

**BEAMS DIVISION DEPARTMENTAL PROCEDURE
BD/MECHANICAL SUPPORT
BDDP-ME-0702**

**PROCEDURE FOR TURNING ON/OFF THE
ANTIPROTON SOURCE LITHIUM LENS WATER SYSTEM**

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TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE	1
2.0 RESPONSIBILITIES.....	1
2.1 TRAINING.....	1
3.0 SUPPORTING DOCUMENTS	1
3.1 REFERENCES	1
3.2 PROCEDURE REFERENCE.....	1
4.0 INSTRUCTIONS	1
4.1 PRELIMINARY ACTIVITIES	2
4.1.1 ACCESS TO THE APO WATER CAGE.....	2
4.2 TURNING OFF THE LITHIUM LENS WATER SYSTEM.....	2
4.2.1 LOTO LITHIUM LENS WATER SYSTEM POWER.....	2
4.2.2 GENERAL PRECAUTIONS.....	3
4.3 RESTARTING THE LITHIUM LENS WATER SYSTEM	3
5.0 CONTROLLED COPY DISTRIBUTION.....	4
Attachment 1, Schematic of Lithium Lens Water System	1 page
Appendix A, Controlled Copy Distribution List	1 page

1.0 PURPOSE AND SCOPE

The purpose of this procedure is to establish the necessary methods and outline the potential hazards associated with turning on/off the lithium lens water system located at the AP0 Target Hall Building. Water contained in the lithium lens system, under normal operating conditions, is contaminated with tritium and other radioactive isotopes due to activation by high energy particles originating from collisions of the proton beam on the antiproton target. ***Special precautions are therefore necessary to ensure the safety of personnel and minimize any potential for exposure or contamination.*** This procedure outlines the steps necessary to properly shut down the water system, as well as restart the system after all necessary work has been performed. Also delineated are the safety hazards associated with the lithium lens water system.

NOTE: This document does not address procedures for work performed on the water system either in the caged area or the vault area.

2.0 RESPONSIBILITIES

At the request of the Antiproton Source Department, Mechanical Support Department personnel will coordinate all necessary pre-planning tasks, interface with appropriate Beams Division Radiation Safety personnel, and perform the necessary work on the lithium lens water system.

2.1 TRAINING

All personnel are required to have current Radiological Worker and Radioactive Waste Disposal training. Verification may be found on the monthly Beams Division Safety Training printout, the TRAIN database, or by contacting the Beams Division ES&H Department.

3.0 SUPPORTING DOCUMENTS

3.1 REFERENCES

Attachment 1, the Lithium Lens Water System, is a schematic of the closed loop lithium lens water system complete with secondary cooling and the safety purge devices. This may be referred to should questions regarding hardware configurations arise.

3.2 PROCEDURE REFERENCE

Procedure for Inspecting AP-0 Water Systems: BDDP – ME – 0706

4.0 INSTRUCTIONS

4.1 PRELIMINARY ACTIVITIES

- a. The BD/Radiation Safety Section shall be notified as to the proposed work to be done, and ***all lead personnel that will be involved in any work on the water system must have a pre-planning meeting.*** The procedure to be followed for stopping and starting the lithium lens water system requires a minimum of two people.
- b. Beam to the AP0 target shall be disabled prior to and during the conduct of work on the lithium lens water system.

4.1.1 ACCESS TO THE AP0 WATER CAGE

The water cage area is located on the south wall of AP0 behind the vault enclosure. ***All personnel entering the AP0 water cage shall be monitored with film badges, and personal dosimeters. Minimum protective clothing requirements include rubber gloves, coveralls, rubber-lined foot covers, and a face shield.*** Additional requirements may be posted locally at the water cage entrance or may be specified by radiation safety personnel. The keys required for access to the water cage area must be checked out by the Crew Chief in the BD/Main Control Room. Permission of the Beam Division Radiation Safety Officer (BD/RSO) is required prior to checking out the AP0 water cage key.

4.2 TURNING OFF THE LITHIUM LENS WATER SYSTEM

- a. Disable the argon safety system for the lithium lens water circuit by closing the valve on top of the argon cylinder. The argon safety system is located in the southeast corner of AP0 near the target blower system.
- b. Bleed off the trapped argon gas in the brass manifold pipe, by opening the bleed valve on the end of the manifold. The manifold is located on the wall above the argon cylinders.
- c. Rotate the pressure regulator T-handle clockwise which is located on the end of the brass manifold pipe. This will release the argon pressure throughout the lithium lens water system, trip the argon pressure interlock, and shut off the pump. When the water system is shut off, the 3-way valves in the vault area will automatically shift to the purge position.

