

Vacuum Group Procedure VA-008.18.1.59
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Revision 01

****IMPORTANT****

This procedure was written for use with the chamber rework facility that existed in building 975 for chamber cutting, cleaning, welding, baking, and leak check. That facility has been decommissioned. Prior to the performance of any work within the scope of this procedure, it is the responsibility of the supervisor to ensure that *work planning* has been performed for the protection of the workers, equipment, and the environment. A new facility will have to be developed and this procedure will have to be updated to reflect the equipment available in the new facility. This procedure is a guideline for how chambers were reworked in a safe and environmentally friendly manner previously.

1. **PURPOSE:**
 - 1.1 To provide an effective procedure for AGS Vacuum Technicians to re-work vacuum chambers at Building 975.

2. **RESPONSIBILITIES:**
 - 2.1 The AGS Vacuum Supervisor shall be responsible for the implementation of this procedure.

3. **DISCUSSION:**
 - 3.1 This procedure is written so that trained AGS Vacuum Technicians will be able to successfully and efficiently re-work a vacuum chamber, installing new bellows and flanges, and baking it in a safe manner.

4. **PRECAUTIONS:**
 - 4.1 The technician shall be aware of radiation levels of the chambers as indicated on the "Traveler" Sheet.

5. **PREREQUISITES:**
 - 5.1 The Technician shall have been trained in this procedure
 - 5.2 Activation Worker Training
 - 5.3 Film Badge
 - 5.4 Self Reading Dosimeter
 - 5.5 Safety Protective clothing, gloves, boots, glasses
 - 5.6 GS Vacuum Procedure 8.18.1.31 (Use of Oven)
 - 5.7 AGS Vacuum Procedure 8.18.1.66 (Chamber Cutting)
 - 5.8 AGS Vacuum Procedure 8.18.1.67 (Chamber Welding)
 - 5.9 AGS Vacuum Procedure 8.18.1.68 (Chamber Bakeout)

6. **OPERATIONAL PROCEDURE:**
 - 6.1 See following pages.

CHAMBER FACTORY REWORK PROCEDURE
REV. B
April 11, 1990

1. Make travelers for individual chambers.
 - a. Use the known defective bellows list.
 - b. The chamber's present location in the ring (A-6, L-14, etc.) will be the chamber serial number until the chamber has been reworked and reinstalled in the ring.
2. Remove clamps and seals from the chambers.
 - a. Note any rubber seals removed in a log and compare the log with the defective bellows list.
 - b. Update the travelers.
3. Remove chambers from the magnets.
 - a. Put the chamber on the ring cart.
 - b. Mark on the chamber its "Serial No." and the date with a magic marker.
4. Take a radiation survey and a contamination smear from the chamber.
 - a. Note any "hot spots" on the chamber with a magic marker.
5. Attach the traveler to the chamber.
 - a. Include radiation survey data.
 - b. Update the traveler if any glytal is found on the bellows or other parts of the chamber.
6. Move the chamber to the North Conjunction Area.
 - a. Cover all flanges tightly with Aluminum foil and then cover the 9 1/2 inch flanges with the rubber boots before moving.
7. Update the radiation tag and the traveler with the results of the contamination smear.
8. Load the chamber onto the 975 trailer and move to 975.
 - a. Record in the North Conjunction Area radiation log book that the chamber is being moved out of the ring.
9. Unload the chambers from the trailers in the outside storage area of 975.
 - a. Chambers are to be stored in this area by type and by bellows rework requirements.
 - b. Log chamber into 975 radiation log book.
 - c. Remove the PUE from the chamber. Log and discard the old PUE feed-thru in the "Argonne Bin".
 - d. Rework the PUE in accordance with the PUE rework procedure.
10. Move the chamber to the cutting room.
 - a. Use the ring cart.
 - b. Review the traveler for bellows information.
 - c. Mark on the chamber where the conduit is to be cut off.

11. Cut off old ion pump conduit old PUE elbow (if applicable) and old bellows (if required).
 - a. Review the traveler to verify bellows information and conduit cutoff dimension before cutting.
 - b. Log and discard old components in "Argonne Bin".
12. Move the chamber to the steam clean area.
 - a. Use the ring cart.
13. Clean the chamber.
 - a. Remove any glytial or leak sealant with acetone and scotchbrite pads. Collect the acetone and the scotchbrite in a separate container.
 - b. Detergent steam clean the chamber. Collect all of the runoff water. Separate containers must be kept for each chamber.
 - c. Log the water container and remove a sample for health physics.
 - d. Rinse the chamber with distilled alcohol. Collect all of the runoff alcohol. Reuse the alcohol. When the chambers are finished the remaining alcohol is to be sampled by Health Physics for contamination.
 - e. Allow the chamber to air dry.
 - f. Cover the openings in the chamber with aluminum foil and move to the chamber welding area.
14. After receiving the results for the water samples, dispose of the water in the appropriate manner.
 - a. Clean water is to be drained into the sanitary sewer system.
 - b. Contaminated water is to be moved to the "igloo area".
 - c. If the alcohol is to be disposed, clean alcohol must go to the chemical waste disposal area. Contaminated alcohol to the "igloo area".
15. Move chamber to the welding area.
 - a. Remove and inspect new ion pump conduit for damage or chipped flanges.
 - b. If required, remove and inspect PUE feedthru for damage or scratched flange.
 - c. If bellows are required, find correct bellows, inspect flange and leak check bellows/flange assembly (or verify that they have been leak checked).
 - d. If bellows are required, measure chamber to determine if spacers are required. If required get the correct size spacer and mark its location on the chamber.
16. Move chamber to welding table.
 - a. Cover all ports with aluminum foil.
 - b. Set-up a tube to the Argon bottle for the internal Argon purging.
 - c. Verify bellows type and dimension required for bellows spacer.
 - d. Start internal purging and weld chamber.
 - e. Maintain purge until the chamber has cooled.
17. Move the chamber to the leak check area.
 - a. Put blank-off flanges on the main marman ports with Viton seals, metal retainers, and standard ring clamps.
 - b. Use a copper conflat gasket and a blank flange on the PUE ports.
 - c. Put the pump-out flange on the ion pump port with a Viton seal, metal retainer and

