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Title: Q-6 DARHT WEATHER ENCLOSURE PROJECT UPGRADES DESIGN REVIEW

Author(s): Lavelle, Morgan Joseph
Lucero, Donn Henry

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Q-6 DARHT WEATHER ENCLOSURE PROJECT UPGRADES DESIGN REVIEW

Morgan Lavelle

Donn Lucero

Q-6, Site Instrumentation & Readiness Team

June 23, 2020

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by Doug McHugh, Q-6 DC
on June 15, 2020

Description

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JHCA 0003 00H3

Design Review Contents

- Introduction: Presenters/Reviewers
- Project General Description/Why Needed
- Design/System Details
- Schedule
- Questions

Introductions

- Q-6 Staff Supporting DARHT Weather Enclosure Project Leads
  - David Robbins, Q-6 *Detonation Science & Technology, Group Leader*
  - Morgan Lavelle, Q-6, *Site Instrumentation & Readiness (SIR) Team Leader*
  - Donn Lucero, Q-6, *SIR Team Member*
- Q-6 Design Review Chairperson
  - Thomas Mason, *Q-6 Deputy Group Leader*
- Design Review Panel
  - Travis Weaver, J-DO
  - Scott Hickman, J-4
  - Mark Pickrell, J-4
  - Dennis Royer, J-1
  - Josh Esquibel, J-1
  - Kris Peterson, J-1
  - Ed Jacquez (or representative), J-1
  - Rodger Hall, Q-6

Description

- The Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility is adding a weather enclosure for the vessel area that will require the Detonation Science and Technology Group's (Q-6) support for installing new cabling infrastructure to support capacitive discharge unit (CDU) firing operations and diagnostics.

- The requirement's work scope is described in Q-6-TR-0034U*, *Q-6 Support for the DARHT Weather Enclosure Upgrade Project, Customer Requirements Review (CRR)*

  ** = Available via the Yellow PDMLink*

Description

- The customer for the DARHT weather enclosure project supported by Q-6 is Travis Weaver, from the Integrated Weapons Experiments Division Office (J-DO), and Scott Hickman, from the DARHT Experiments and Diagnostics Group (J-4).

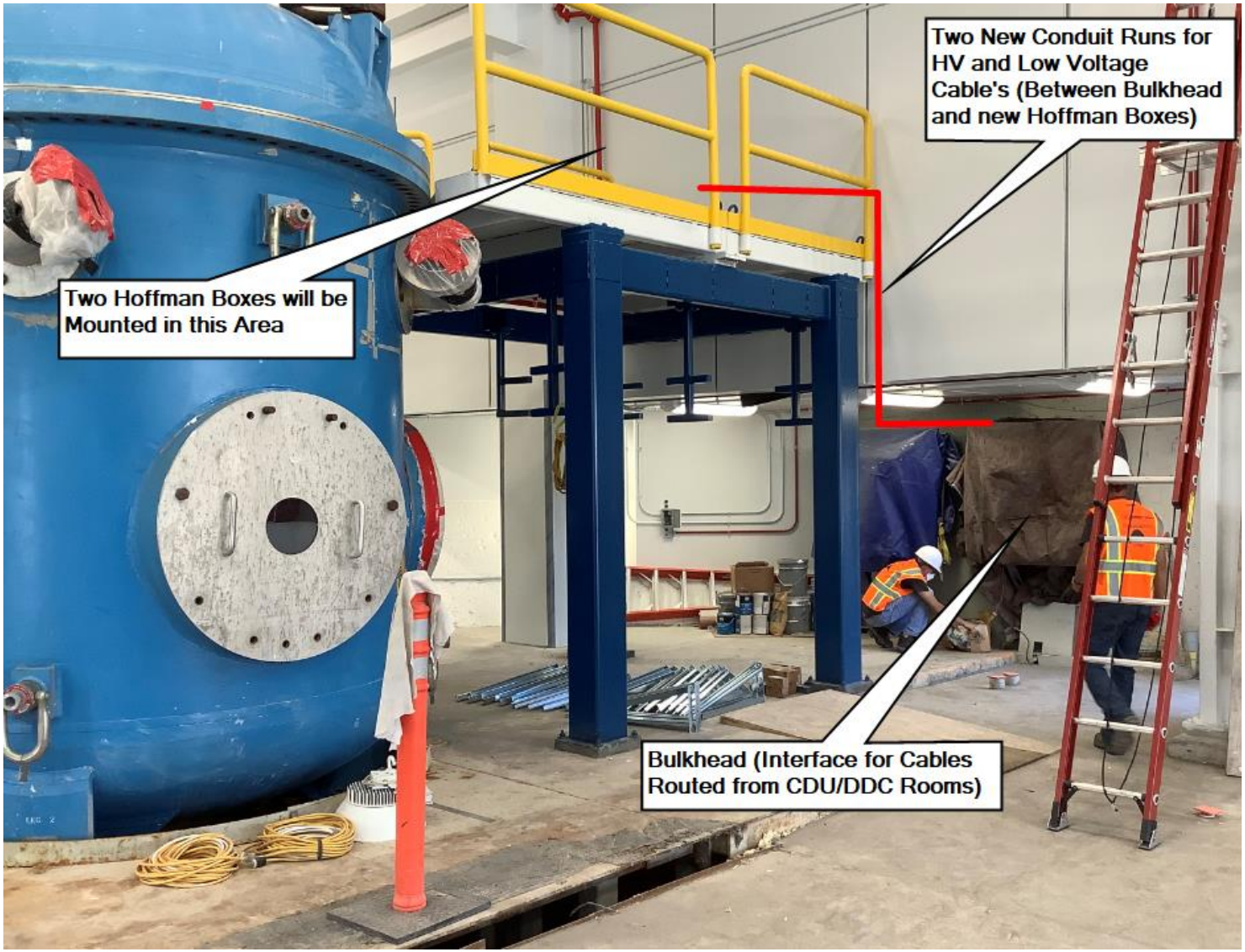
- All materials procured and provide for this project will be ML-4 Quality Grade. Any additional certifications will be provided by Q-6 as described in this design review.

Customer Requirements

- Weather Enclosure Hoffman Boxes
  - Two Hoffman Boxes will be procured and installed by DARHT personnel above the catwalk near the vessel area
  - One will be for Low Voltage Components, the other for High Voltage Components
  - The facility will provide 120 VAC power to these Hoffman Boxes (initial install may be temporary extension cords until final outlets are provided)

- Cabling
  - New cabling is required for high-voltage, signal, and fiber-optic communications between the CDU room and the new Hoffman boxes.
  - The cabling should support at least two CDUs including high-voltage input, high-voltage monitor, current-viewing resistor (CVR), and load ring indicator diagnostics as well as optical triggering inputs.
  - “C-Cable” will be used for all high voltage needs
  - RG-223 Cable will be used for all coaxial signal needs

