Cryostat Front End Design Update

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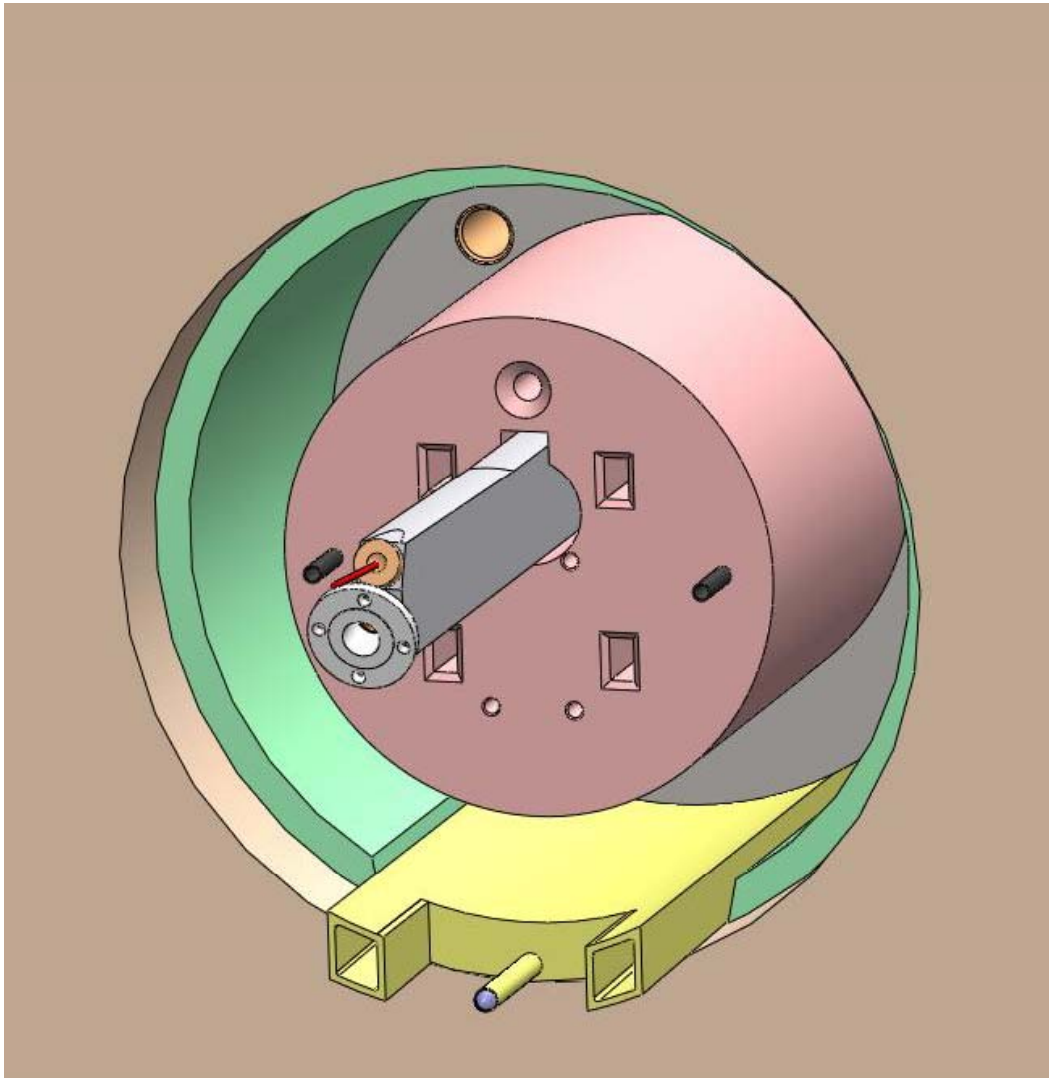
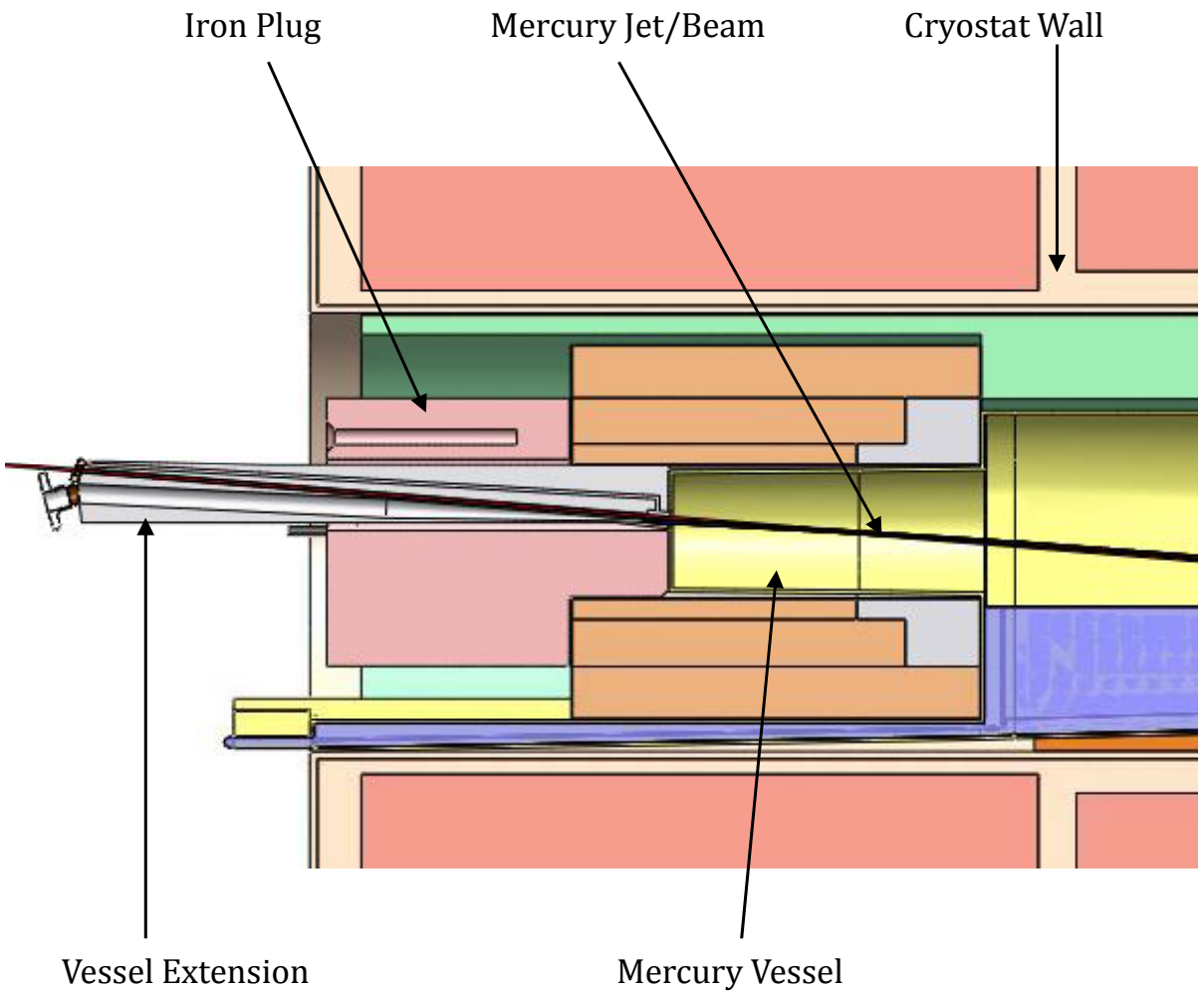
Front of the Cryostat: Considerations



