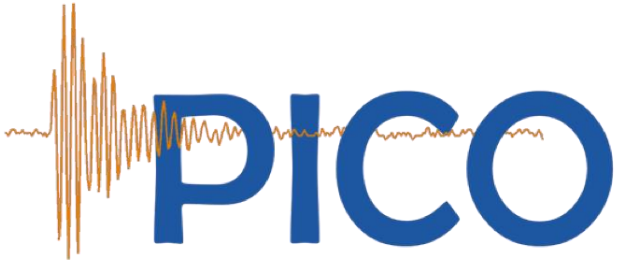


Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

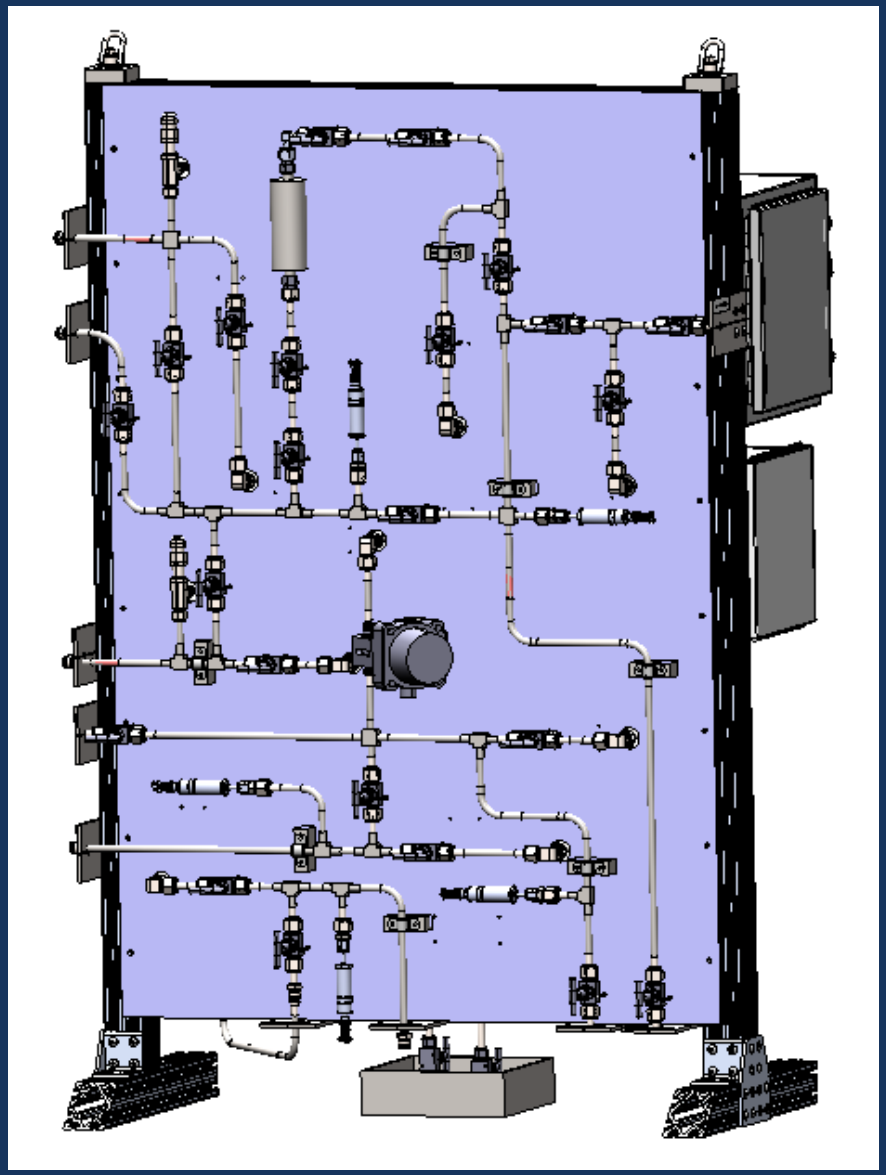
Freon Cart Update

2024-08-19

Mackenzie.dean@queensu.ca

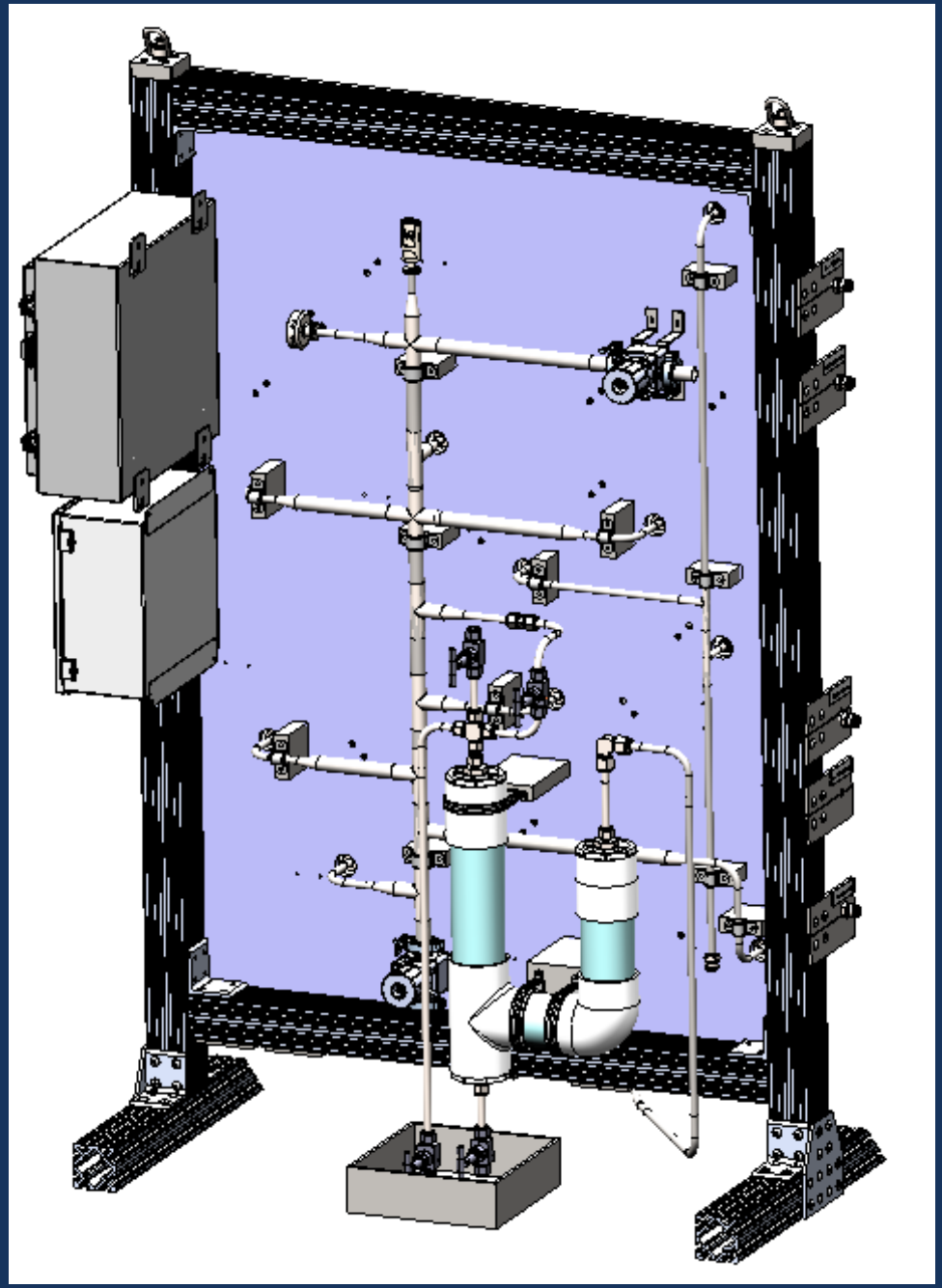
Recap/Intro

- Control PICO-500 working fluid (C3F8)
  - Fill
  - Drain
  - Sampling
  - Recirculation
  - Recovery
  - IV PSV
  - Bubbler
  - Vacuum
- C3F8 → Active Fluid (Octafluoropropane / R218)
- Temperature Ranges
  - 10°C to 20°C
  - -25°C to 30°C
- Pressures Range
  - 25 psia to 200 psia