Customer Requirements



Customer Requirements

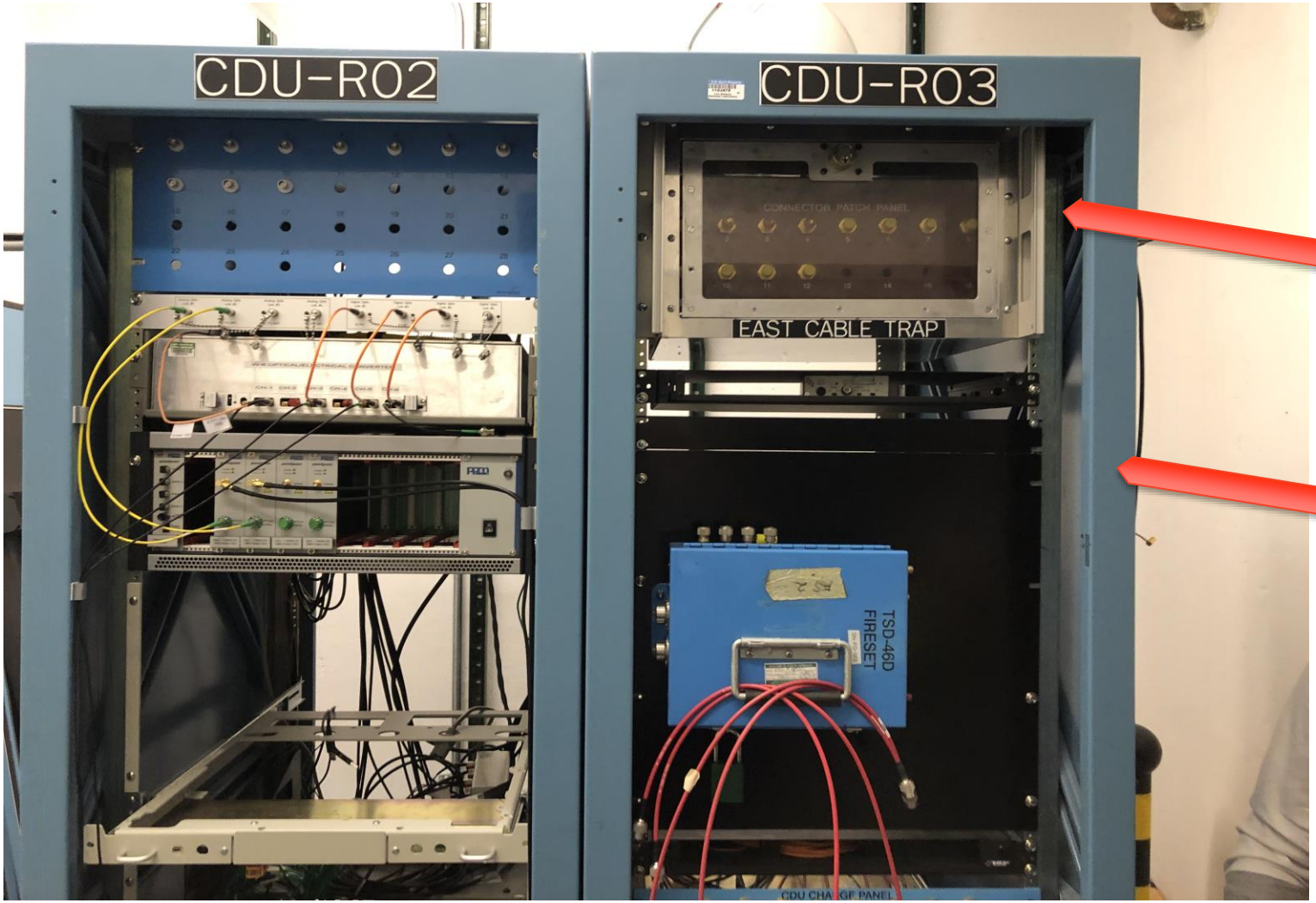
- Cabling (-continued)
  - Currently, there are two fiber optic cable bundles running from the control room to the firing point and they must be replaced by the exact lengths of these bundles as follows:
    - Multimode: 170 feet with ST-ST type connectors
    - Single Mode: 170 feet with FC-FC type connectors
  - All C-Cables will be hi-potted during their assemblies
  - All Coaxial Cables will be provided by (quality) proven/established vendors such as Pasternak.

- Capacitive Discharge Units (CDUs)
  - All CDUs currently active or backup will be qualified by Q-6 (actual number unknown)
  - Q-6 will provide CDU diagnostic timing and performance validation as part of this qualification process
  - No new CDU development or replacement is within this work scope

Customer Requirements

- Deliverables
  - Q-6 will be responsible for installing all new cables associated with this work scope
  - Q-6 will be responsible for validating cable performance after installation with DARHT personnel.
  - The original cable trap located in the CDU Room will be incorporated into all high voltage cable runs to the High Voltage Hoffman Box (in the weather enclosure area).
  - New patch panels may need to be replaced inside the CDU room (at Q-6's discretion)
  - All cabling will be isolated from ground including patch panels
  - Q-6 will provide all documentation of any new installation, including released drawings of all cabling and related infrastructures

