

Beam Tube Opening and Closing Procedures

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Estimating the water inserted into the tube

The concept is to use the total pressure measured on the discharge gauges closest to the 80K trap and estimate the fraction of the gas that is water from rga spectra taken at the instrument chambers closest to the trap. The pressure of water is then

$$P(\text{H}_2\text{O}) = P(\text{gauge}) f(\text{H}_2\text{O})$$

where the water fraction is

$$f(\text{H}_2\text{O}) = \frac{\text{amu}18}{0.5\text{amu}2 + \text{amu}18 + \text{amu}28 + \text{amu}32 + \text{amu}44}$$

The water load into the tube is the sum of the contribution from both ends

$$Q(\text{total}) = Q(\text{end 1}) + Q(\text{end 2})$$

The load from an end is estimated by

$$Q(\text{end}) = F \alpha(\text{end}) P(\text{H}_2\text{O}) t(\text{exposure in sec})$$

Table 1: Water pumping parameters

pumping speed at trap aperture	F	1×10^5 liters/sec
transmission	α (long trap)	3.3×10^{-2}
transmission	α (short trap)	3.0×10^{-1}

The measurements of the pressure and the rga spectra are taken just **prior** to opening the gate-valve to the tube. At Hanford, Mark Lubinski is maintaining the record of the total amount of water introduced into the tube.

Opening and closing the gate valves

The concept is to make “soft” closures of the valves while we are doing optical tests. The soft closure is intended to reduce the wear on the valves which have a manufacturer estimated lifetime of 1000 cycles for hard closures. By performing a soft closure we hope to increase the life of the gate carriage and “O” rings. The procedure to achieve a soft closure is different for the pneumatically and the electrically operated valves.

Pneumatic Valves

OPEN (operation takes about 4 minutes)

- 1) set switch to local
- 2) set switch to open
- 3) increase pressure to 45 psi
- 4) listen for gate carriage disengaging from flat flange
- 5) watch for LED at top of cylinder and listen for end of gas flow at the solenoid valve
- 6) set switch to remote leaving 45 psi on the cylinder
- 7) enable auto-close

CLOSE (operation takes about 15 minutes)

- 1) set switch to local
- 2) release pressure by turning regulator fully ccw
- 3) when pressure is steady, switch to close
- 4) when pressure has gone to zero, close shutoff valve above regulator
- 5) adjust pressure to 10 psi
- 6) open shutoff valve
- 7) wait for flow at solenoid valve to stop (typically 10 to 20 minutes)
- 8) set switch to remote

Electric Valves(Each new valve requires testing to determine the correct closing time)

Always check that the controller is operable by looking at the display on the controller. If there is an error condition indicated push reset on the controller.

OPEN (operation takes about 4 minutes)

- 1) set to open
- 2) set to local
- 3) when valve stops moving, set to remote
- 4) enable interlock

CLOSE WGV9(Washington) Y mid station (operation takes about 4 minutes (needs precision))

- 1) make sure switch is set to remote
- 2) set to close
- 3) begin timing, set to local
- 4) wait 4 minutes 18 seconds, then set to remote to stop the motion
- 5) find the tape marker on the drive pulley
- 6) move switch from remote to local and watch for 2 turns of pulley rotation
- 7) stop motion by switching from local to remote

CLOSE WGV13(Washington) X mid station (needs precision)

- 1) make sure switch is set to remote
- 2) set to close
- 3) begin timing, set to local
- 4) wait 4 minutes 20 seconds, then set to remote to stop motion