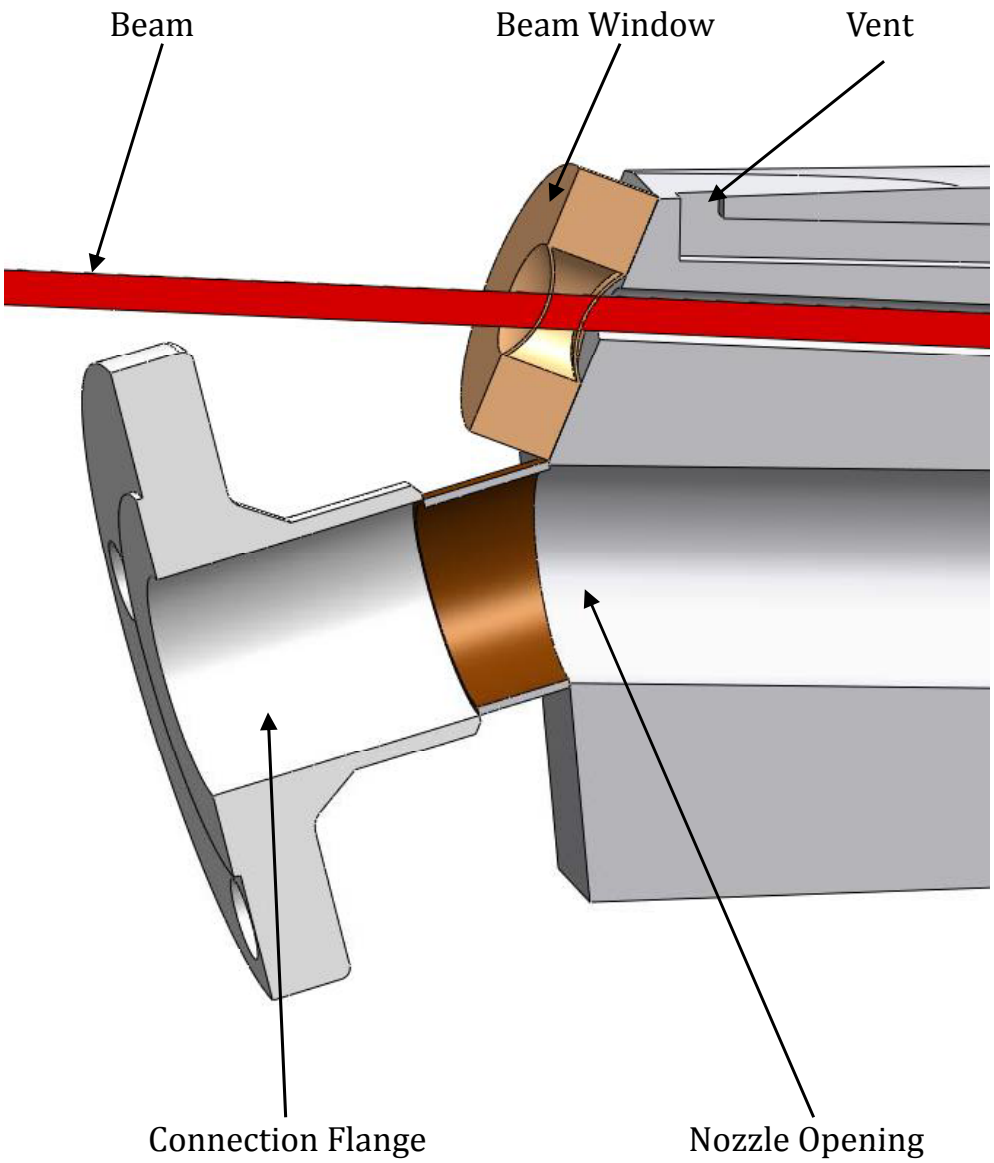
- **Beam window must be added to the front of the cryostat to provide mercury vapor containment**
- **Mercury nozzle must be positioned below proton beam and at specific angle**
- **Everything must come straight into cryostat so iron plug can be removed**