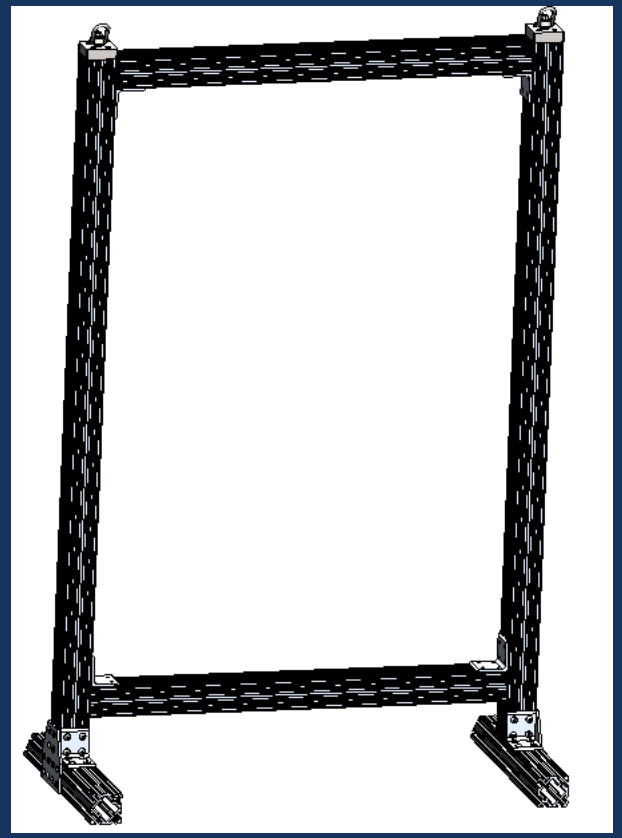
Since Last Meeting

- 3D Design is essentially final
  - Cylinder & Line heaters TBD
- Bubbler System designed and components ordered
- Purifier shell testing complete



Currently

- 8020 framing ordered
- Received quote for many off the shelf components
  - Swagelok
    - Bellows sealed valves
    - Welded tube fittings
    - VCR fittings
    - PSVs
    - Pneumatic valve
- Bubbler components ordered
- Started to create drawing package
  - Frame
  - Main plate
  - Assembly
- Contacted possible fabricators – Certified by TSSA and can provide sanitary orbital welding
  - Pure Ingenuity
  - Highland
  - CROM
  - Swagelok

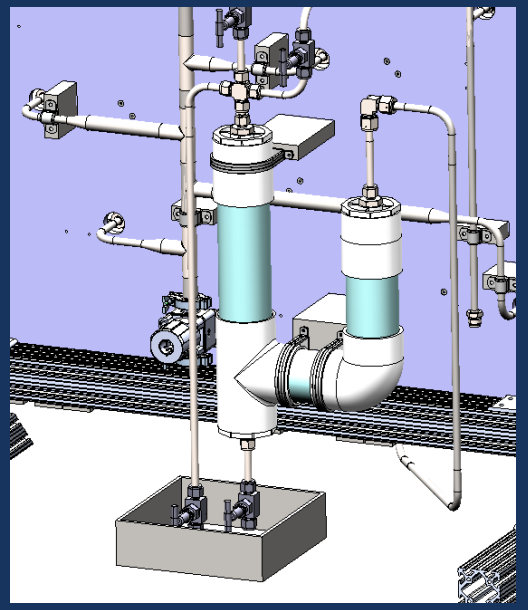


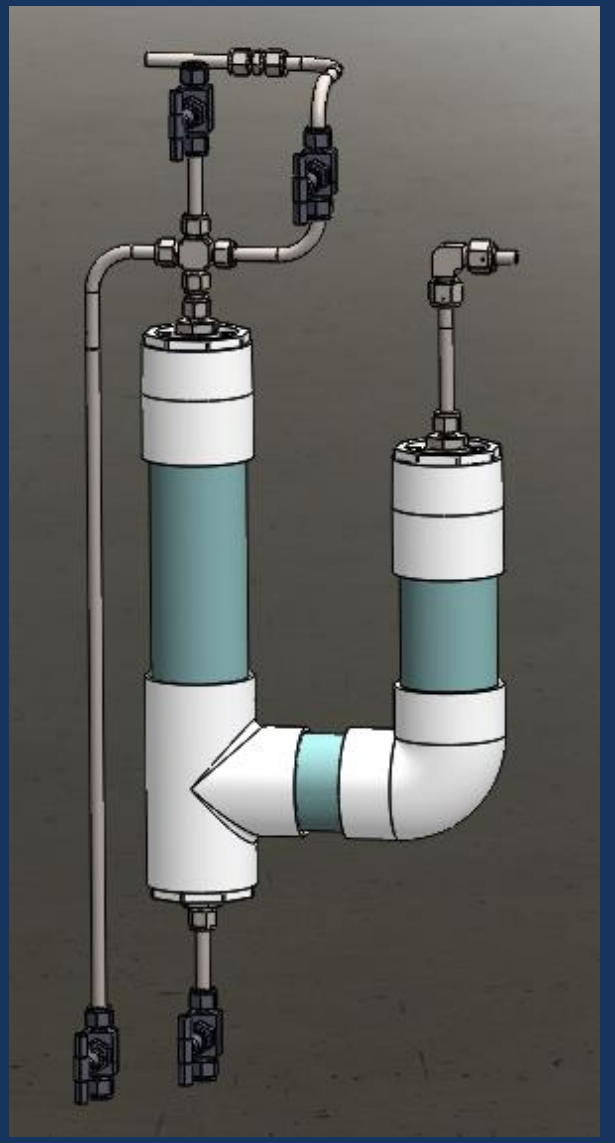
Next Steps

- Bubbler to be built and tested
- Order all off the shelf components
    - Swagelok
    - Mcmaster Carr
    - IdealVac
    - Lesker
- Prepare and submit TSSA registration and fabrication RFQ