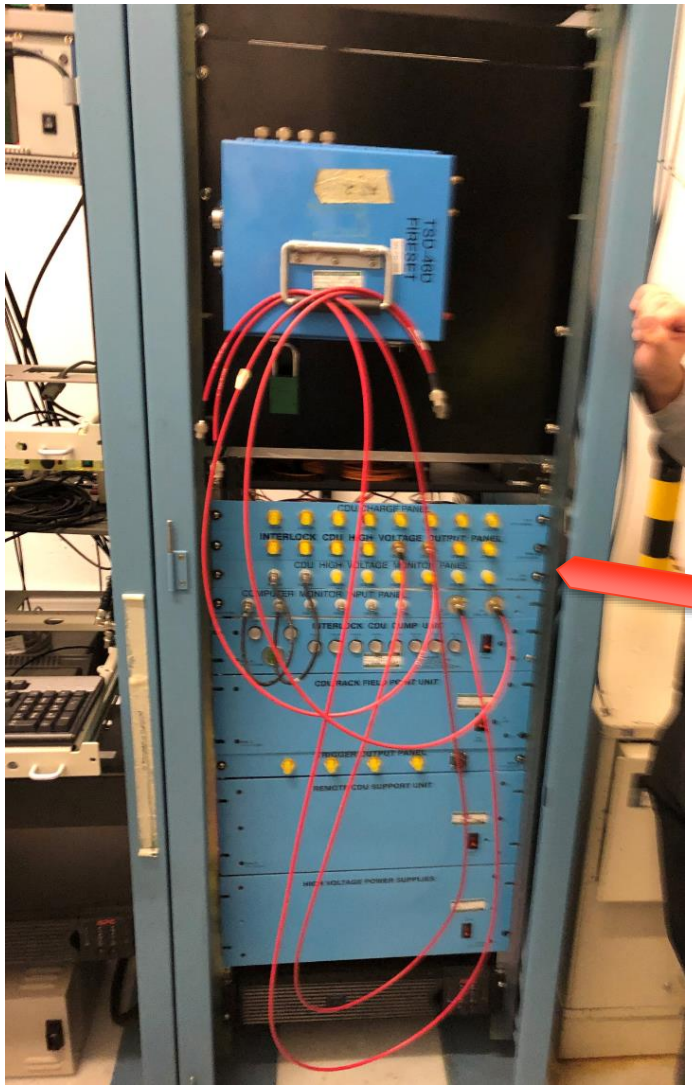
Customer Requirements



Existing Cable Trap

CDU Room Racks

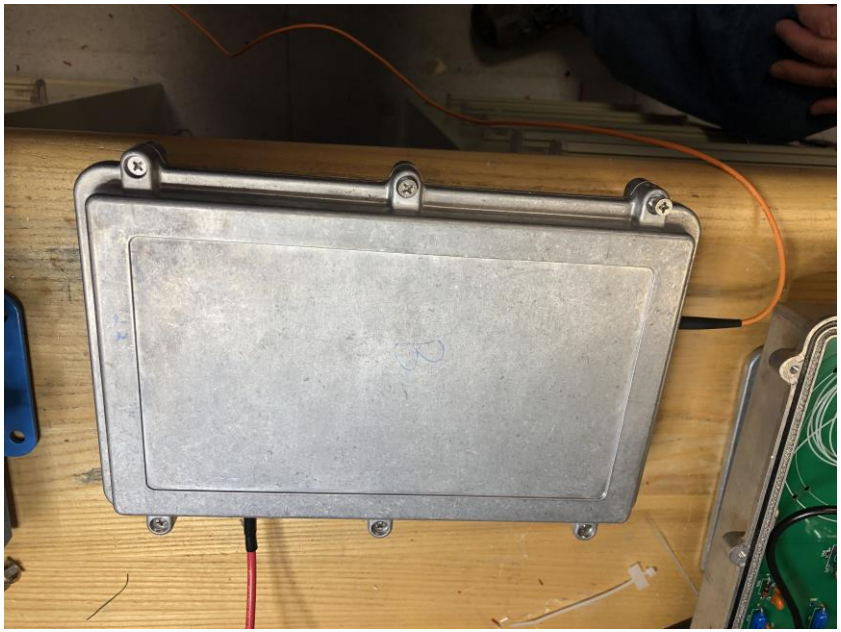
Customer Requirements

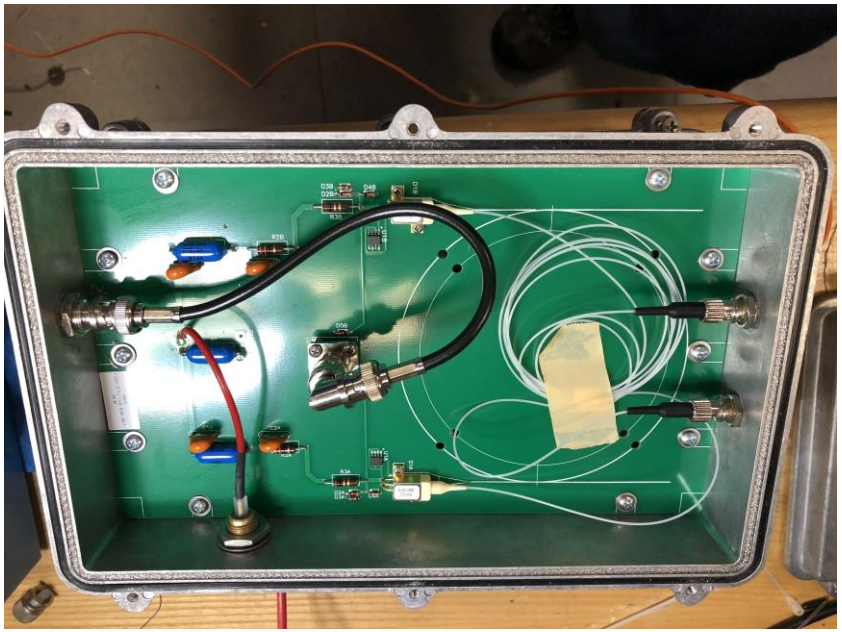


Existing High Voltage Patch Panels in CDU Room Rack

Customer Requirements

- Load Ring Indicators
  - The current DARHT T&F System uses legacy Load Ring Indicators which provide two laser diode outputs triggered by current output from the load ring of the CDU during firing. Q-6 will test these two units to ensure they are performing optimally. No replacement is anticipated at this time

