Cable Plant Design and Installation - Challenges and Lessons Learned

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U.S. DEPARTMENT of ENERGY
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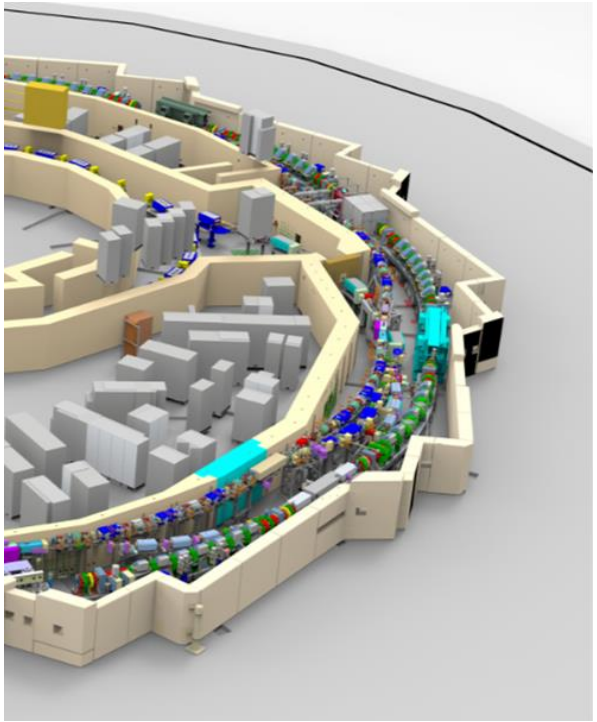
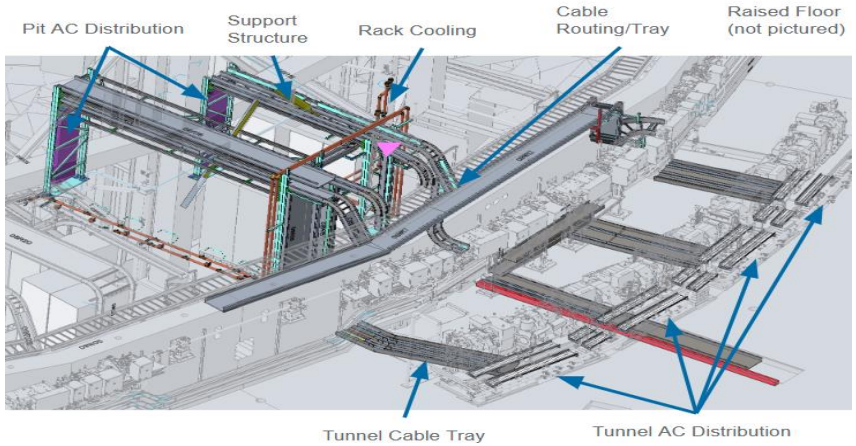
Outline

- ALS-U AR cable plant scope
- Progress
- Challenges



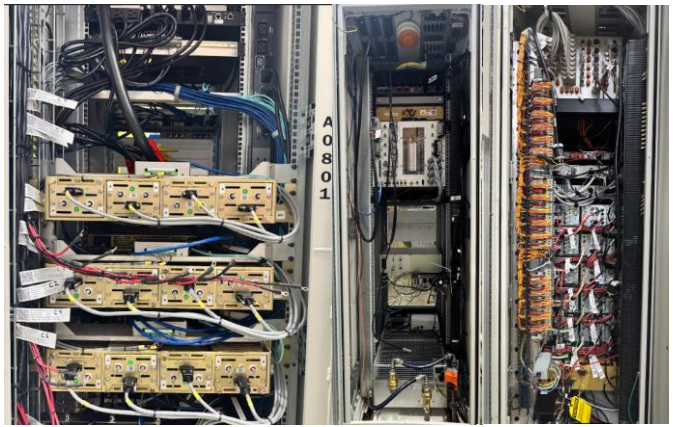
Cable Plant Scope

- Design of cable plant infrastructure
  - AR - in-house
  - SR - subcontractor oversight
- Procurement of racks (AR/SR) and infrastructure (AR only)
- Maintaining cable database
- Removal, Installation and testing of AR and SR infrastructure and cable plant



Cable Plant Progress

- AR Cable Plant design complete and approved by AHJ
- SR subcontract awarded, first sector at 60% progress - estimated completion Nov, 2026
- AR installation in progress - Estimated completion Nov, 2026
  - 58/59 Racks installed
  - 6/12 infrastructure and AC installation completed, 2 sectors in progress - Estimated completion July, 2026
  - Cable pulled and Termination (2338 Cables - AR) - 29% pulled and 13% Terminated and tested.
  - 7 racks ready for functional testing.