Bubbler System

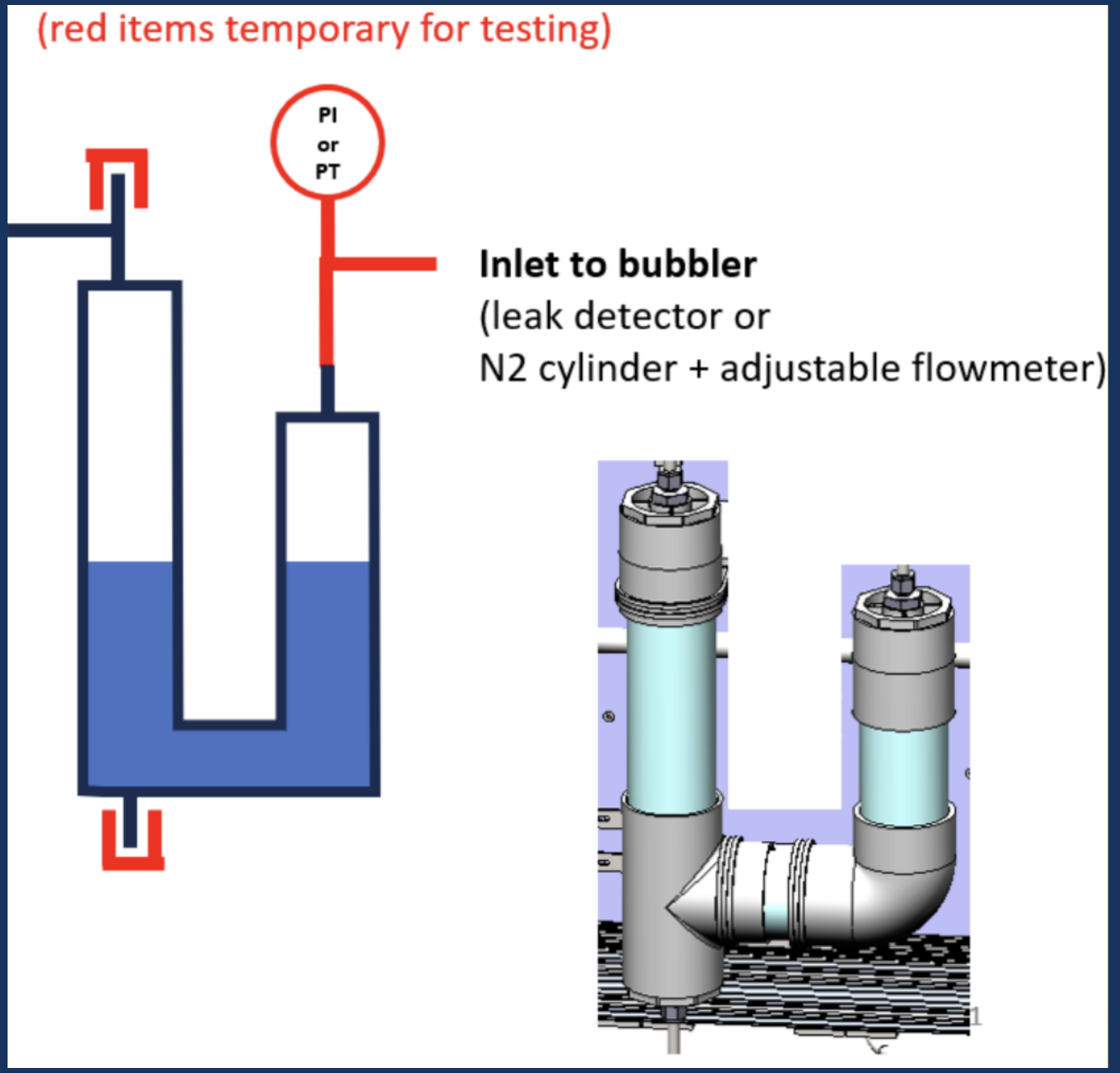
- Functions
  - Prevent moist lab air from reaching the PSV on the cold plate and freezing
  - Provide a buffer for lab pressure swings
  - Exhaust freon from PSV if required
- Filled with Mineral Oil, attached to vacuum manifold
- Located on the back of the freon cart
- Next step is to build and test it at queens





Bubbler Testing

- Leak testing
  - Pump down and sniff with helium
- Water/N2 testing
  - Fill bubbler with water
  - Flow N2 through at minimum 150 SLPM (comparable to C3F8 at 60 SLPM design flow rate)
- Goals
  - Monitor bubbler upstream pressure
  - Monitor discharge side of bubbler for splashing



TSSA Submissions

- Variance submission covering Dytran + Pall purifier
  - Include burst test report and datasheets
  - SNOLAB needs to sign off on application (in progress)
- Category H registration covering freon cart all the way up to connection to PV

RFQ for Freon Cart

- Scope
  - Prepare engineering documentation for the freon system, including applicable B31.3 calculations
  - Submit package to TSSA for Category H registration covering
    - High pressure sections of freon panel (i.e. vacuum segments, IV PSV, and bubbler are excluded)
    - High pressure field tubing runs between freon panel and PV
    - High pressure freon feedthroughs on VJ
    - Cold plate
  - Supply parts not explicitly provided by PICO
  - Manufacture, by orbital weld, assemble, and test the freon panel, cold plate, and connecting tubing spool pieces according to applicable TSSA/B31.3 requirements

RFQ contd

- Exclusions
  - PICO will supply fittings, instruments, and 80/20 frame to fabricator
  - Bubbler will be made in house and does not need to go to fabricator

- Testing
  - Helium leak acceptance test by PICO
  - Hydrotest per B31.3 by fabricator
    - Purifier cannot be installed for hydrotest

RFQ contd

- PICO submitted documentation will include
  - P&ID excerpt of registered sections
  - Instrumentation list with CRNs for each component (will list CRN TBD for Dytran + purifier)
  - Want to keep some flexibility for small changes - Include statement in RFP and drawings: may have more or less of the same components depending on PICO requirement, but will remain under the maximum size limitations of the design per Cat H fitting limits (max 42 L)
  - G/A drawings
    - 80/20 frame
    - Freon panel assembly
    - Cold plate assembly
    - VJ feedthroughs (freon in, out, IV PSV discharge)
    - Details of field spool pieces (12' sections, flex hoses)
  - CAD models
    - Freon panel assembly
    - Cold plate assembly
    - VJ feedthroughs (freon in, out, IV PSV discharge)

Timeline

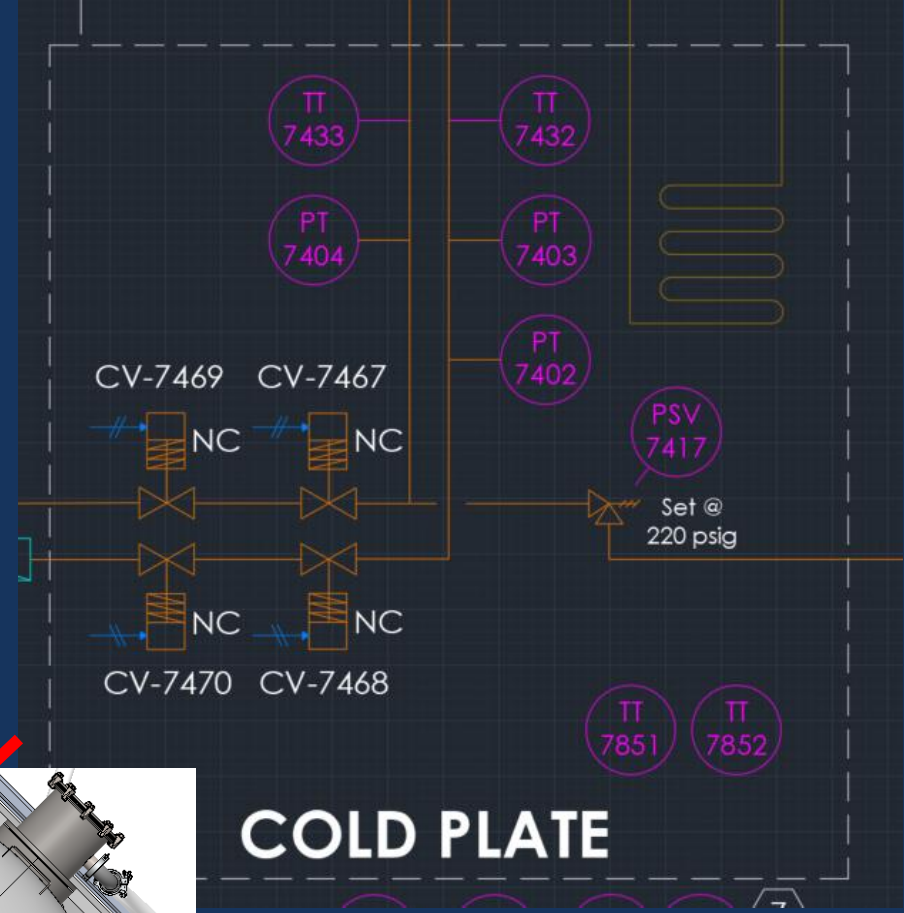
- August
  - Issue draft RFQ for freon panel fabrication
  - Review by Mackenzie
- September
  - Order components (Swagelok, PTs, regulators, PSVs, vacuum fittings)
  - Build 80/20 frame
  - Submit variance application for Dytran + Pall Purifier
  - Send RFQ for freon panel fabrication (Highland, CROM, Pure Ingenuity, Swagelok)
- October
  - Award PO to fabricator for freon panel
  - Submit TSSA application package for freon panel Category H registration
- January
  - Receive TSSA CRN for freon panel
  - Receive TSSA variance approval
  - Begin panel fabrication
- March
  - Pressure test freon panel
  - Complete helium leak acceptance test
- April
  - Ship panel to SNOLAB