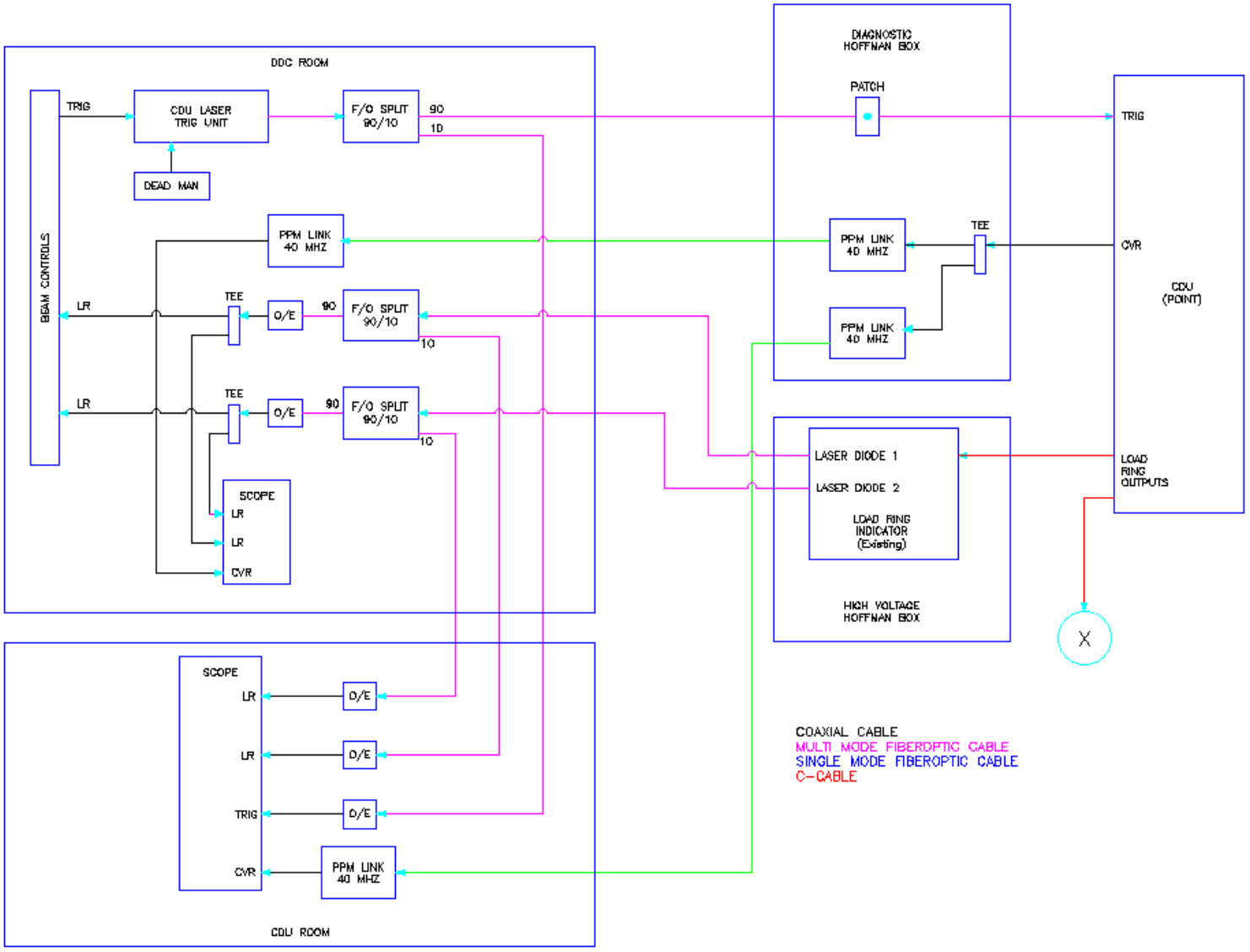




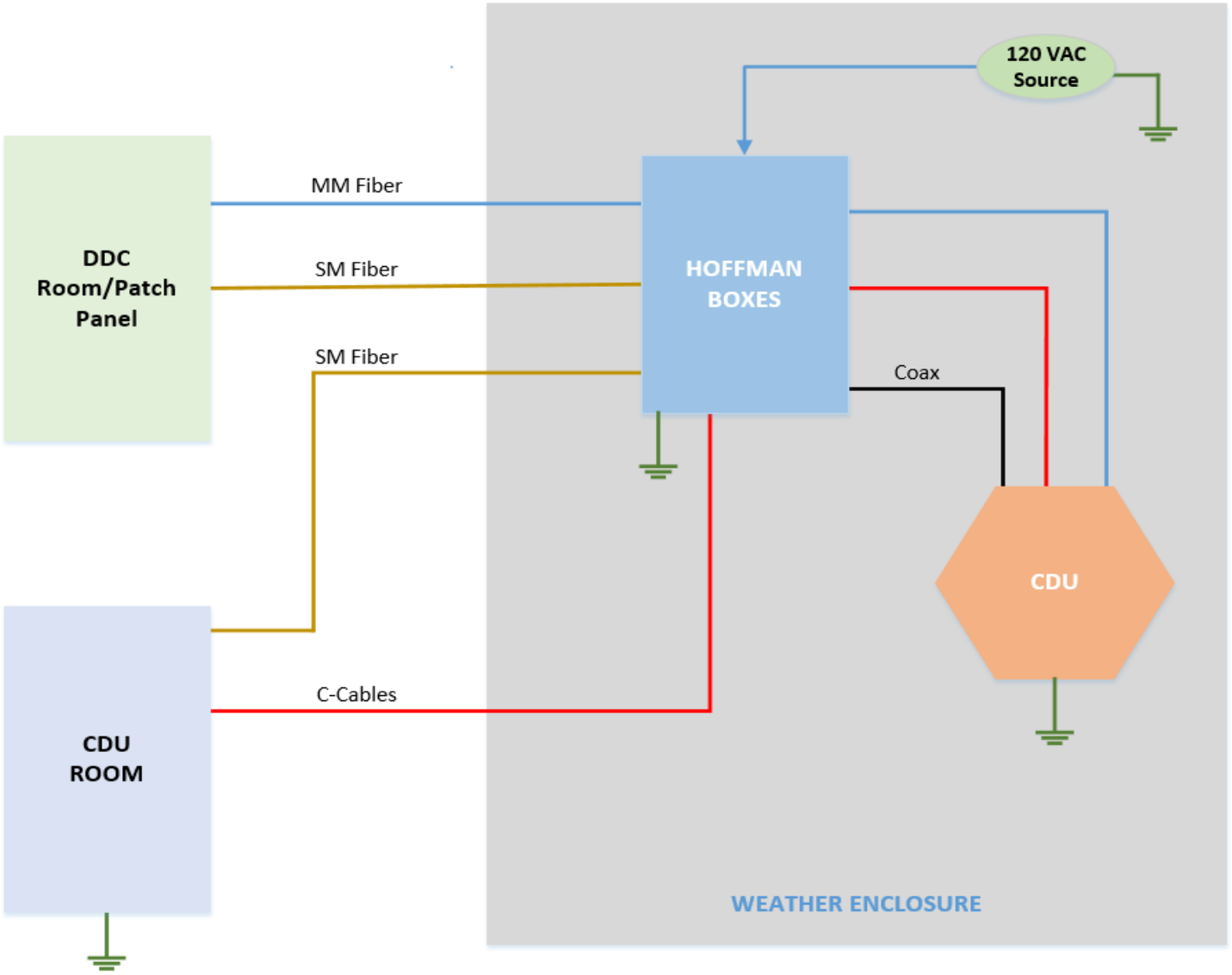
Customer Requirements

- Diagnostic Cabling Isolation – CVR Diagnostics
  - PPM Links will be used to isolate the CVR diagnostics from the point/Hoffman box to the CDU and DDC rooms
  - PPM Links will have a bandwidth of 40 MHz and use Single Mode Fiber Optic cabling as transport media between these rooms
  - PPM Links will be procured, installed, tested, and validated by Q-6
- Diagnostic Cabling Isolation – Load Ring Indicators
  - As previously mentioned, legacy load ring indicators will be used (up to two)
  - They inherently provide isolation due to laser diode outputs
  - Multimode fiber optic cable will be used as the transport media between above mentioned rooms
- Diagnostic Cabling Isolation – High Voltage Cables
  - All high voltage cable runs, including patch panels and cable traps, will have their ground isolated from rack/case ground

Design Details (Diagnostics)



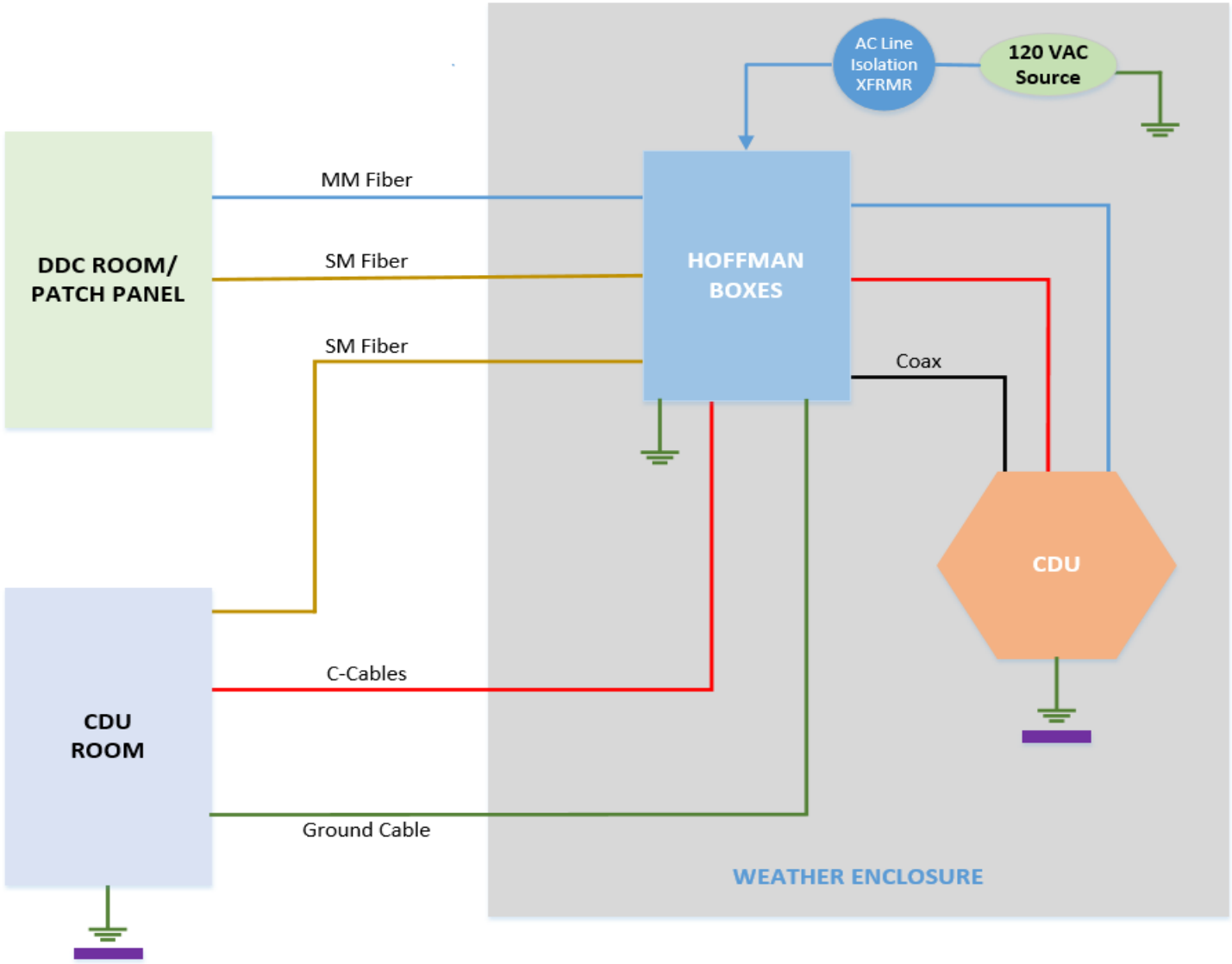
Design Details (Grounding System)



