FABRICATION OF THE JEFFERSON LABORATORY CRYOGENIC CONTROL RESERVOIRS

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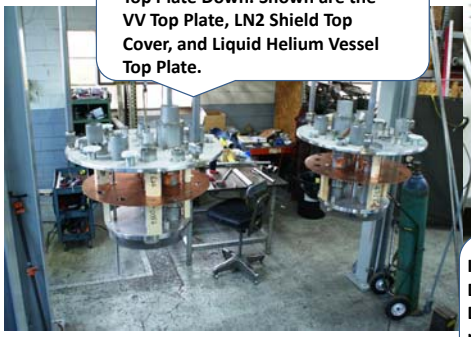
Abstract

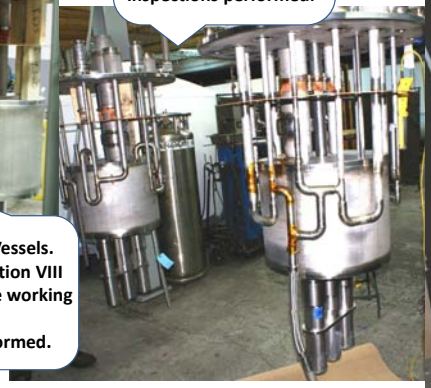
Meyer Tool & Mfg., Inc. (Meyer Tool) of Oak Lawn, Illinois is manufacturing six Cryogenic Control reservoirs (CCRs) for the Thomas Jefferson National Accelerator Facility (Jefferson Lab). Five of the CCRs will be installed in the new Super High Momentum Spectrometer (SHMS) planned for Jefferson Lab's Hall C and the sixth will be installed in Hall D. Both projects are part of the 12 GeV upgrade to the CEBAF accelerator. The CCRs are a cryogenic distribution box designed by Jefferson Laboratory. They include internal reservoirs in order to provide a continuous supply of liquid helium and liquid nitrogen to superconducting magnets through periods of disruption in the external supply. This paper discusses the manufacturing and process measures that were implemented in order to meet the Department of Energy requirements for pressure vessels (10CFR851 Appendix A Part 4), to eliminate brazing flux contamination, and to reduce weld distortion in multiple internal vessels. The CCRs will undergo pressure and vacuum testing at Meyer Tool before being installed by the magnet manufacturer.

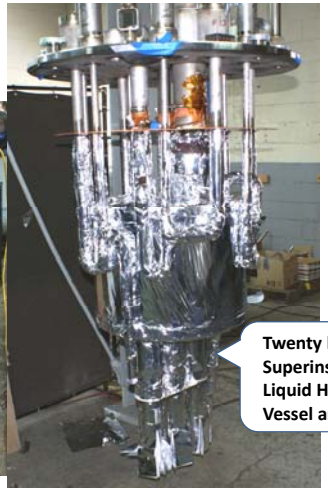


Assembly of Cryostats from the Top Plate Down. Shown are the VV Top Plate, LN2 Shield Top Cover, and Liquid Helium Vessel Top Plate.

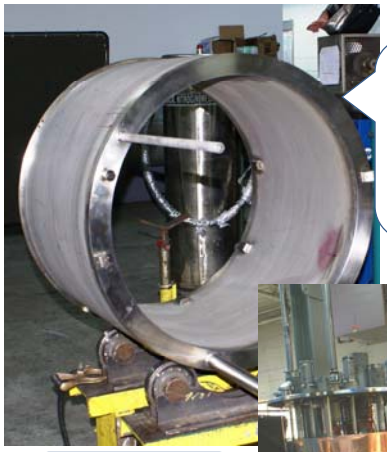
Installation of Liquid Helium Pressure Vessels. Design to ASME Code B&PV Design Section VIII Division 2. 95 psia maximum allowable working pressure, 4.4K minimum design metal temperature. Charpy impact tests performed.

Piping Spools, fabricated to ASME B31.3 Process Piping Code. 90%+ bench welded to 3D model. CWI weld inspections performed.

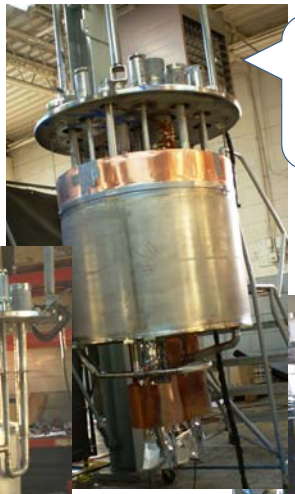




Twenty layer Superinsulation of Liquid Helium Vessel and piping.

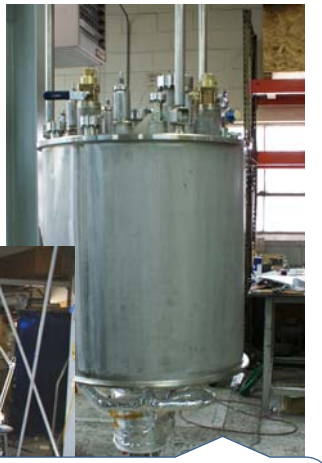


304SS welded construction, Liquid Nitrogen, annular style Pressure Vessel, built to the ASME B&PV Code Section VIII, Division 2. 95 psia maximum allowable working pressure.



Copper Heat Shield attached to the Liquid Nitrogen Pressure Vessel. Stainless steel ring silver brazed to copper shield, then welded to Liquid Nitrogen Vessel.

Forty layer Superinsulation of Liquid Nitrogen Vessel and piping.



Cryostat Vacuum Vessel installed. Welded cylinder slipped over subassembly. Final test involve evacuation of the vacuum vessel and connected to a leak detector with the pressure circuits sequentially pressurized with helium gas.

Two Cryostats in process. Liquid Nitrogen Vessel installed on left, Liquid Helium piping installed on right. Kapton tape on piping on right is part of temperature sensors' installation detail.