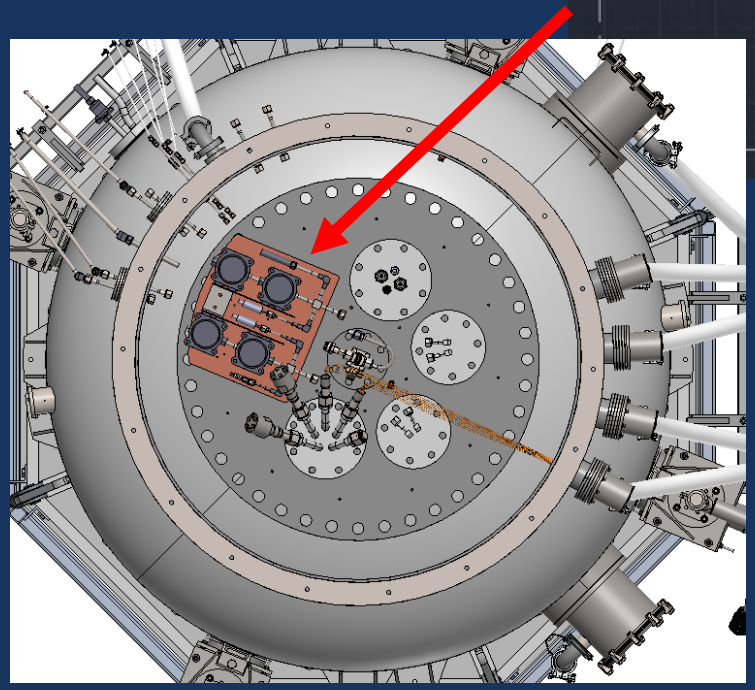
Hazards

- Re-capturing procedure
- Regulations for use of Freon
  - C3F8 → Reg. 463/10 → Ozone depleting substance
  - Any discharges must be reported to SNOlab, discharges of over 100kg to be reported to MOE
    - Reference Freon Accidental Release document
  - Leak checks
  - Record keeping

Cold Plate

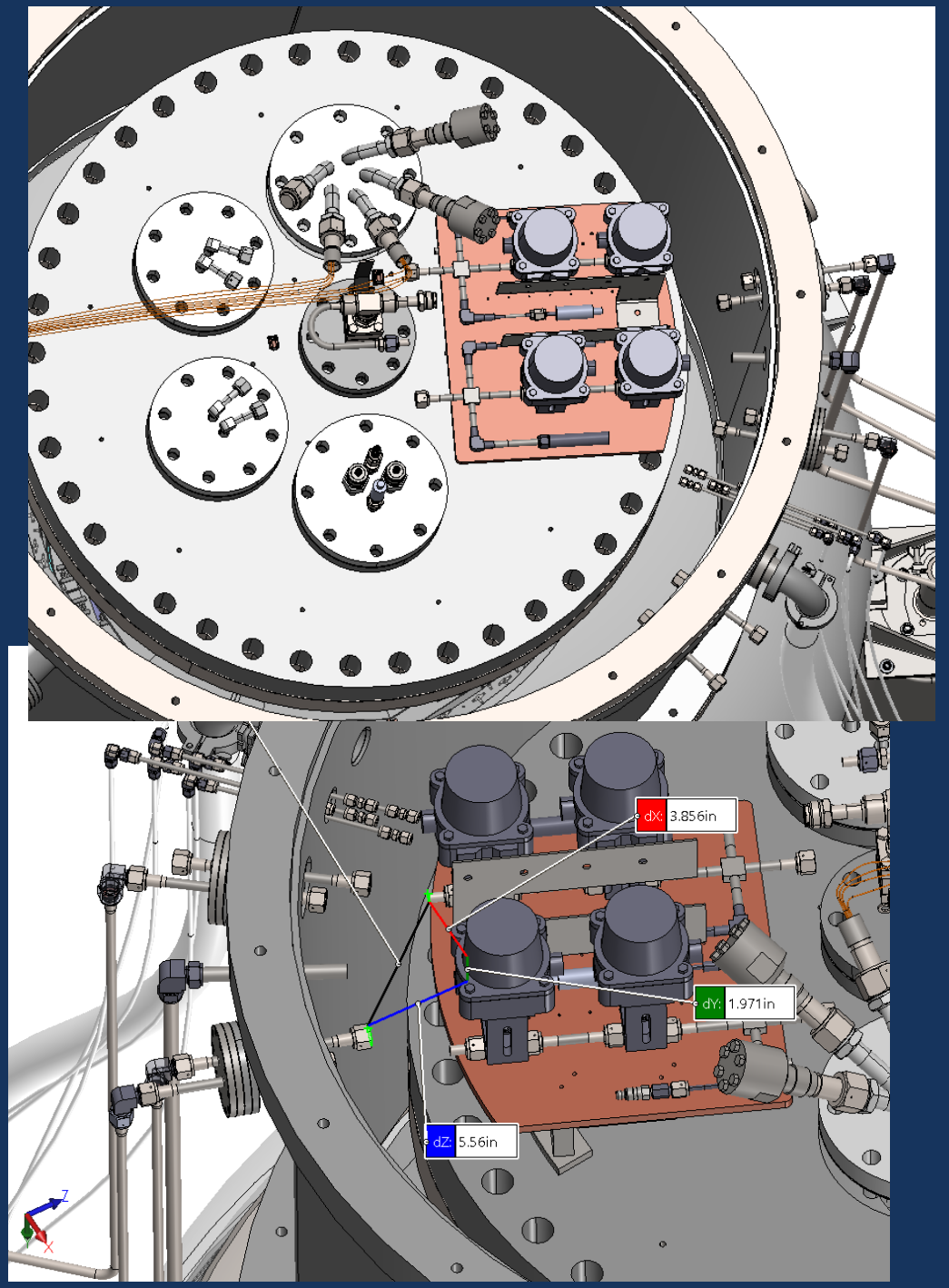
- PSV 7417
  - Emergency pressure relief for Freon
  - Parker CYF10MM200 – Cryogenic Thermal Relief Valve
- Pneumatic valves
  - Swagelok bellows sealed VCR
- PT's
- Dytran
- Cooling coil on under side

