

K. Summary Report on Hardware, Magnets, and Vacuum Systems, R. W. Higgins, LASL

Los Alamos Scientific Laboratory group AT-3 presented R&D activity on vacuum flanging and general vacuum aspects of the Proton Storage Ring (PSR) and entertained discussions on related vacuum technology associated with accelerators and storage rings. The R&D effort described by AT-3 involved flange-seal candidates for the PSR amenable to remote handling techniques. Four flange systems (Figs. III-K.1-4) were shown as possible candidates for simplified connection and disassembly activity on the PSR. The seals noted in Figs. III-K.1 and III-K.2 ("k" and "c" seals) are presently under experimental study for leak tightness, ease of assembly and disassembly, and susceptibility to leakage failure under thermal excursions caused by pipe in situ bakeout at 260 °C. These seals have operated satisfactorily for lead and silver coatings.

Other candidates employing deformation sealing methods adaptable to guide connection techniques are shown in Fig. III-K.3 and III-K.4. The Belleville-loaded seal shown in Fig. III-K.3 was discussed as a potential candidate having low-flange axial loads but high-radial sealing loads comparable to knife-edge loads of conventional ultra high vacuum sealing systems.

The modified ConFlat system shown in Fig. III-K.4 was shown as a potential candidate having known and reliable ultra-high vacuum sealing characteristics, but employing a modified marmon block clamp system capable of maintaining the high axial loads necessary for deformation sealing of the ConFlat seal ring, but requiring an auxiliary initial clamping system before the marmon block clamp is emplaced.

Discussions were undertaken on equilibrium and bakeout pumping requirements for small storage rings, with representative pumping profiles given for an elemental section of the PSR, shown in Fig. III-K.5. High throughput pumping with turbomolecular pumps was discussed with particular experience given by Argonne National Laboratory personnel on backstreaming studies they have done with vertical axis turbomolecular pumps. Residual gas analysis of the molecular species in beam pipes in the immediate region

of turbomolecular pump inlets detected no oil vapor species even with heavy contamination of the pumps at their discharge ports. These results appear to be considerably sound with the high rotor speed turbomolecular pumps.