4.2.1 LOTO LITHIUM LENS WATER SYSTEM POWER

Each individual entering the water cage enclosure must lock out and tag out (LOTO) the lithium lens water system power supply prior to performing any work on the water system.

SPECIAL NOTE: IF, UPON ENTERING THE APO WATER CAGE AREA, SPILLED WATER IS ON THE FLOOR OUTSIDE OF THE PUMP SKID DRIP TRAYS OR SPRAYING WATER IS PRESENT IN THE WATER CAGE, DIAL X3131 IMMEDIATELY AND NOTIFY THE EMERGENCY OPERATOR THAT RADIATION SAFETY ASSISTANCE IS NEEDED. DO NOT ATTEMPT TO CLEAN UP THE SPILL. WAIT FOR TRAINED PERSONNEL WITH THE PROPER EQUIPMENT.

4.2.2 GENERAL PRECAUTIONS

CAUTION: The lithium lens water system is still pressurized at this point due to a 9 psi head on the pressure tank (bladder membrane). Prior to beginning any work on the lithium lens water system, water will need to be drained from the system. This can be done by opening the blowdown valve on the inlet strainer of the pump, and draining water into the 5 gallon plastic carboy next to the water system. (See attachment 1 for location of inlet strainer blowdown valve). The blowdown valve has a 5/16" tygon tube attached to it, which is placed in the carboy. This carboy is specifically labeled for radioactive liquid waste, and is used only for draining water from the lithium water system. Drain water out of the system until the suction gage located on the front of the water system reads zero.

4.3 RESTARTING THE LITHIUM LENS WATER SYSTEM

- a. After the necessary work to the water system has been performed, remove all safety locks and tags from the power supply.

CAUTION: The following step requires access to the control panel while the panel is energized. Special care should be exercised to avoid contact with exposed buswork and wiring on the inside of the panel.

- b. Turn on the lithium lens water system at the control panel located on the front of the supply. While holding the start button in, open the control panel cover and depress the purge override (red button). This will cause the three-way valves in the vault to shift back to their normal operating position. Release the start button, but continue to hold the override button in. This allows the water system to operate without the purge safety system.
- c. While one person is holding the purge override button depressed, the second person must reset the argon safety system. Turn the argon pressure regulator counterclockwise until no spring pressure is on the valve stem, close the manifold