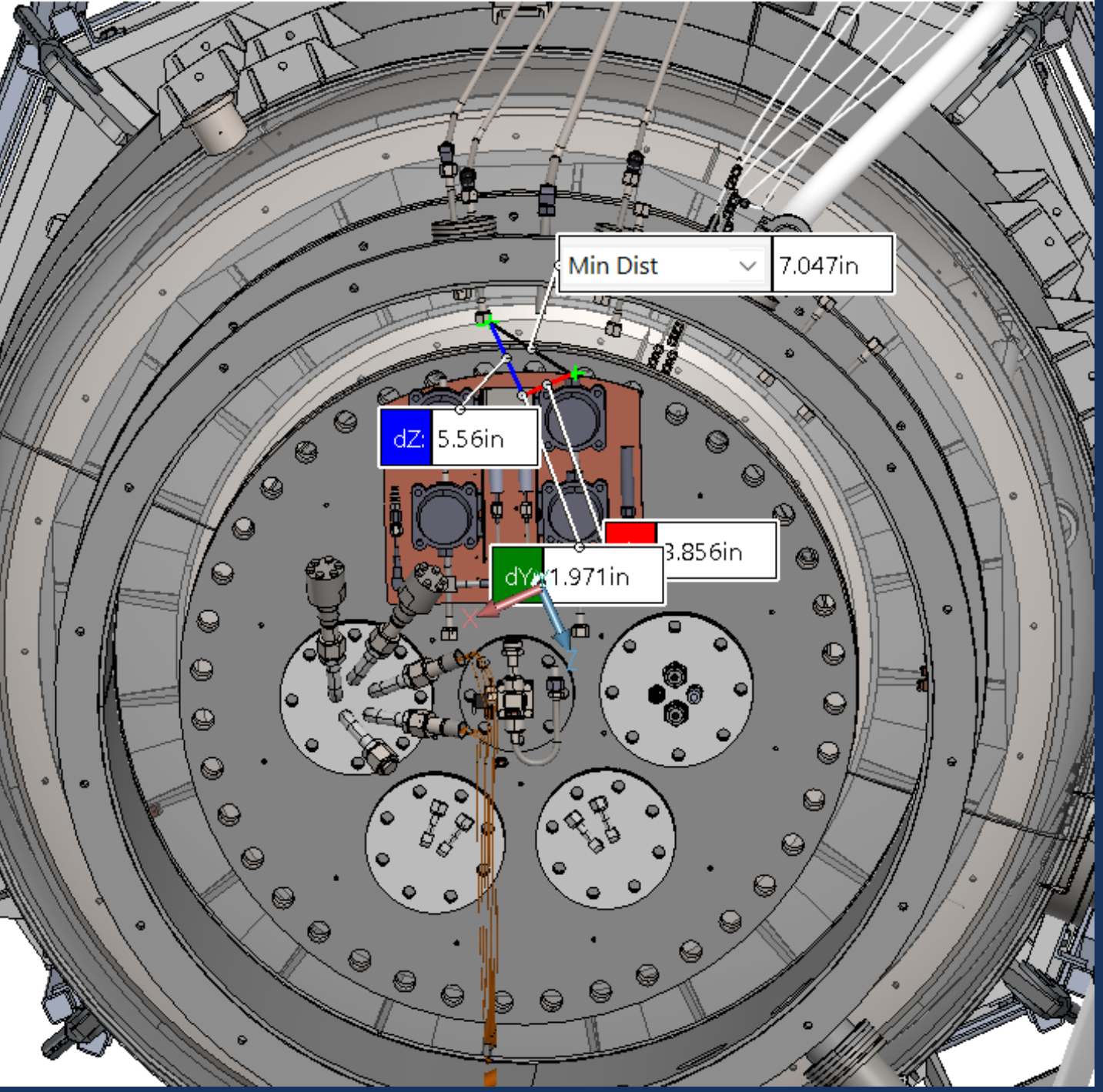




Status

- Design can be orbital welded as is
  - Checked with fabricator – clearances are sufficient for weld head
- Pneumatic valves are large but fit
- Mounting needs a bit of work
- Connection points seem feasible

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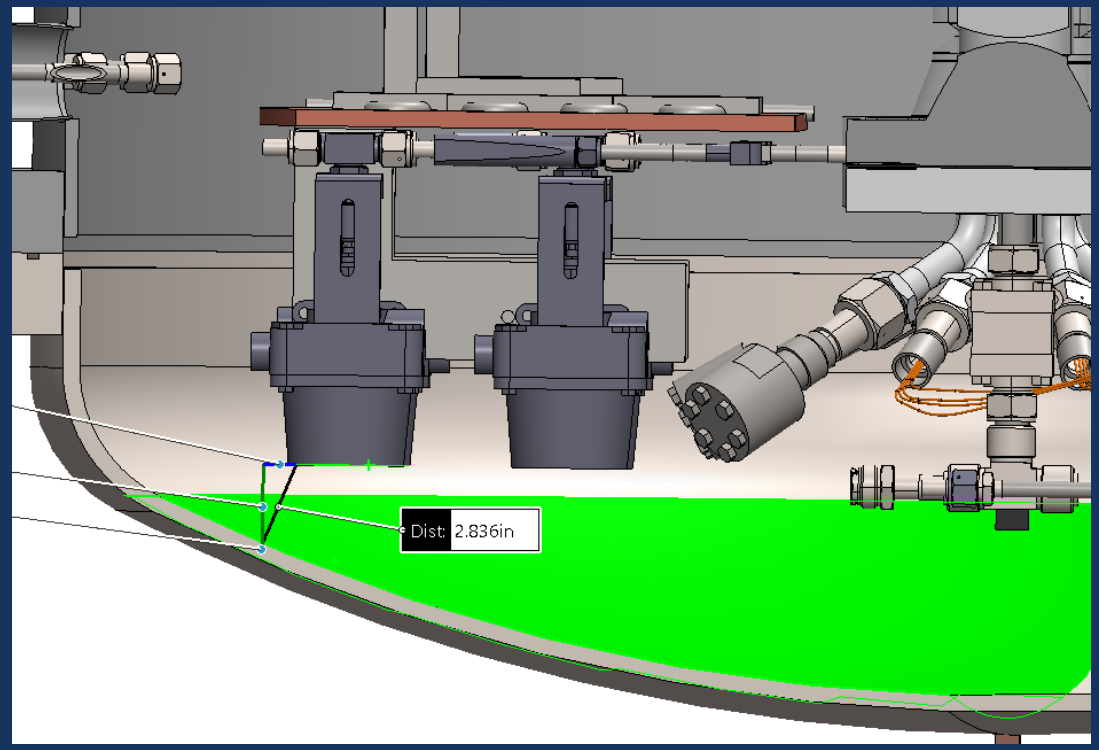
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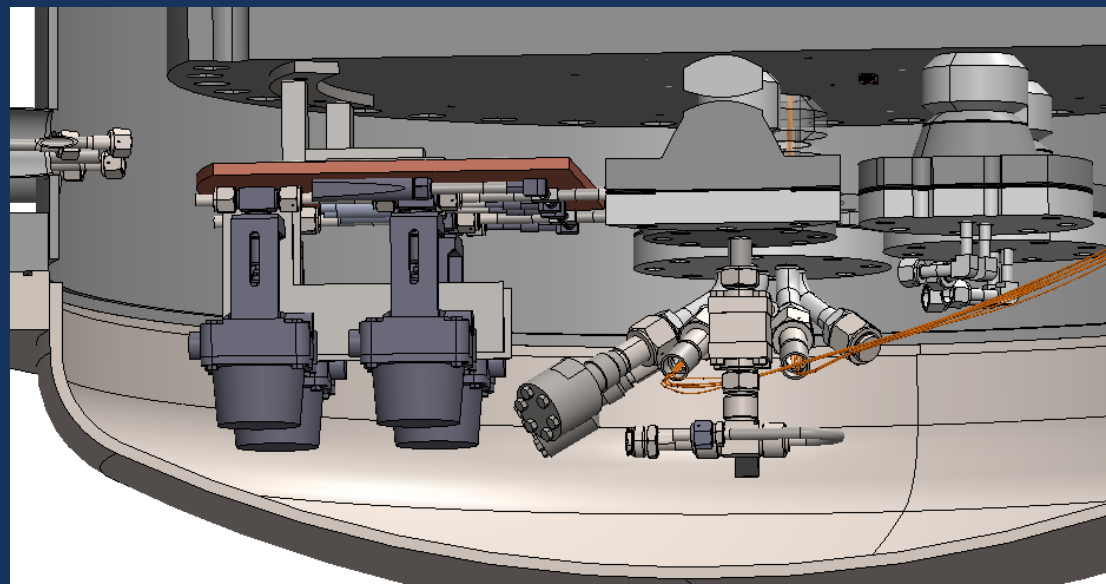
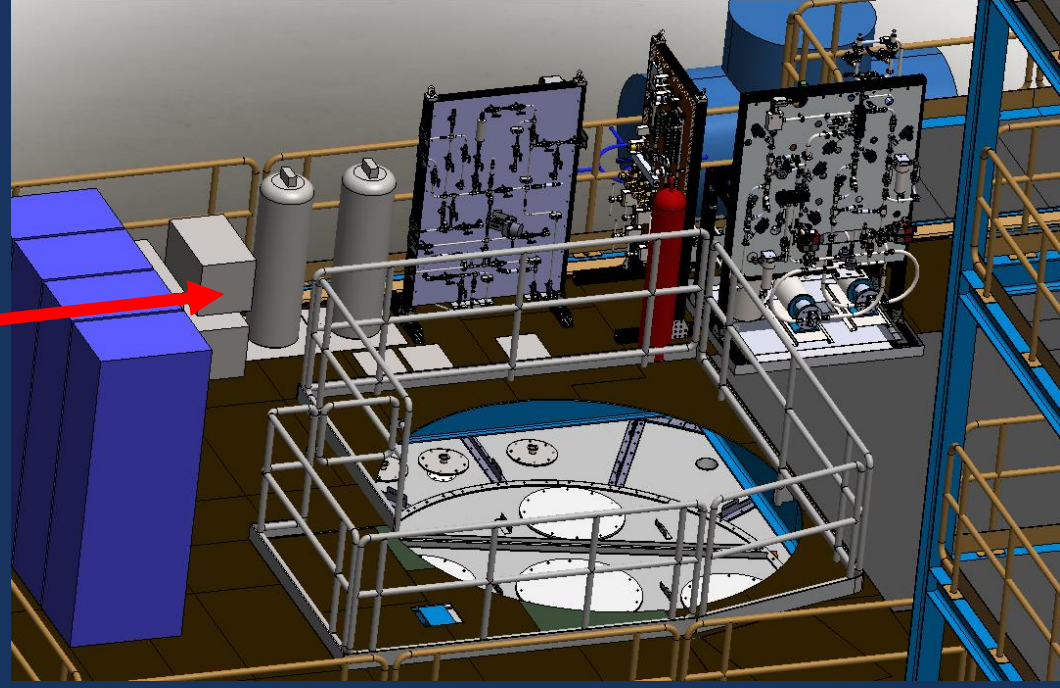
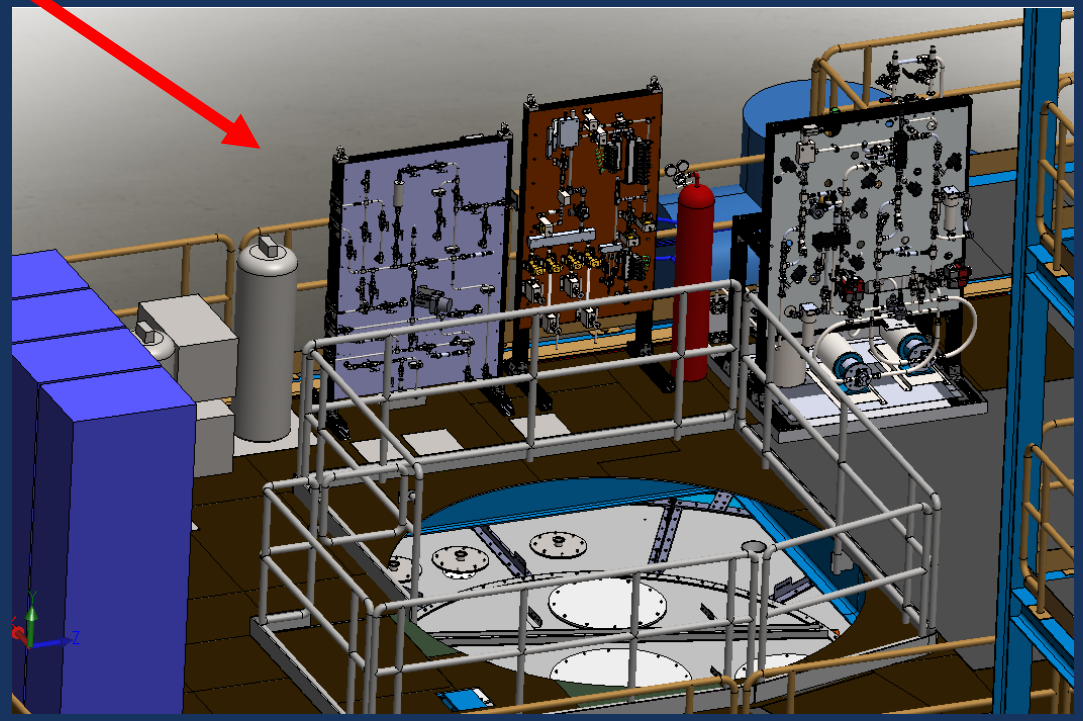