Issues

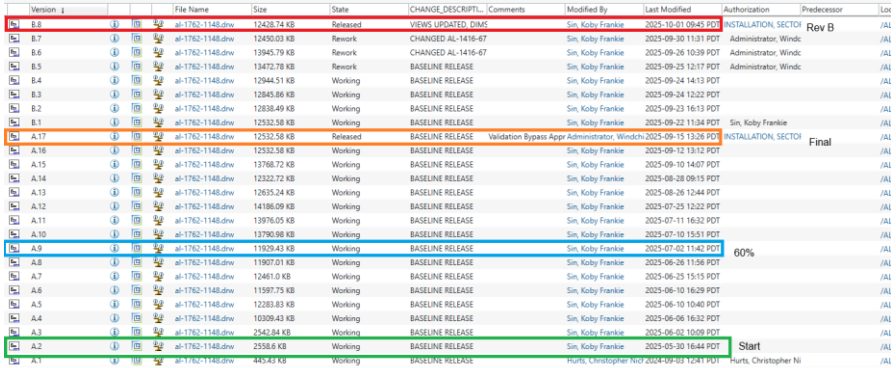
Using correct software and expertise for infrastructure design.

AR design was done in-house using Creo, this tool is meant to create CAD drawings and 3D models for machines not infrastructure.

Design in-house - 3-5 months per sector, design packages 17

Design with subcontractor using Revit - 10 months all SR sectors, design package 1

Bonus - Use BIM model for capturing existing infrastructure



Deliverables	Duration	Weeks	Estimated Dates
30% one sector (S5) design package	1 week	1	3/31/2026
30% one sector (S5) review	1 week	1	4/7/2026
60% one sector (S5) design package	2 weeks	2	4/21/2026
60% one sector (S5) review	1 week	1	**4/28/2026**
90% one sector (S5) design package	2 weeks	2	5/12/2026
90% one sector (S5) review	1 week	1	**5/19/2026**
30% all 11 (S1,2,3,4,6,7,8,9,10,11,12)sectors design package	3 weeks	3	6/10/2026
30% 11 (S1,2,3,4,6,7,8,9,10,11,12) sectors review	2 weeks	2	**6/24/2026**
60% 11 sectors design package	3 weeks	3	7/16/2026
60% 11 sectors review	2 weeks	2	7/30/2026
90% 11 sectors design package	4 weeks	4	8/27/2026
90% all sectors review	2 weeks	2	9/11/2026
100%/IFP all sectors	3 weeks	3	10/2/2026
100% review all sectors	2 weeks	2	10/16/2026
IFC all sectors	3 weeks	2	10/30/2026