Design Details (Grounding Systems)

- There are many ‘grounds’ in each part of the system
  - CDU Racks
  - Hoffman Boxes
  - CDU
  - 120 VAC Power Sources
- A grounding methodology needs to be deployed to prevent ground loops
- An isolation system was previously deployed with the old system

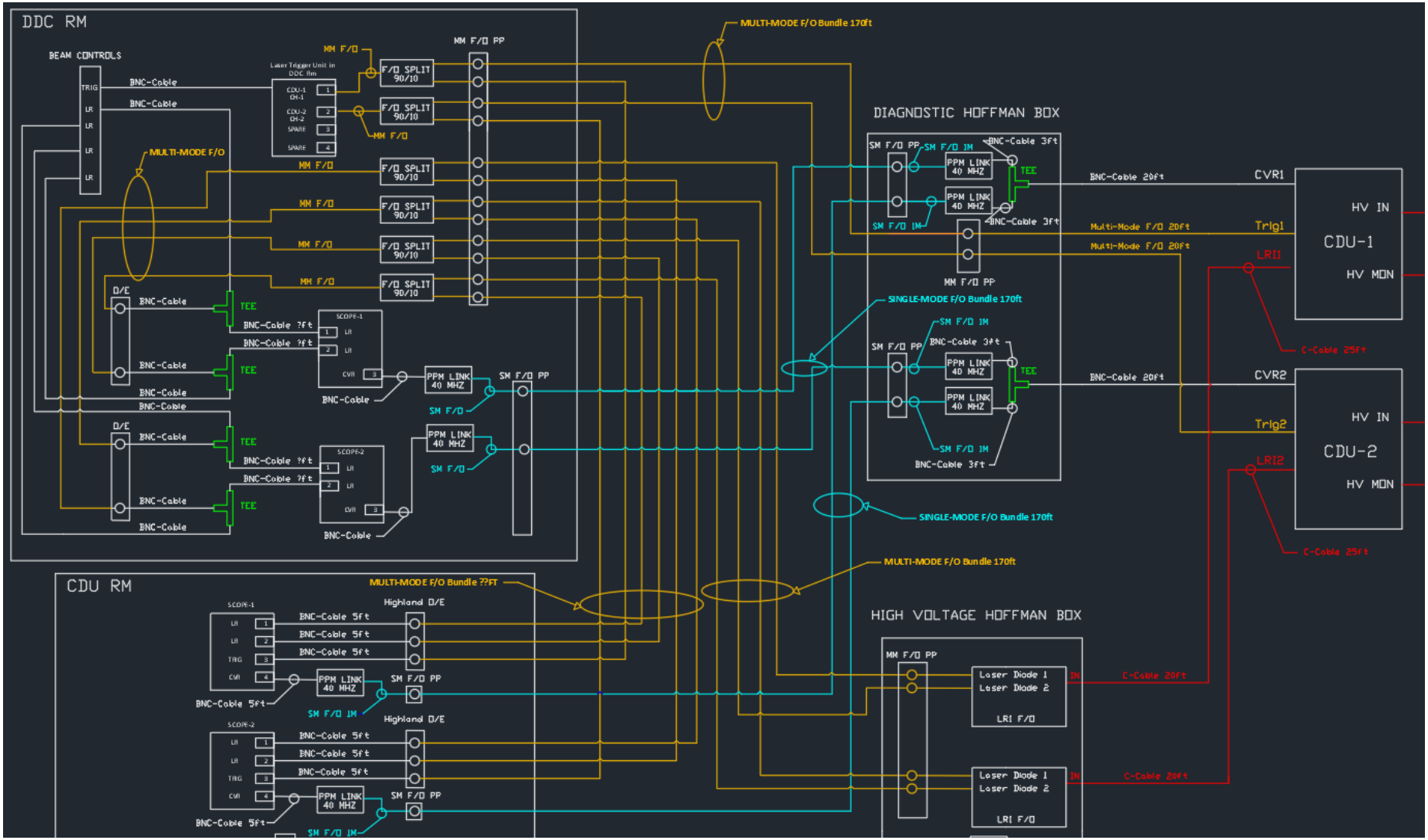
Design Details (Grounding System)



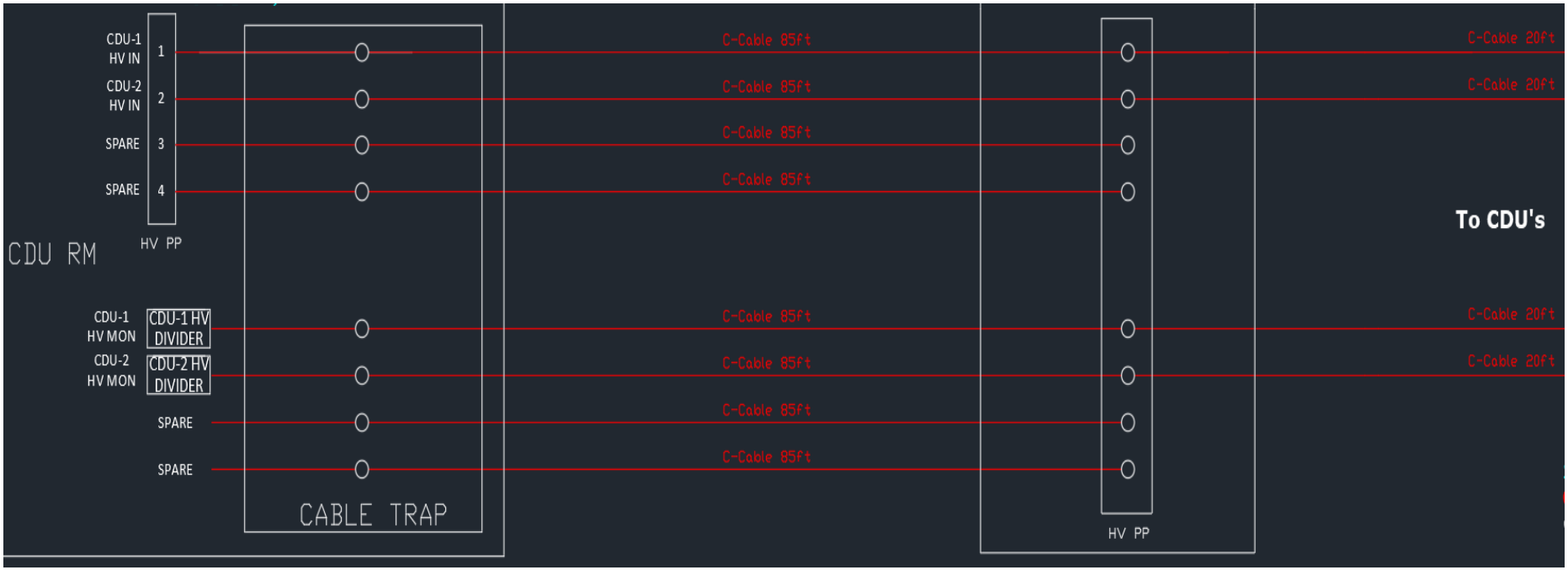
Design Details (Grounding Systems)