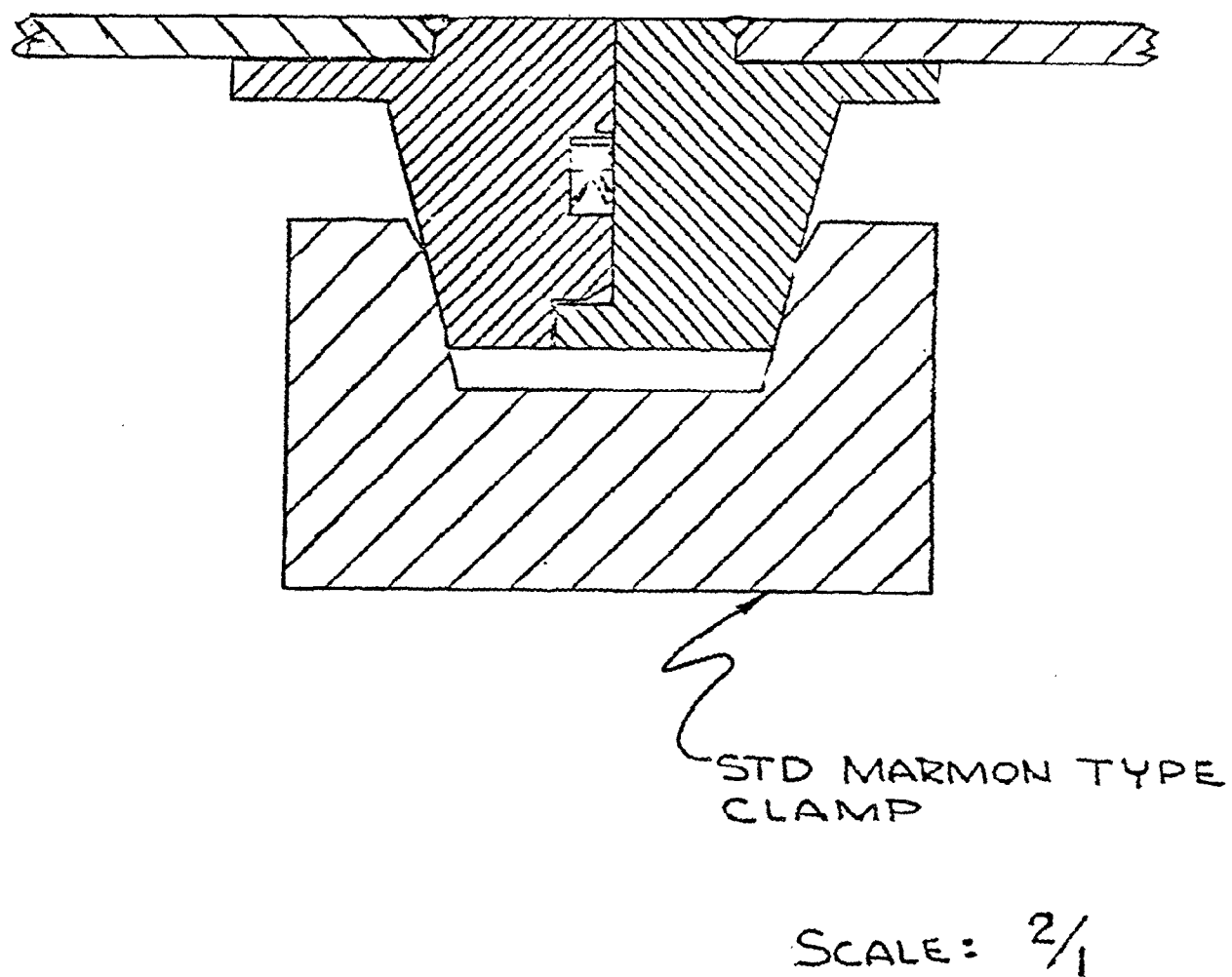
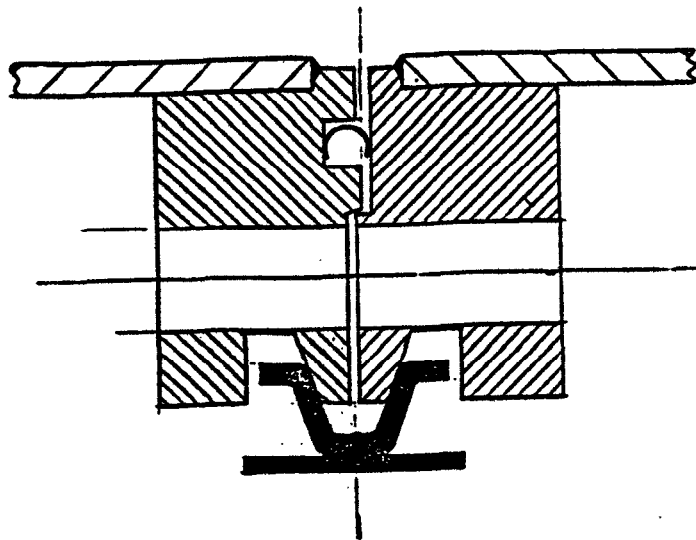


Fig. III-K.1. "k"-seal marmon clamp.



OPEN POSITION

SCALE: 2/1

Fig. III-K.2. "C"-ring voss clamp.

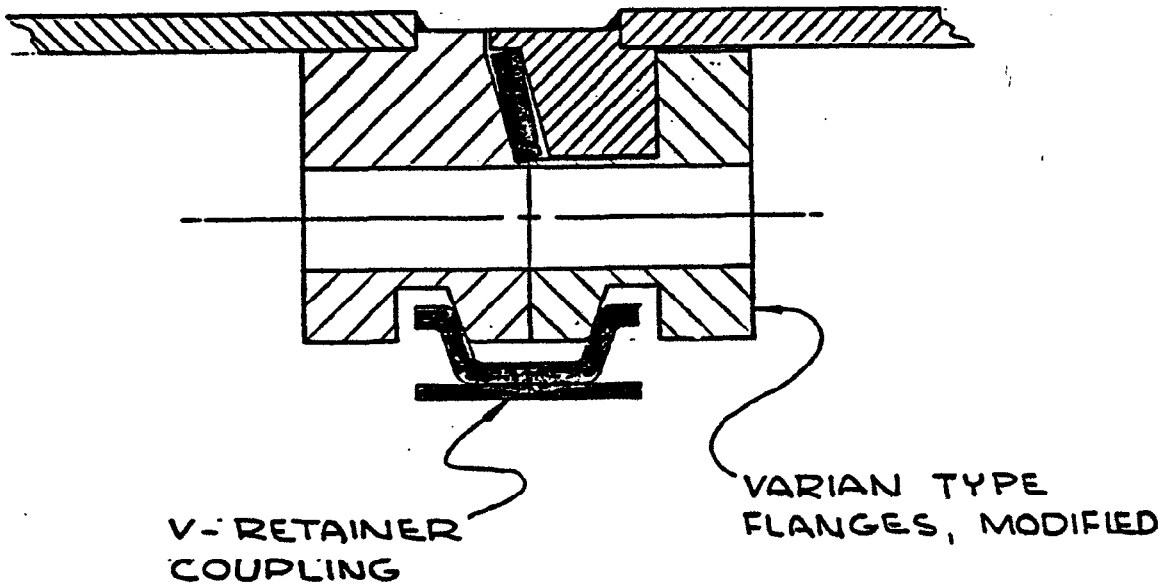


Fig. III-K.3. Belleville-ring-seal voss clamp.