Cube Hall Layout

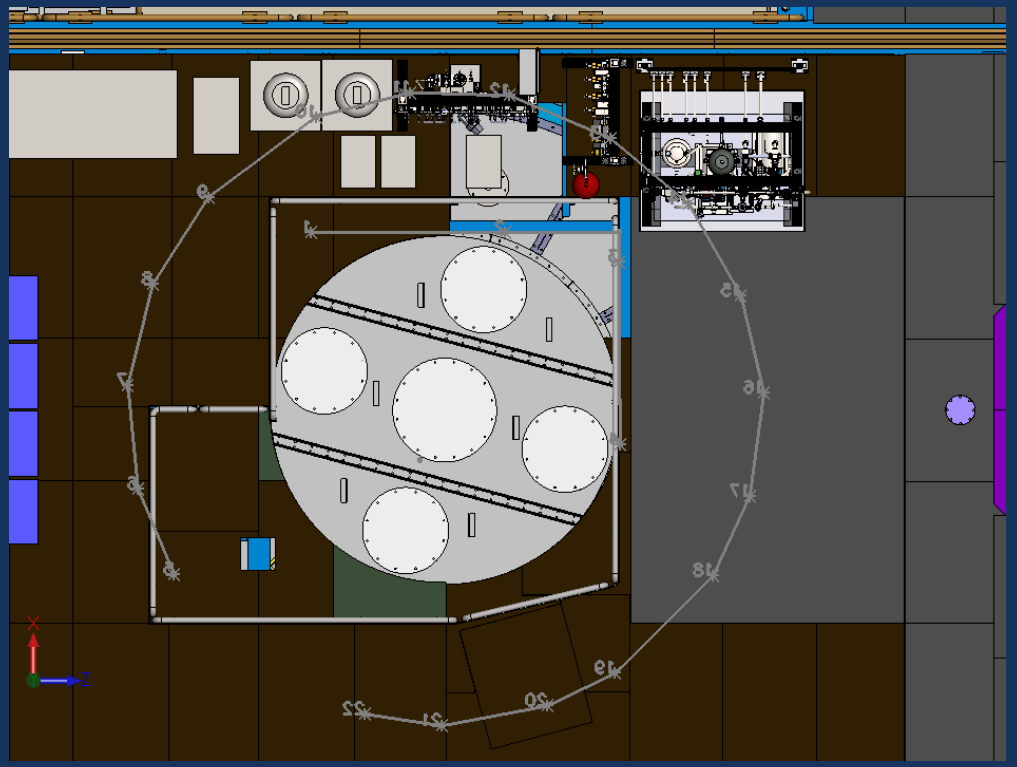
- 2 layouts
  - Pneumatic Panel Perpendicular to Freon cart
    - Both freon cylinders can fit beside Freon cart
  - Pneumatic panel Parallel to Freon cart
    - 1 Freon cylinder beside Freon cart and 1 must go somewhere else on deck
- Both layouts seem feasible
  - Do we prefer freon cylinders side by side or potentially easier access to Pneumatic Panel