Front of the Cryostat: Possible Solution



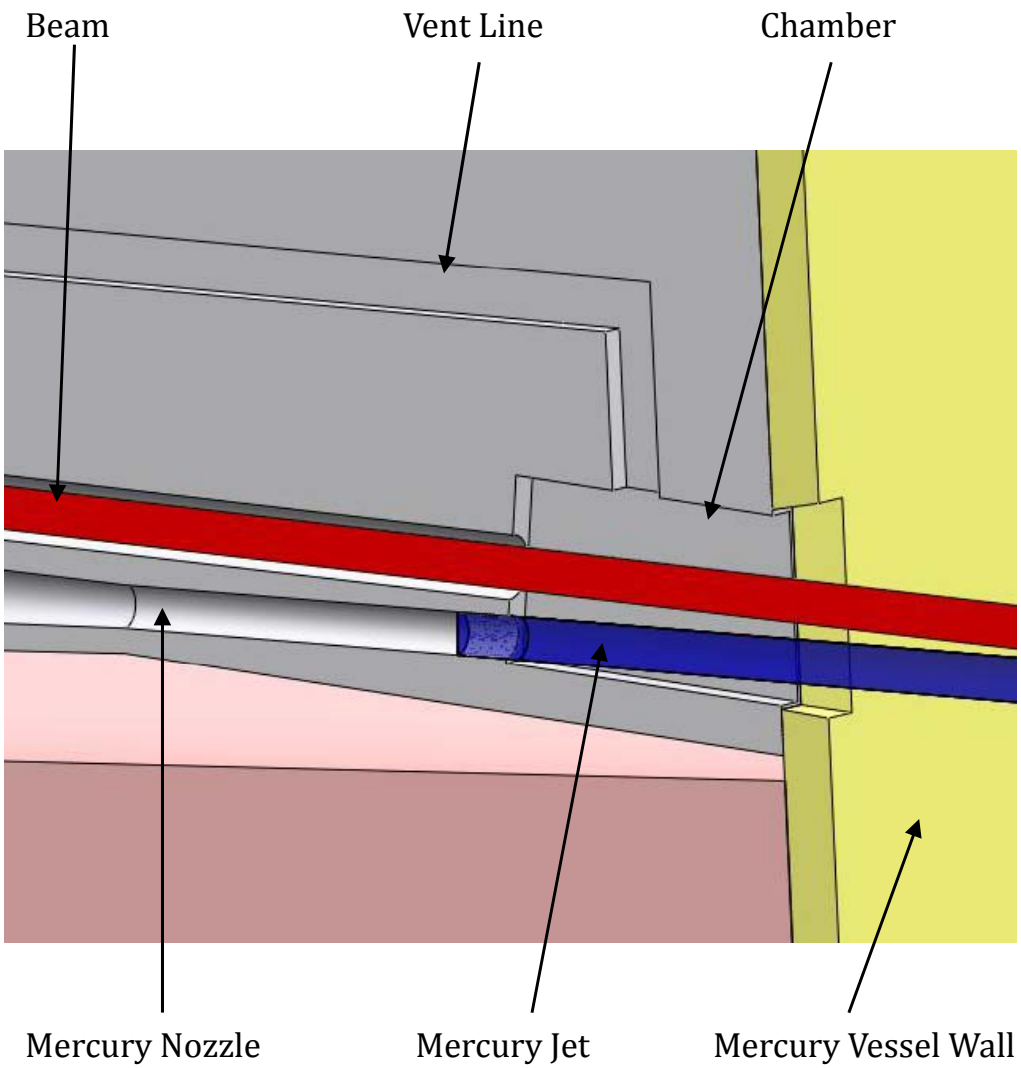
- **Mercury vessel extension comes off the front of the cryostat**
- **Provides location to mount beam window, contains nozzle, and vent**
- **Due to shallow angle between mercury nozzle and beam, extension must be very long to provide enough space for window, pipe connections**

Vessel Extension: Front



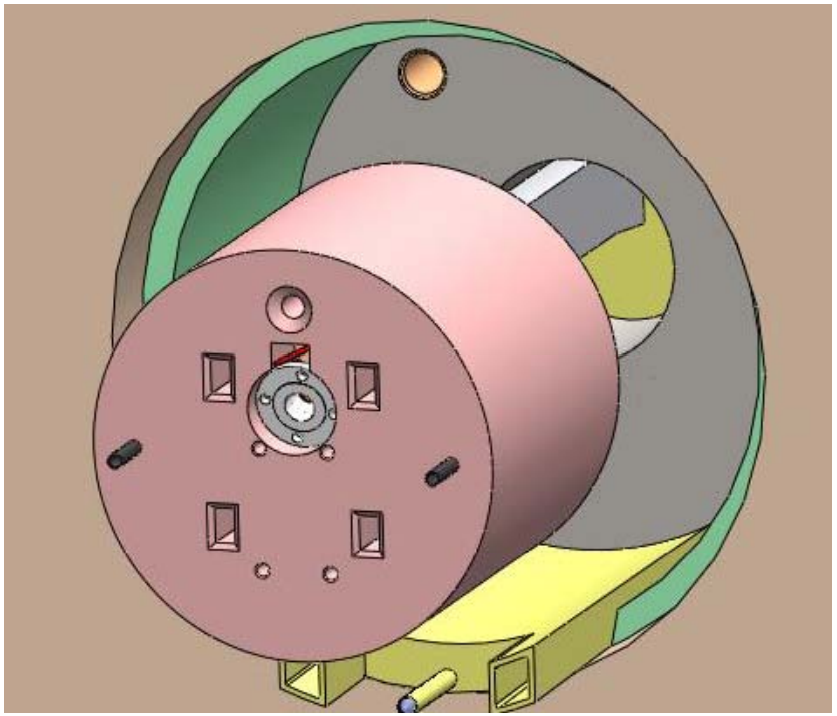
- **Note how close pipe connection flange (white) and window (brown) must be**
- **Window, pipe angled away from each other**
  - **Will angle in pipe create flow problems downstream?**
- **Window covers hole that goes back to mercury tank, beam (red) travels through hole**