- Hoffman Boxes will be the ‘Central’ Ground Point
  - Earth ground to these boxes provided by the facility
  - 1.4” diameter ground cable will extend down to the CDU racks (and bonded to them)
- All grounds exiting or entering Hoffman boxes will be isolated
- 120 VAC Power input needs will be isolated via TrippLite Isolation Transformers
- CDU rooms racks are already ‘floating’
- Ensure all equipment in CDU room racks are bonded to the rack…but nothing else
- CDU will be on top of vessel sitting on an isolated panel
- Conduits will be plastic or at least have a di-electric break entrance into the Hoffman boxes to eliminate errant ground path

Design Details (Low Voltage Cabling)



Design Details –continued (High Voltage Cabling)



Miscellaneous

- What is Not Covered or Part of this Work Scope
  - Firing Control System Modifications
  - Diagnostic Recording Digitizers (DDC or CDU Room)
    - The Q-6 Experimental Support Team already has dedicated Tektronix 7104 Digitizers dedicated for DARHT CDU Diagnostics.
  - Feedthroughs are any vessel system/diagnostic
  - Cabling other than what is specified in this design review document
  - Any hardware interlocks responsible for the safe firing of the firing system
  - Any computer system or computer peripheral

Schedule

- DARHT Weather Enclosure Acceptance – Mid June 2020
- Cable Tray Installation – Mid June 2020 to Early July 2020
- Hoffman Box Installations – Middle of July 2020
- Accelerator Cable Installations – July 2020
- Firing Control Cable Installations – Later half of July 2020
- Testing Firing System with DARHT Controls – August 2020
- Wiring/Drawing Package Documentation – September 2020

- Q-6 will start ordering all cabling late June 2020
- Q-6 will work with J-DO for Work Package specifics
  - Coordinate staff working in the weather enclosure to comply with COVID-19 limitations
  - Coordinate daily activates, create a straw man schedule with DARHT leads
  - Work with DARHT and Q-6 management for work package compliances.