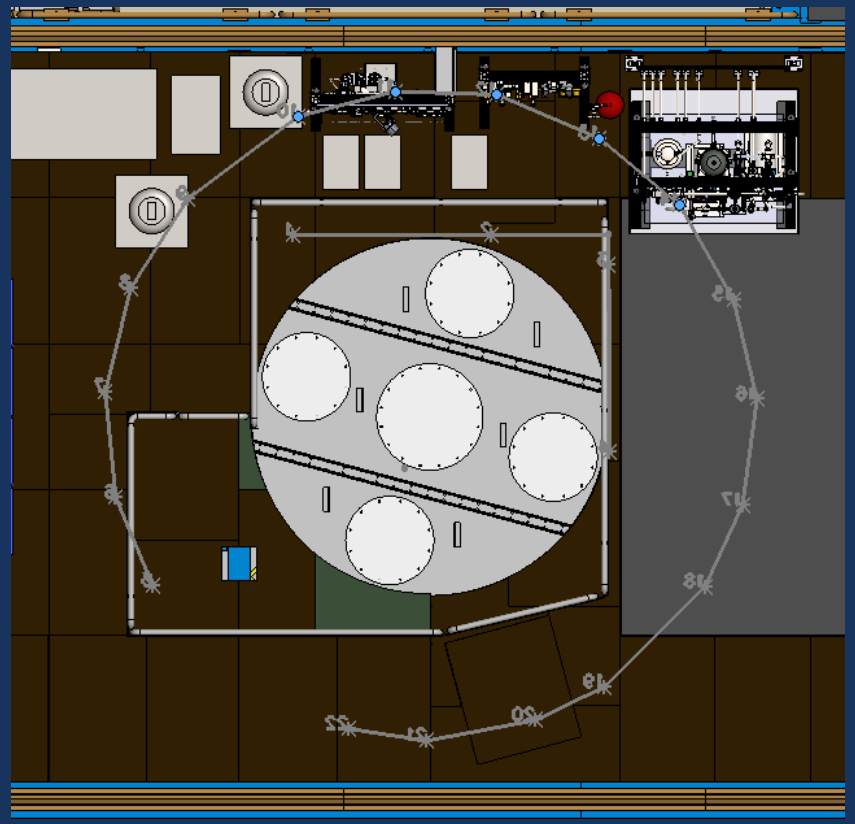




Water Tank Liner Holes

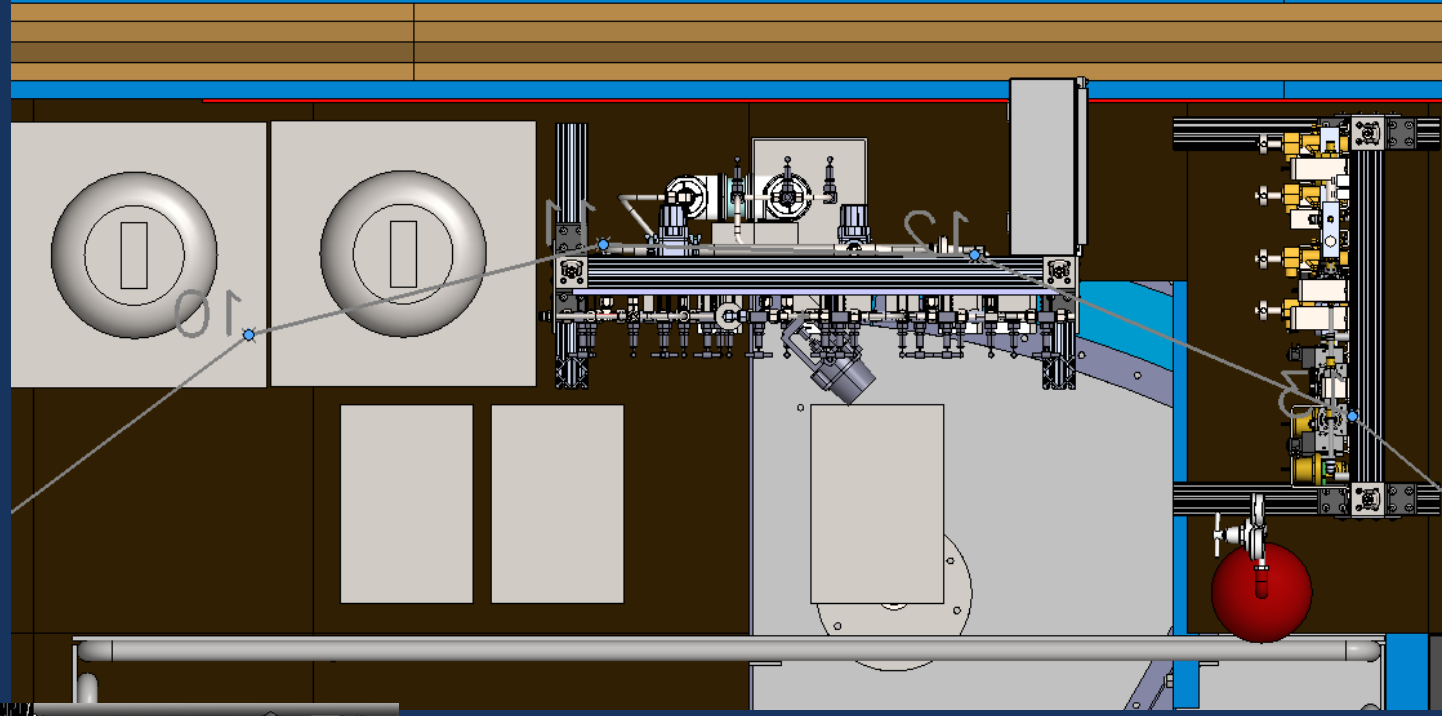
- Holes were scanned and added to the model
- Holes of interest I've highlighted in blue