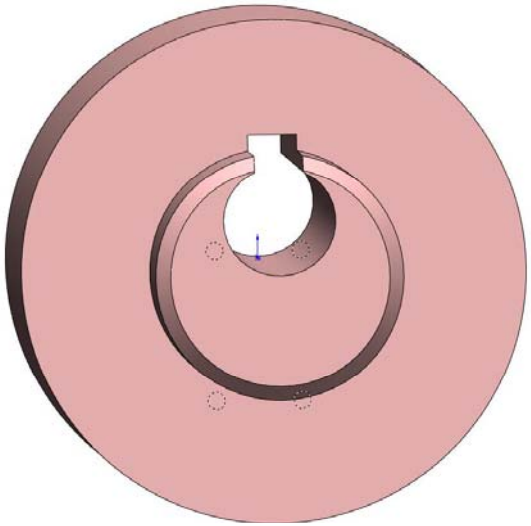
Vessel Extension: Back



- **Mercury nozzle (highlighted in blue) machined directly out of extension**
- **Nozzle ends in small chamber, allows mercury jet (blue) to begin curving downwards into tank (yellow)**
- **Chamber floor sloped, splashed mercury will flow out into tank**

Vessel: Iron Plug



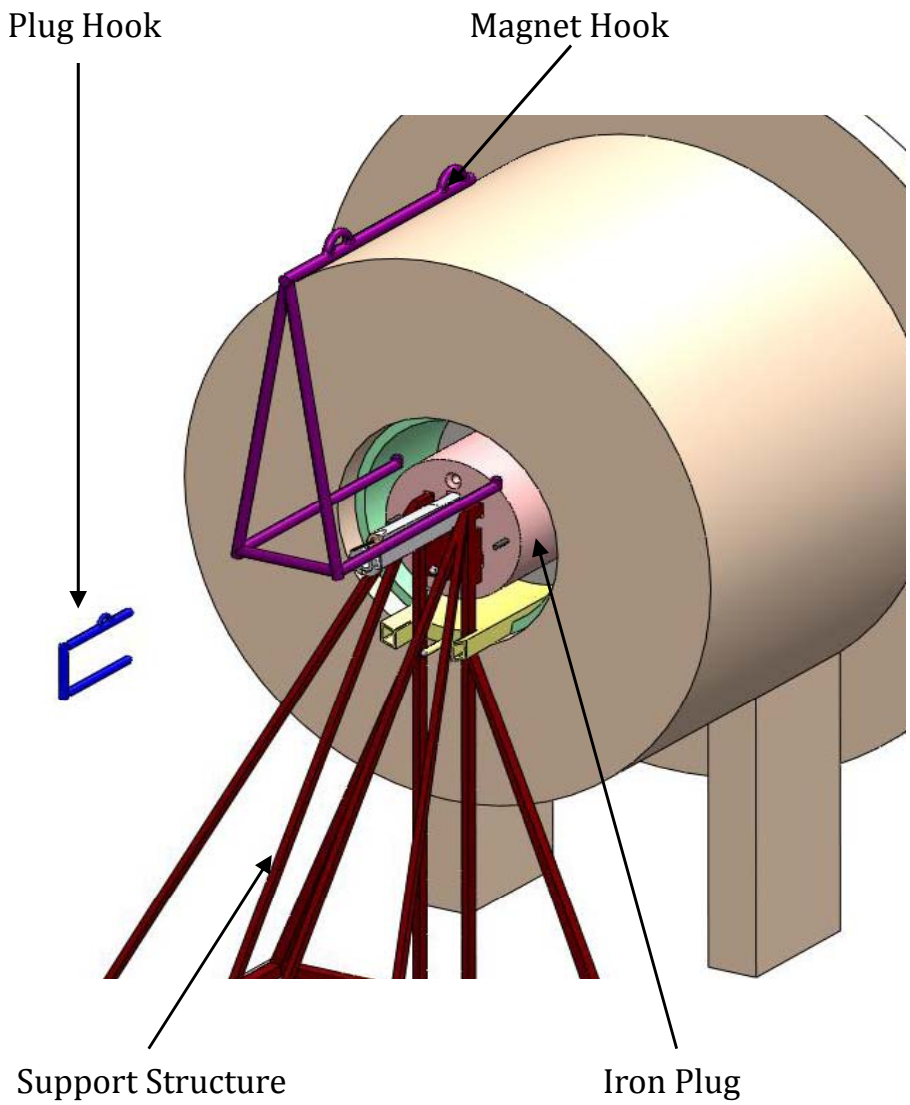


- **Iron plug (pink) can travel straight in and out of the cryostat**
- **Once iron plug travels entire length of extension it is free to be moved elsewhere**
- **Many holes in iron plug**
  - **Is this acceptable?**

Iron Plug/HC Magnet Removal: Animation
(Double click on title below)

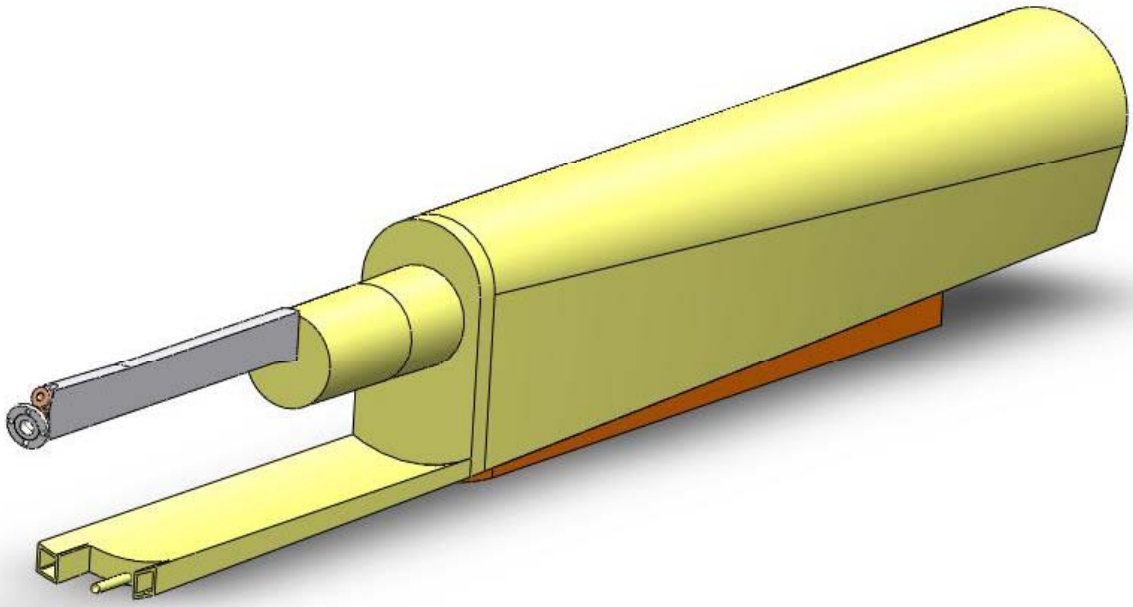
Cryostat magnet removal.wmv

Iron Plug/HC Magnet Removal: Summary



- **Iron plug support structure (red) keeps plug in place during use, moves it back for removal**
- **Plug unbolted from support structure, hook (blue) removes iron plug**
- **Second hook (purple) interfaces with HC magnet group and removes it**
- **Vessel extension, not shown in animation, compatible with this method**

Summary



- **Added extension to mercury vessel to make it a closed volume**
- **Extension contains mercury nozzle, mounting point for beam window**
- **Conceptualized possible method for removing iron plug, HC magnets**

Future Work

- **Viability of vessel extension needs to be examined**
  - **Can the cantilevered structure support itself?**
  - **Can it be machined?**

- **Vent line needs more consideration (rough concept highlighted in blue)**

- **Viability of removal process needs to be examined**
  - **Can the iron plug support structure withstand the magnetic forces?**
  - **Will the structure interfere with other infrastructure**