Miscellaneous

- Questions/Conclusion

Backup Slides

Backup Slides

Backup Slides

Backup Slides

Backup Slides

Backup Slides

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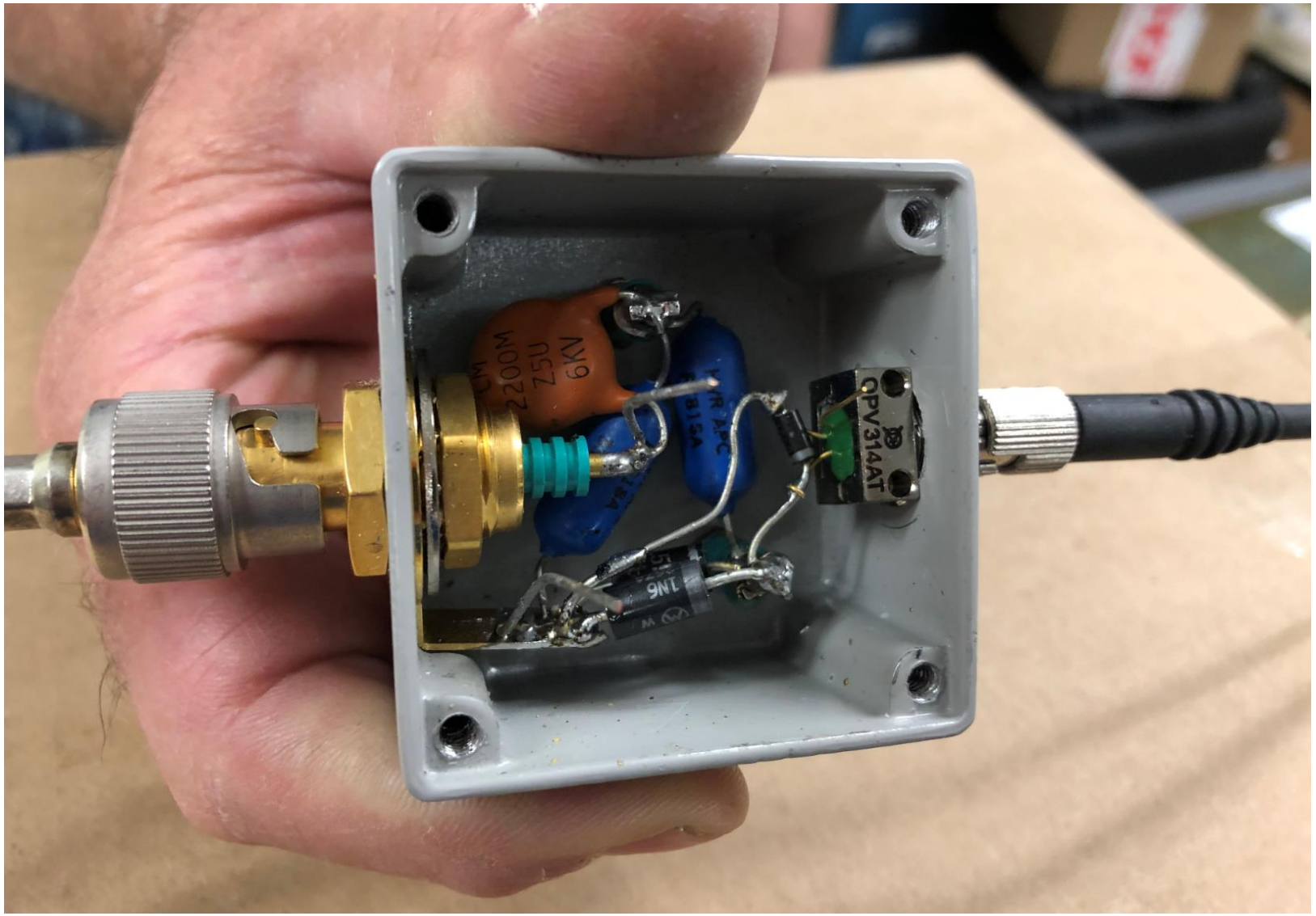