the stainless steel ion pump clamps.

18. Leak check the chamber.
 - a. Calibrate the leak detector at least once at the start of the day and once at the end of the day. Log calibration data in the leak detector log book.
 - b. Use a turbo to rough the chamber and for leak checking.
 - c. Return failed chambers to the welding area for repair. Note failure and failure location on the traveler and mark on the chamber.

19. Move Non-PUE chambers to oven cart and move PUE chambers to the PUE assembly area for step 20.
 - a. Vent the successful chambers to N₂.
 - b. Do not remove the clamps from the chambers which are going to the oven.
 - c. Cover the roughing port with aluminum foil.
 - d. Remove only the downstream clamp from the PUE chamber and cover the flange with aluminum foil.
 - e. If the oven cart is full move the chamber to the oven waiting area.

20. PUE chambers only. Install the PUE.
 - a. Inspect the PUE elbow for proper alignment.
 - b. Install and align the reworked and cleaned PUE.
 - c. Leak check the PUE feedthru (or verify it has been leak checked).
 - d. Screw on the cables and install feedthru with a copper conflat gasket.
 - e. Have E. Sill (or equivalent) electrically check the PUE assembly and mark the electrode location on the feedthru.

21. PUE chambers only. Move the chamber to the leak check area.
 - a. Leak check the chamber in accordance with steps 17 and 18 above with PUE feedthru installed.
 - b. While the chamber is under vacuum have E. Sill (or equivalent) electrically check the PUE.
 - c. Vent successful chambers with N₂, cover the roughing port with aluminum foil, and move it to the oven cart or oven waiting area.

22. Prepare the chambers for bakeout.
 - a. Bolt the roughing manifold onto each chamber on the cart.
 - b. Leak check the roughing manifold.
 - c. Close valve on the oven roughing manifold.

23. Roll the baked chambers out of the oven and roll in the chambers to be baked.
 - a. Remove the travelers from the chambers. Note the location of the chamber on the oven cart on the traveler.
 - a. Bolt the roughing manifold to the oven roughing turbo.
 - b. Start roughing turbo. When pressure in turbo is less than 10⁻³ Torr SLOWLY open the roughing manifold valve (slowly to prevent the turbo from "crashing" if vacuum wasn't maintained in the chambers). Leak check roughing connections.
 - c. Bakeout chambers in accordance with the oven procedure.

24. Remove chambers from the oven.
 - a. Close roughing manifold valve, vent the turbo, and disconnect the roughing manifold from the turbo.
 - b. Roll the chambers out of the oven. Roll in and start the next batch of chambers.
 - c. Reattach the travelers to the chambers.
 - d. Bolt the roughing manifold to the leak detector turbo.
 - e. Start the turbo. When pressure in turbo is less than
 2. 10^{-6} Torr SLOWLY open the roughing manifold valve (slowly to prevent the turbo from "crashing" if vacuum wasn't maintained in the chambers). Leak check all of the chambers.
 - f. While the PUE chambers are under vacuum have E. Gill (or equivalent) electrically check the PUE.

25. Remove the chambers which pass leak and electrical check from the oven cart.
 - a. Valve out the leak detector turbo and vent the chambers to
 3. N_2 .
 - b. Remove all of the clamps and viton seals.
 - c. Immediately cover all ports with aluminum foil.
 - d. Move the chambers to the 975 block house or to the ring cart.

26. Move failed chambers to weld or PUE area depending on failure.
 - a. Repair the chamber as necessary and repeat bakeout and leak checking.

27. Move the chamber to the ring on the ring cart.
 - a. Note on the traveler and mark on the chamber its installation location.
 - b. Log the chamber out of the chamber factory radiation log book.
 - c. Log the chamber into the North Conjunction Area radiation log book.
 - d. Move the chamber to the appropriate magnet with the ring cart.
 - e. Before installing the PUE chambers have E. Gill (or equivalent) electrically check the PUE.
 - f. Wrap the chamber with Kapton.
 - g. Sign off the traveler and return it to the chamber factory.
 - h. Install the chamber in accordance with the installation procedure.