



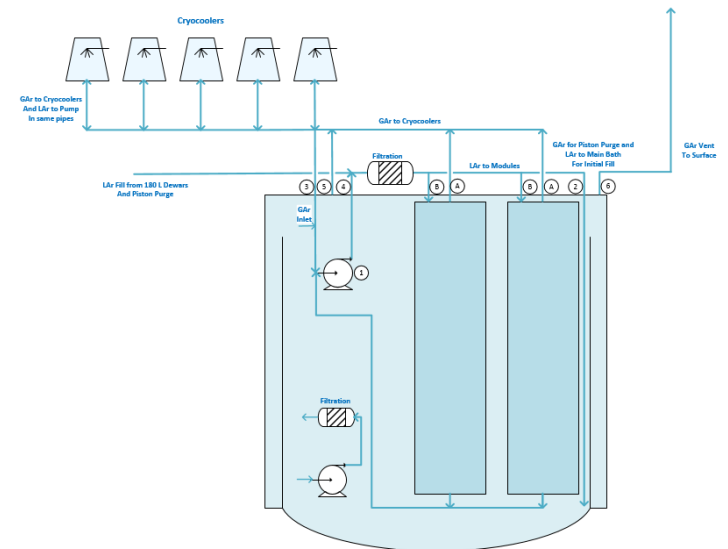
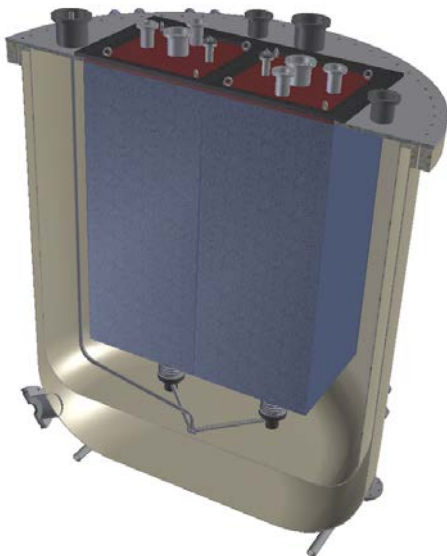
# 2x2 ArgonCube Prototype Qualification

Mike Zuckerbrot

5/23/19

# 2x2 ArgonCube Prototype Description

- Prototype of ArgonCube detectors for DUNE-ND
  - ~6000L VJ vessel, small LAr circulation system w/filters, cryocoolers
  - Running at BERN on and off for several tests
  - To be installed in MINOS underground in ~March 2020
  - History is vague, BNL purchased, sent to CERN, now BERN, vessel tested to 2 bar but top plate is new and has not been pressure tested
- Cryostat and piping will arrive with no documentation and no U or CE stamp



# FESHM Definitions

Exceptional Vessel - A vessel without a stamp or mark certifying compliance to one of the codes allowed by this chapter and does not meet the requirements described for Experiment Vessels.

Experiment Vessel - A vessel within the scope of the code that cannot fully comply with code rules because of vessel geometry, use of special materials, or code conflict with scientific goals, but provides a level of safety equivalent or greater to that provided by the ASME BPVC.

## 6.0 REQUIREMENTS FOR DESIGN, FABRICATION, INSPECTION AND TEST

Vessels within the scope of this chapter shall satisfy one of the following:

1. Include an ASME BPVC U-stamp.
2. Include a European Commission Pressure Equipment Directive (PED) CE-mark and be built per either standard EN-13445, *Unfired Pressure Vessels*, or AD 2000, *Code of Practice for Pressure Vessels*.
3. Conform to another more applicable code in its entirety. Before fabrication, allowance for use of another code shall be approved and documented in a signed memo by the Division/Section/Center Head or designee in consultation with the MSS and CSS.
4. Vessels which do not include a code stamp or mark from one of the codes allowed above shall provide a level of safety and quality greater than or equivalent to that afforded by the ASME BPVC. At a minimum, these vessels shall satisfy the “Experiment Vessel Requirements” section of this standard.
5. All other vessels shall be considered “Exceptional”. They shall be approved only after the designer, reviewer, and Director (or Director’s designee) are satisfied that provisions have been made providing a level of safety and quality greater than or equivalent to that afforded by the ASME BPVC.

# Precedent and Proposal

- Recent precedent set at PAB for an unmarked, undocumented pressure vessel
  - FEA analysis per ASME BPVC DII Part 5 “Design by Analysis”
  - 1.5 x MAWP hydrostatic test
  - Visual inspection of welds and measurements for thicknesses
- Analysis per ASME BPVC DII avoids having an exceptional vessel

## **Qualification of 24 inch Vacuum Vessel for 150 psi Internal Pressure**

Bob Wands  
August 1, 2017

### **Introduction and Summary**

A vacuum vessel built in-house during the 1980’s is to be repurposed as a 150 psi pressure vessel. There are no drawings or calculations for this vessel, requiring that visual inspection be used to determine the sizes, materials, and weld characteristics required to provide the necessary foundation for a Code-based stress analysis.

The ASME Boiler and Pressure Vessel Code, Section VIII, Div. 2, Part 5 “Design by Analysis” rules were used to perform the analysis necessary to determine the maximum allowable working pressure of the vessel.

This analysis indicates that the vessel may be safely used at an internal pressure of 150 psi, taking into account the necessary welded joint deratings, as well as the Fermilab 0.8 derating for in-house pressure vessels.