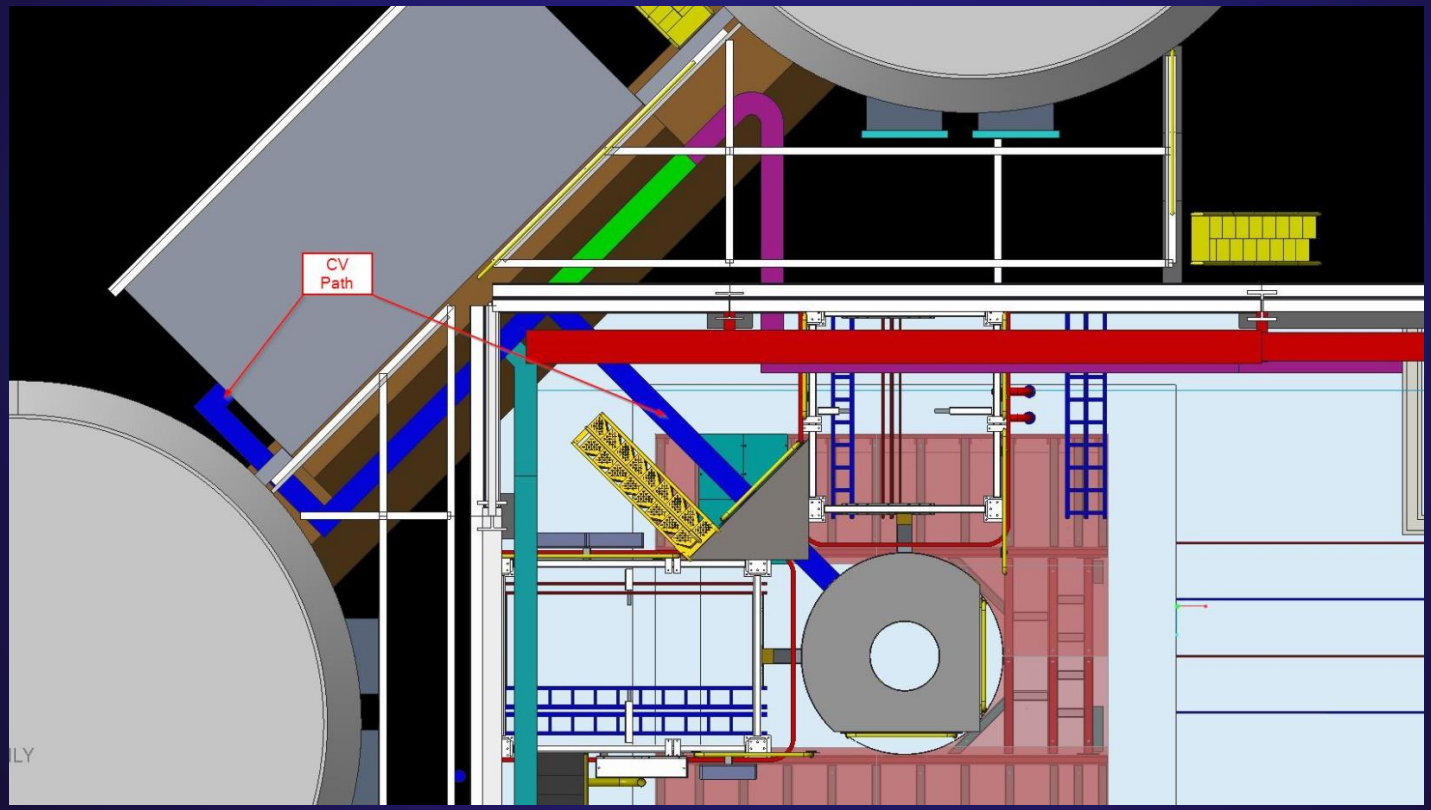
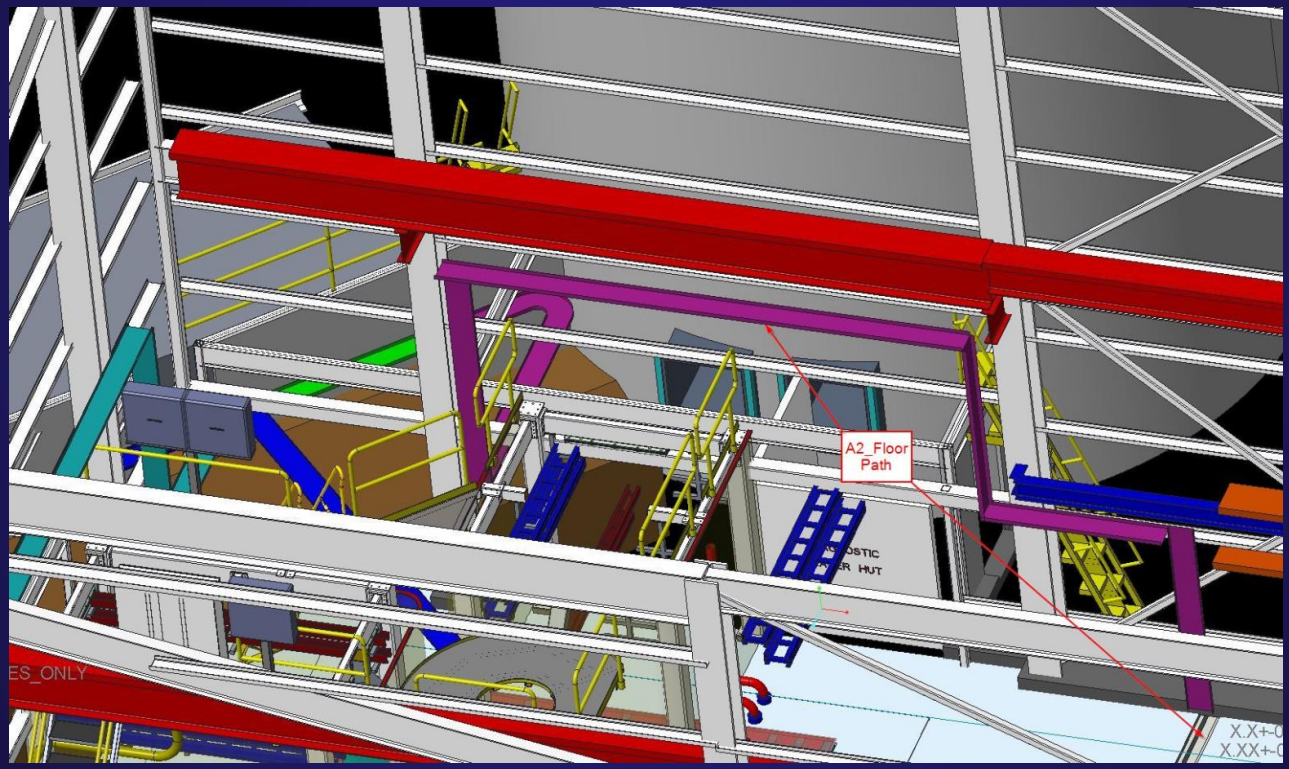
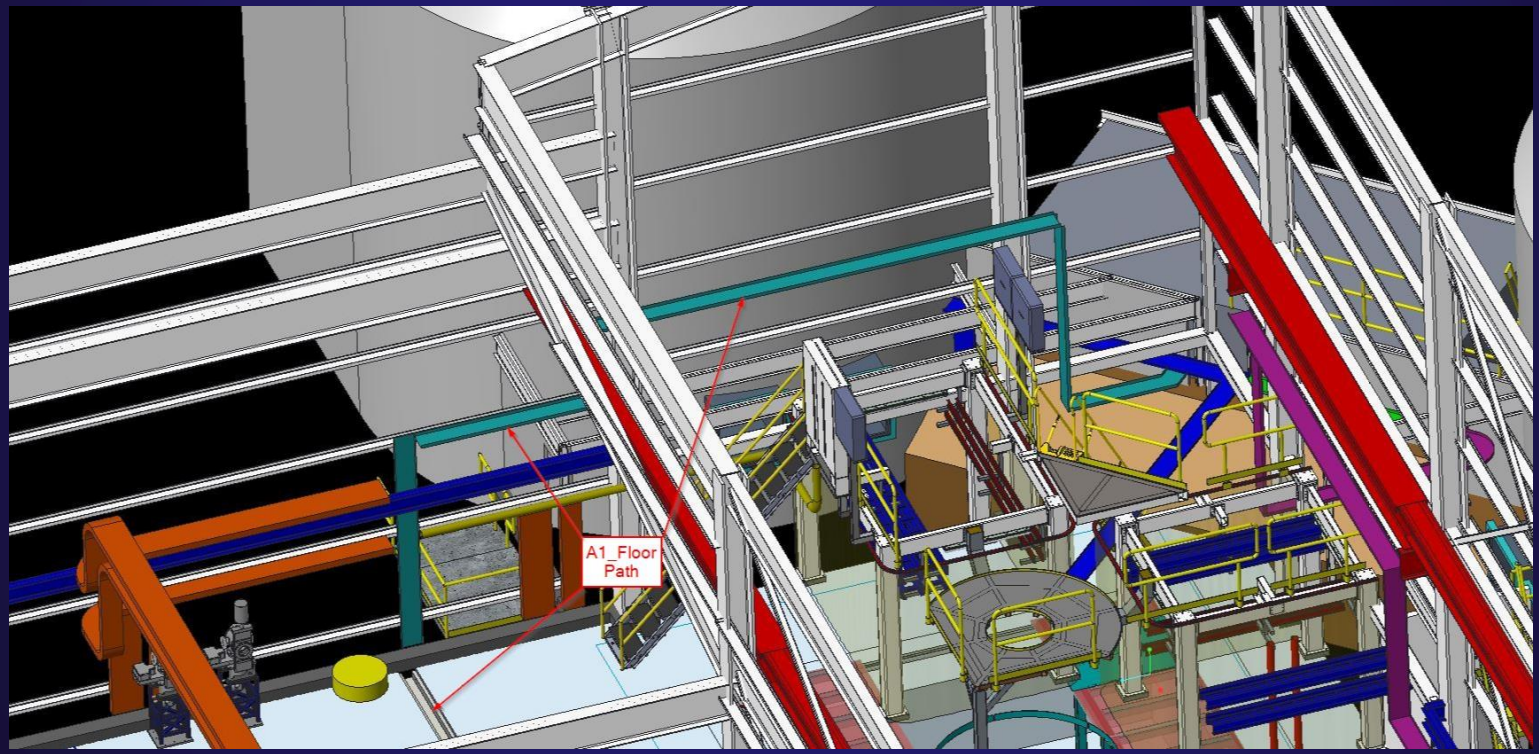
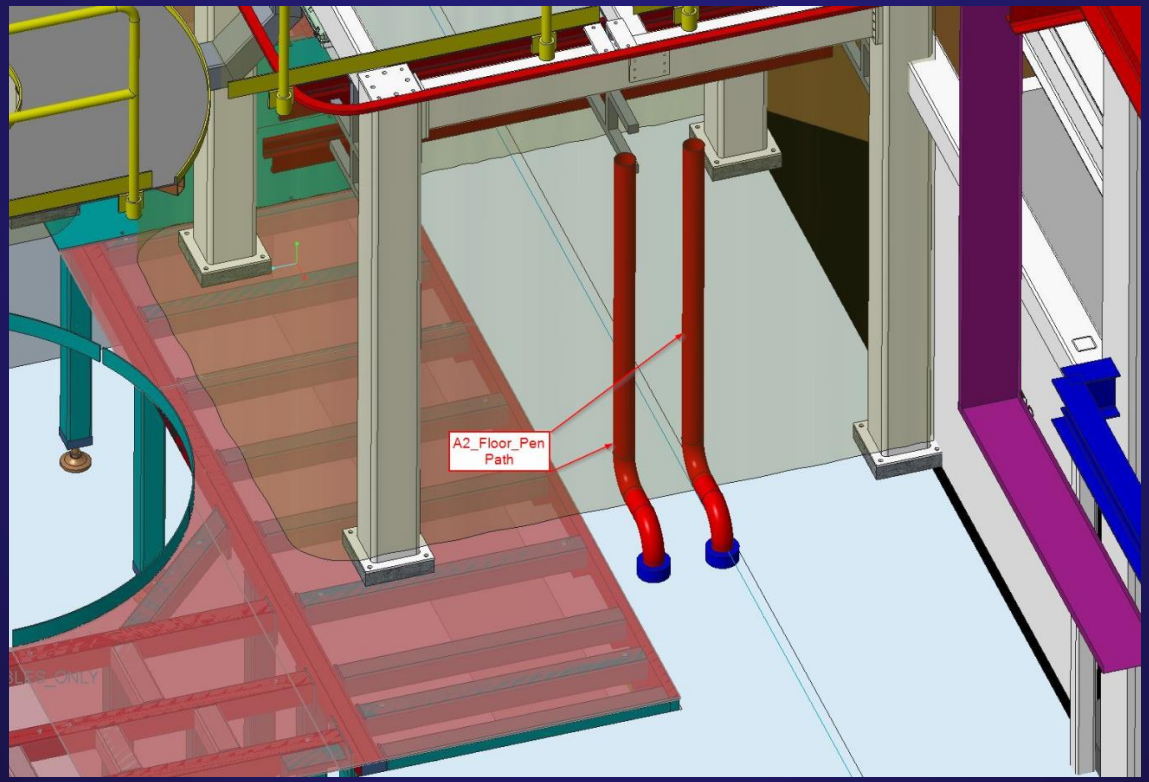
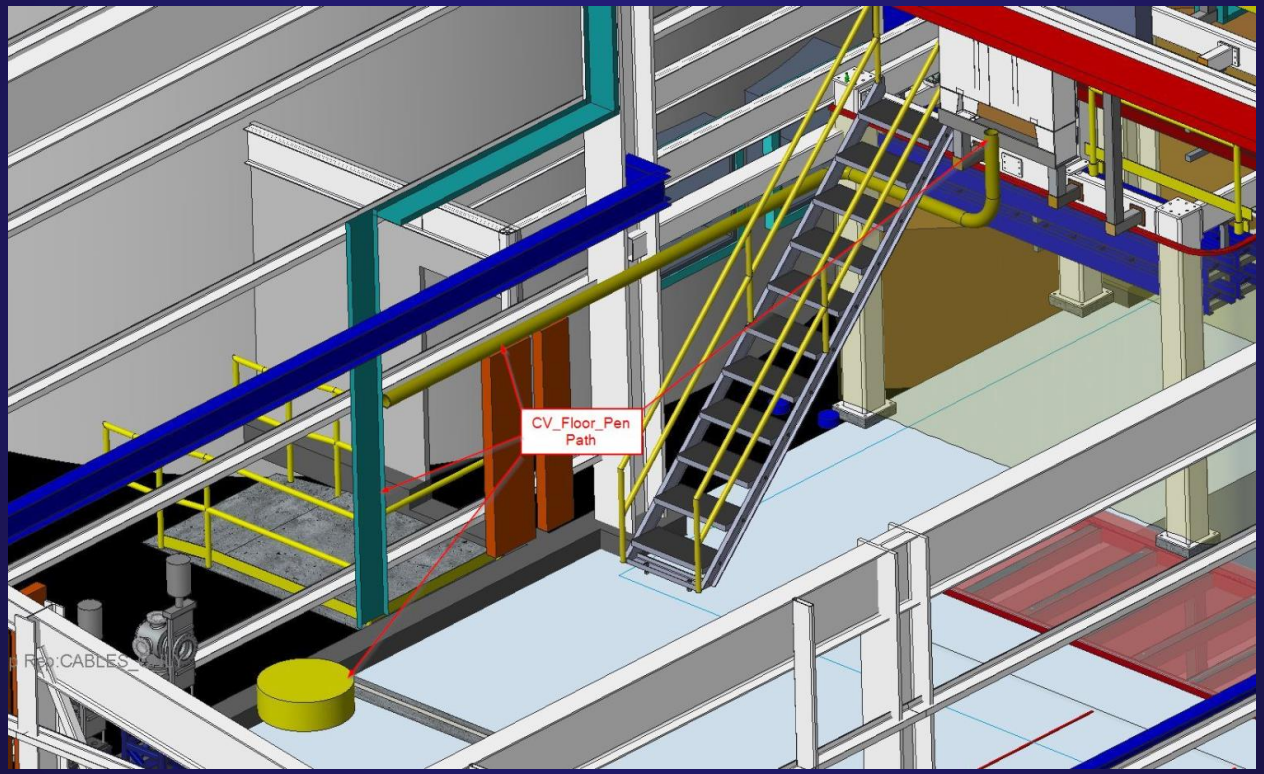





A2_Floor
Path


A1_Floor
Path




CV_Floor_Pen
Path