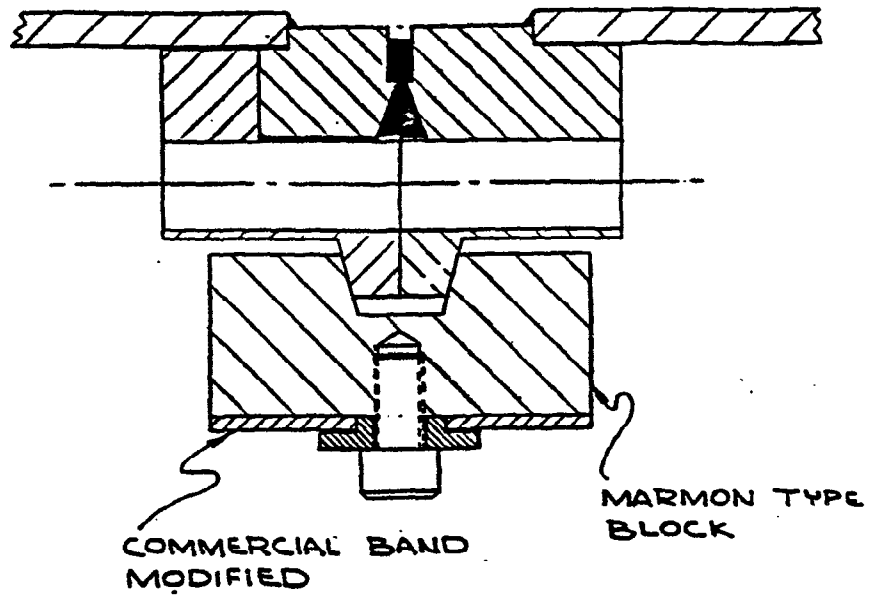


Fig. III-K.4. Conflat-seal marmon block clamp.

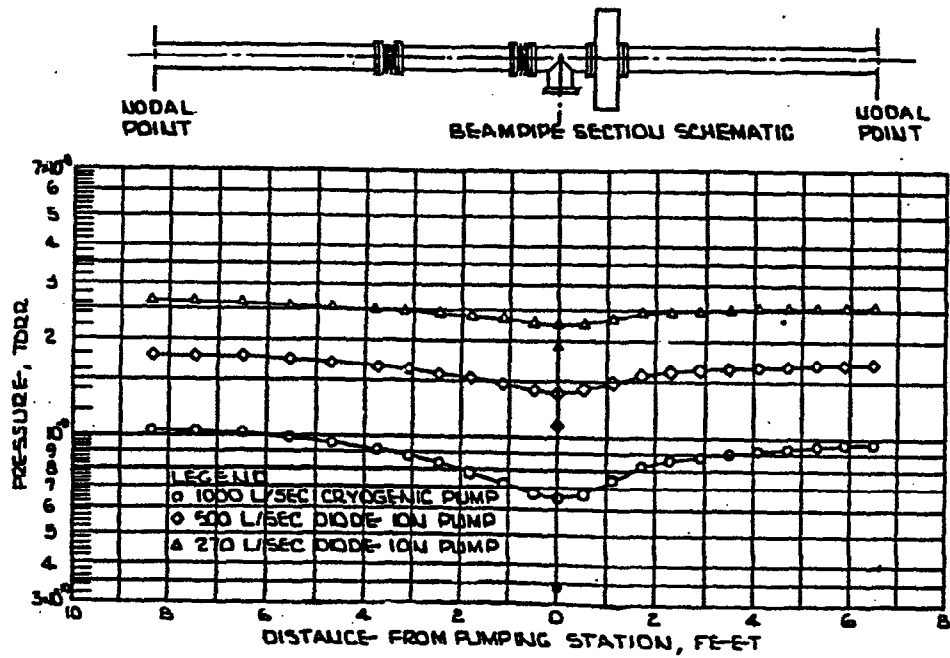


Fig. III-K.5. Pressure profiles for a typical 6-inch O. D. beampipe segment.