Tour Group Job Description: Dry Box Captain

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The primary responsibility of the dry box captain is to ensure that the dry box is kept in good working order and that the integrity of the atmosphere within the dry box is maintained. Total responsibility for the dry box can be broken down into several smaller tasks, each of which is listed and described below.

Atmosphere Testing: The atmosphere in the dry box should be kept both water- and oxygen-free. There are several simple tests to determine if this is so.

Light-Bulb Test: A standard 40W incandescent light-bulb is heated over a Bunsen-burner flame until the glass deforms and forms a small hole. Viewing the filament through the hole will confirm that the filament is unbroken. It is wise to introduce several of these light bulbs into the dry box before carrying out the tests as the first few may burn out. The light-bulb is screwed into an open socket which should be kept within the dry box at all times. Oxidation and moisture will oxidize on the hot filament and eventually it will burn out. However, a good atmosphere in the box will permit the bulb to burn for up to one week (optimal). A burn time over 24 h is acceptable while anything less indicates a compromised atmosphere.

$TiCl_4$: This compound (which is stored in the dry box) will visibly fume in the presence of water and simply opening the bottle will quickly indicate the presence of water.

Dry Box Operation: To guarantee that a clean atmosphere is maintained, the dry box captain should instruct all novices in the proper use of the dry box. (For detailed instructions, see operational protocol posted on dry box.)

Catalyst Regeneration: The atmosphere in the dry box is constantly run over a catalyst bed (insulated cylinder to left of box) to keep it clean. Occasionally, (every six months or sooner as needed) the catalyst should be regenerated to remove bound oxygen and water. The regeneration procedure is listed in the manual and usually takes about 12 h.

Vacuum Pump Maintenance: It is the responsibility of the dry box captain to change the oil in the vacuum pump periodically (1-2 times/year). Note that all the water driven from the catalyst bed during a regeneration cycle will end up in the vacuum pump. Thus, it is prudent to schedule an oil change just after a catalyst regeneration. Both of these activities can be conveniently scheduled during a lab clean-up.

Cleanliness of the Box: Although each person is told to clean-up after each dry box use, it becomes necessary from time to time to clean the interior of the box. This amounts to clearing away garbage, wiping surfaces with a solvent, and cleaning the glass if necessary.

Calibration and Leveling of the Balance: The dry box captain should use a mirror to check the leveling bubble behind the balance and endeavor to keep it level. The taped box within the dry box is where the original leveling took place. It can be moved but please note that leveling can be an arduous process taking a fair amount of time and work.

Gloves: Good practices should be employed to avoid puncturing or cutting the gloves. In the event of a puncture, it is the responsibility of the dry box operator to repair or replace the glove. A small puncture can be repaired with a standard bicycle tire repair kit or some electrical tape. (One should be found among the dry box paraphernalia.) Extensive damage will demand a glove replacement. There is a metal plate in the dry box to plug the glove hole in the event of a catastrophic failure. Replacement gloves (an older but usable pair) can be found above the dry box.