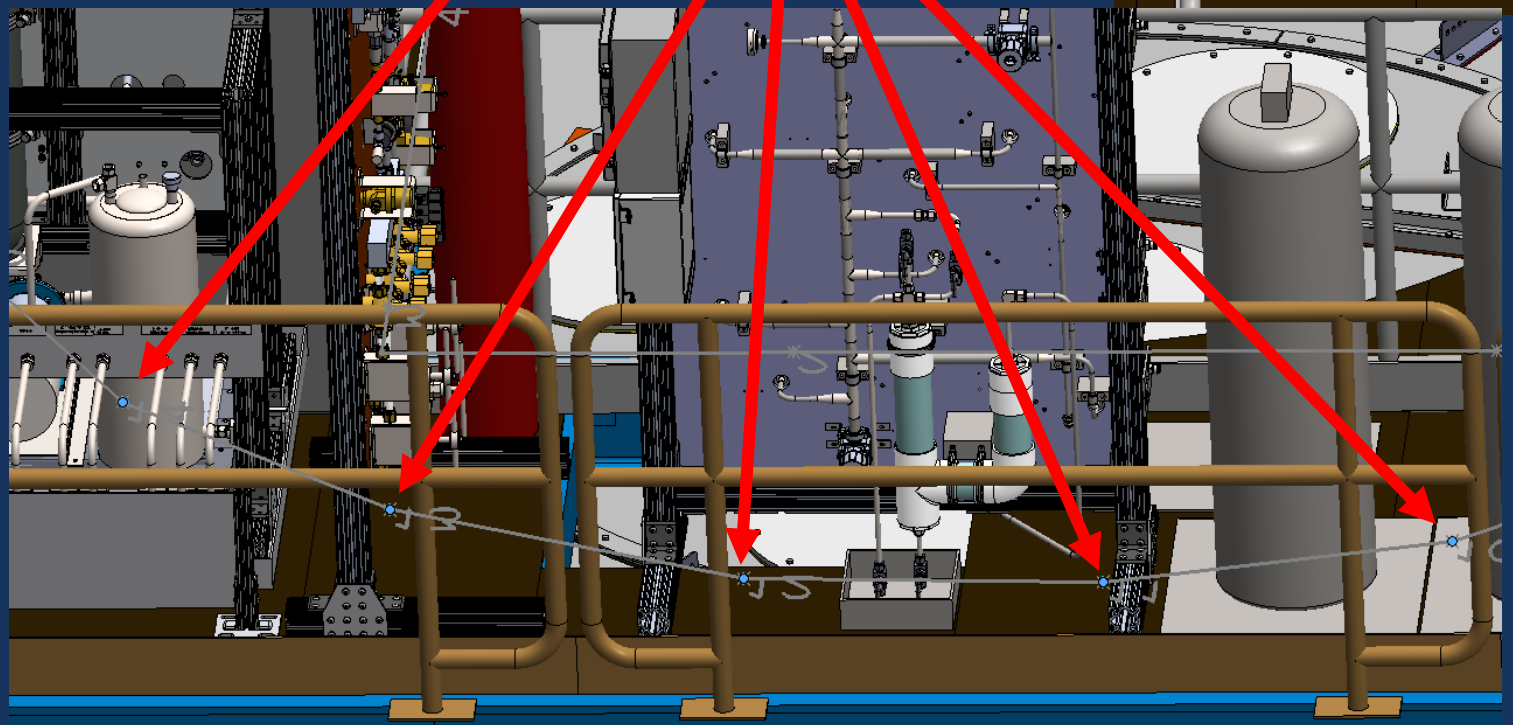


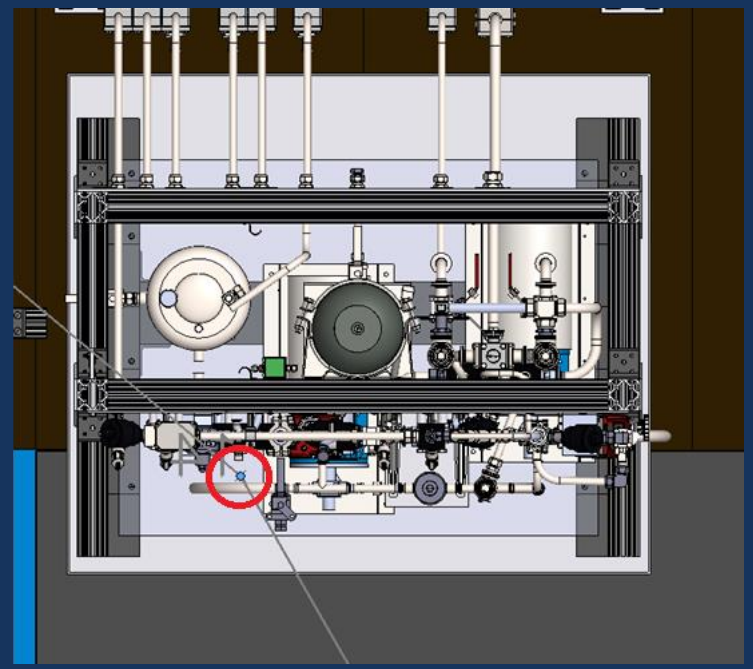


Layout 1

- Overlap: Hydraulic Cart

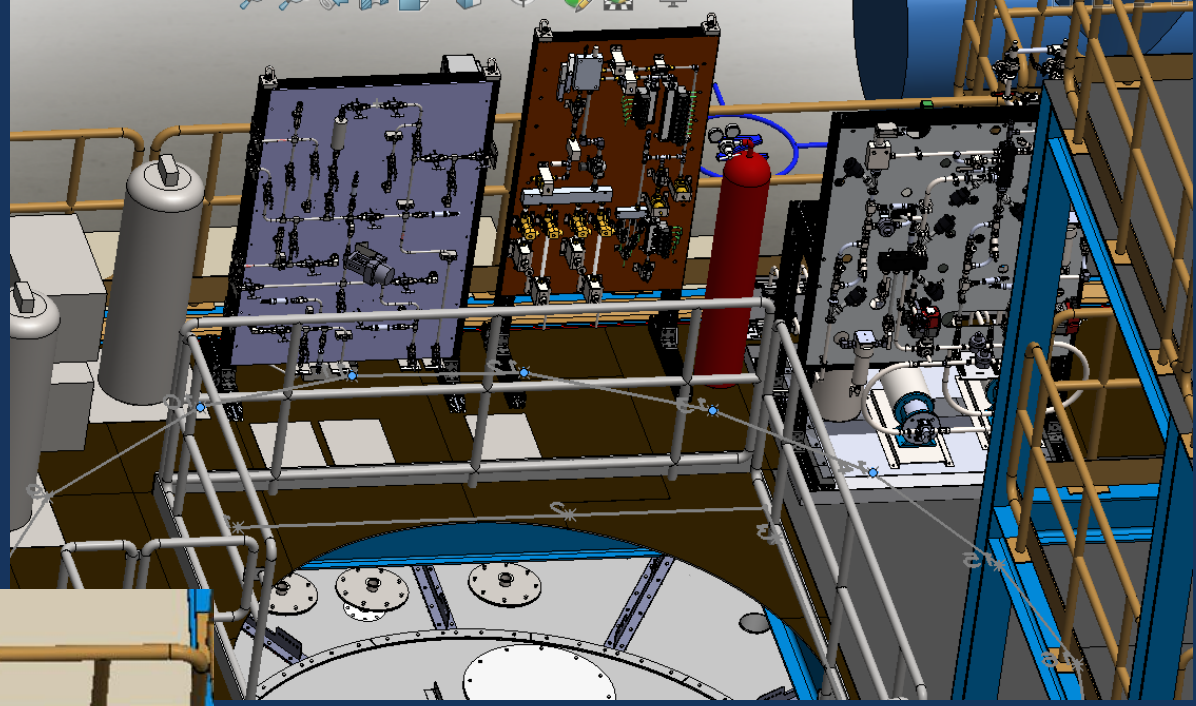


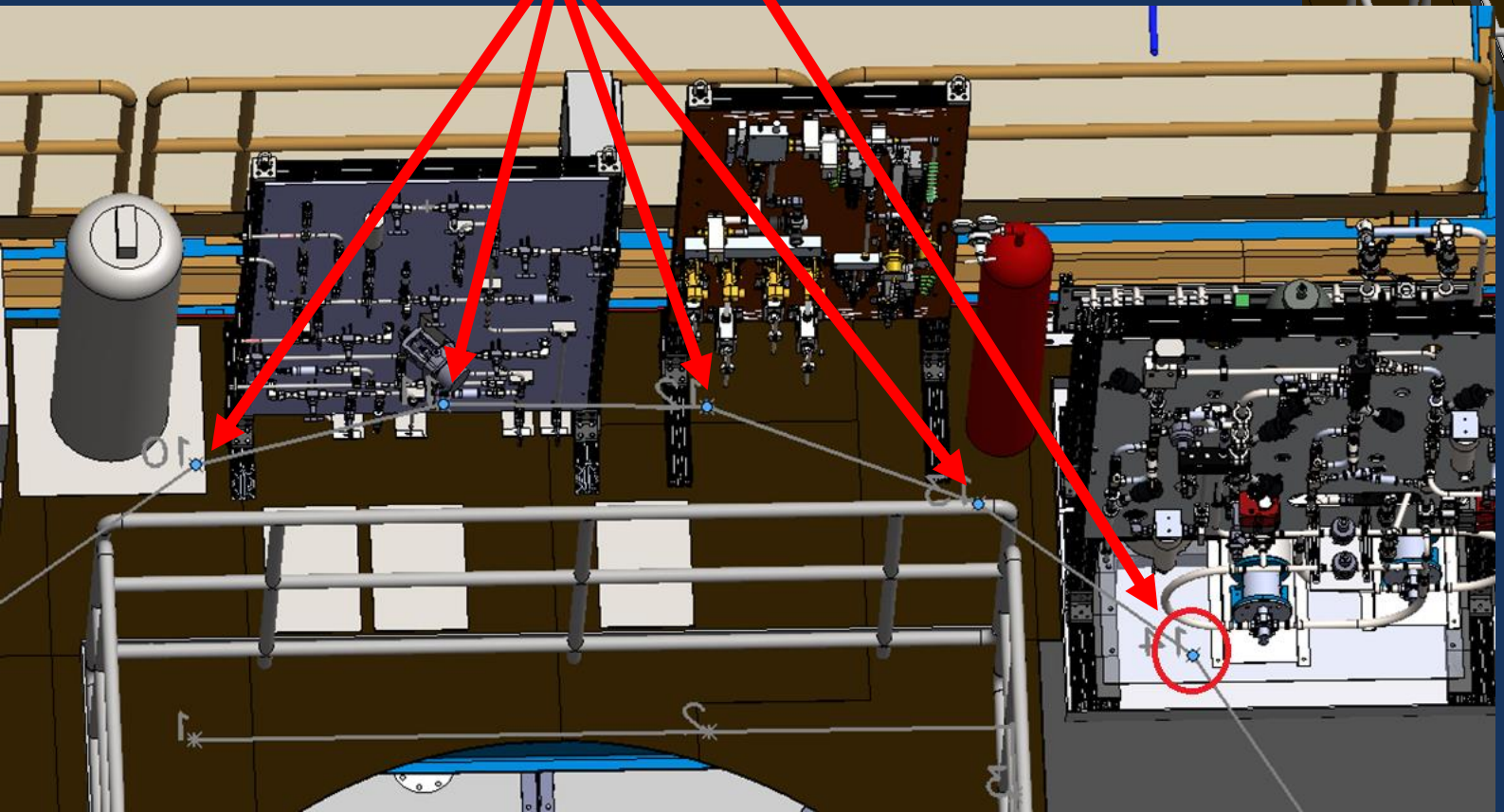




Layout 2

- Same concern





Questions?