.
8. Press the pushbutton to acknowledge the result and return to normal operation.
9. Repeat the zero procedure.
10. If the sensor fails again, a spare sensor is in one of the drawers next to freezer W.

Activating a new O_2 sensor:

1. Take the unit out into the hallway
2. Press and hold the pushbutton, a countdown will start, continue holding the pushbutton until the countdown is complete.
3. The unit will go through an internal diagnostic (the LEDs will flash; a countdown will start and the unit will vibrate for 20 seconds).
4. Once the operating life countdown and gas detected are shown (see picture on previous page), the unit is working and can be placed on the hook into the soil extraction room.
5. Bring the defective unit to the lab manager so a new spare can be ordered.