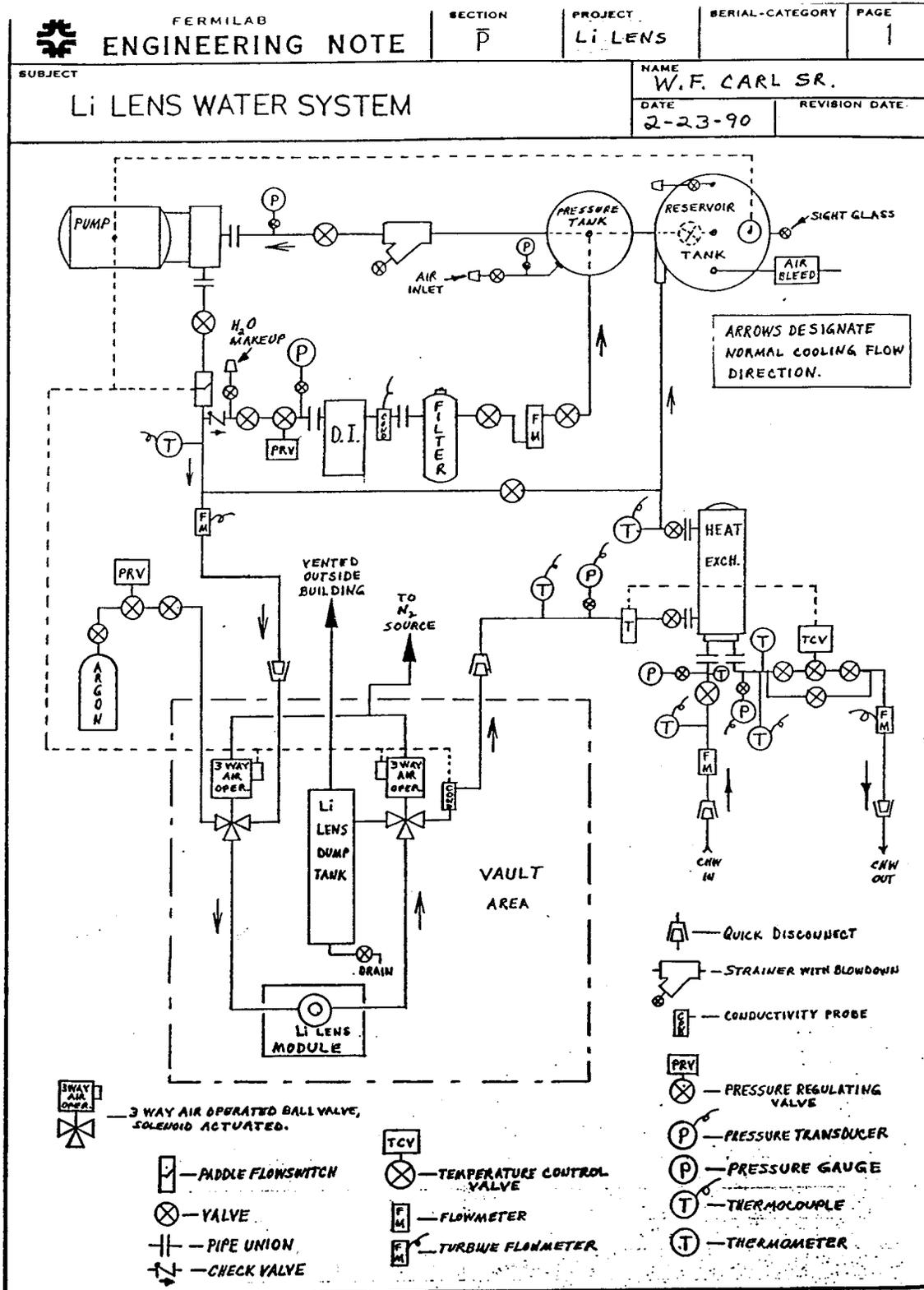
bleed valve, and open the valve on the argon cylinder. Now the argon pressure regulator can be reset to 10 psi.

- d. The second person must now reset the interlocks at the main control panel in AP0 to enable the lithium lens system. The interlocks are reset by pushing the green button for the lens parameters found in relay rack R5-E of the control panel. Check to see that the interlocks are enabled by observing the reset lights in rack R6-B and R6-C of the control panel.
- e. The purge override button can now be released in the lens water control panel.
- f. Check the lens circulating water pressure either on the suction gage of the pump, or on channel 15 of the A/D converter located in relay rack R5-E of the AP0 control panel to determine if water will need to be added to the system. Proper water pressure should be approximately 9.5 psi on the gage, or 5.00 volts on the converter. If water pressure reads between 4.80V and 5.20V on channel 15 of the A/D converter go to step j. Otherwise follow the steps listed below to add water to the lithium lens water system.
- g. The source of makeup water for the lithium lens water system is 95 degree low conductivity water (LCW), which is located in a header pipe directly above the lens water system. Attach the 1/4" rubber hose, which taps off of the header pipe above the pulse magnet water system, to the lens water system on the deionizing/filtration loop (see attachment 1). The quick-disconnect fittings attached to the hose, as well as the water system, will facilitate this process.
- h. Open the shutoff valve on the header pipe to allow water into the hose. Slowly open the 1/4" needle valve on the DI/filtration loop of the lens water system which will add makeup water into the lens system. Continue to add water until the suction gage of the lens system reads 9.5 psi.
- i. Close the 1/4" needle valve, the shutoff valve on the header pipe, and disconnect the hose.
- j. Frisk all personnel and tools immediately after leaving the lithium lens water cage area.

5.0 CONTROLLED COPY DISTRIBUTION

- 5.0.1 Reference Appendix A. The Mechanical Support Department Head is responsible for approving Appendix revisions.

ATTACHMENT 1 SCHEMATIC OF LITHIUM LENS WATER SYSTEM



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ATTACHMENT 1

APPROVED _____

DATE _____

APPENDIX A: Controlled Copy Distribution List

<u>Controlled Copy No.</u>	<u>Recipient</u>
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2	Antiproton Source Department Head Dave McGinnis
3	BD ES&H Department Head Mike Andrews
4	Responsible Engineer Jeff Bielicki

APPENDIX A