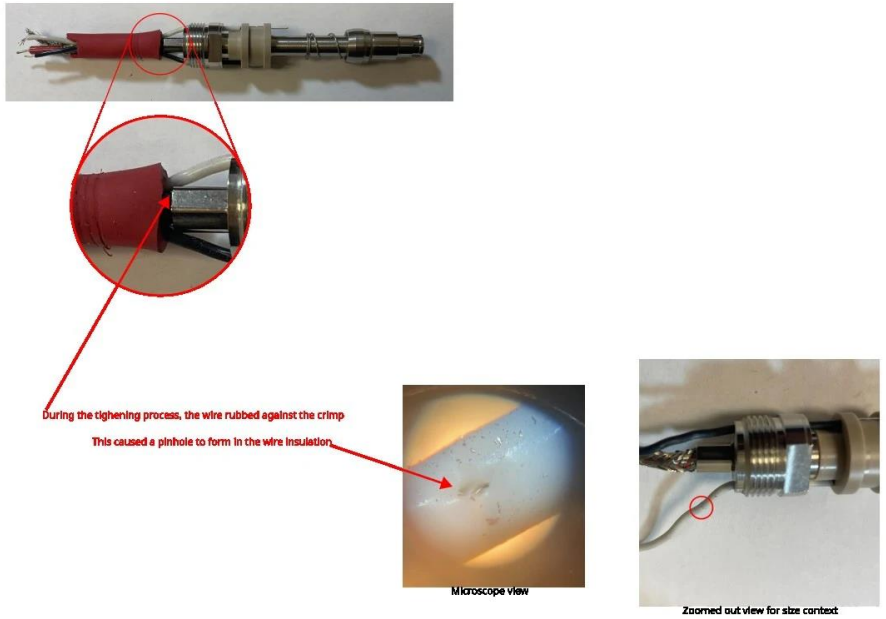
Issues

- Vacuum Gamma cable terminations
  - Gamma cables multiple cables failed testing

Cause: Connector failure caused by the cable twisting as the cable collet is tightened. Specifically, this caused the white wire to rub against the edge of the crimp, causing a pinhole in the wire's insulation

Possible solutions: Machining the connector to accept the cable OD or using lubricant or cut back the insulations to reduce OD of cable

Path forward: Performing workshop to train installers and contractors to work on this connector termination following vendor instructions, understanding the challenges and training individuals to work on these terminations



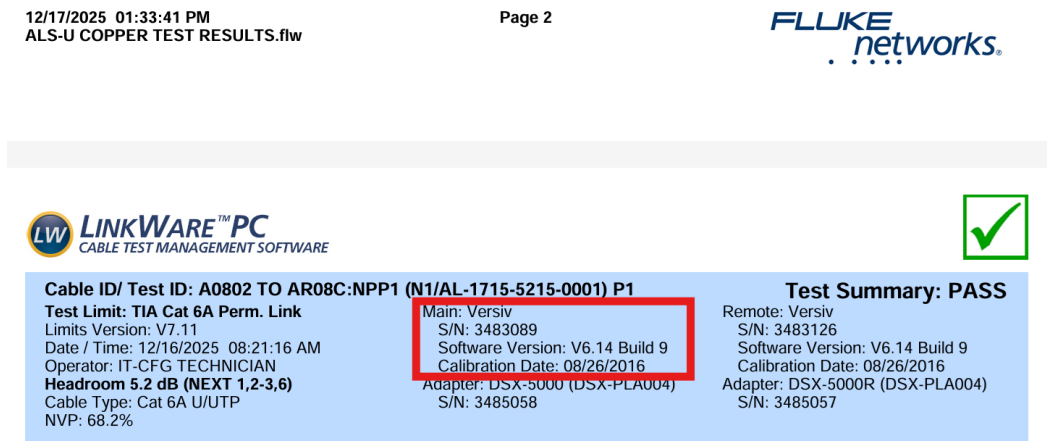
Issues

- Network testing equipment out of calibration

Issue: The network team did several cable tests where all results were submitted as passed and results were provided to subsystem owner for acceptance. It was identified from the test reports that device was last calibrated 10 years ago

Possible solutions: Buy / rent new calibrated testing device, calibrate existing device

Path forward: All network cable tests are paused until a calibrated device is obtained.


12/17/2025 01:33:41 PM
ALS-U COPPER TEST RESULTS.flw

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FLUKE networks

LINKWARE™ PC
CABLE TEST MANAGEMENT SOFTWARE

Cable ID/ Test ID: A0802 TO AR08C:NPP1 (N1/AL-1715-5215-0001) P1

Test Limit: TIA Cat 6A Perm. Link
Limits Version: V7.11
Date / Time: 12/16/2025 08:21:16 AM
Operator: IT-CFG TECHNICIAN
Headroom 5.2 dB (NEXT 1,2-3,6)
Cable Type: Cat 6A U/UTP
NVP: 68.2%

Main: Versiv
S/N: 3483089
Software Version: V6.14 Build 9
Calibration Date: 08/26/2016
Adapter: DSX-5000 (DSX-PLA004)
S/N: 3485058

Test Summary: PASS

Remote: Versiv
S/N: 3483126
Software Version: V6.14 Build 9
Calibration Date: 08/26/2016
Adapter: DSX-5000R (DSX-PLA004)
S/N: 3485057

Issues

- Rack Energization

Background: A vacuum rack was energized following AHJ approval. During subsequent inspections of additional racks for energization, the AHJ identified that some installed equipment was not finger-safe.

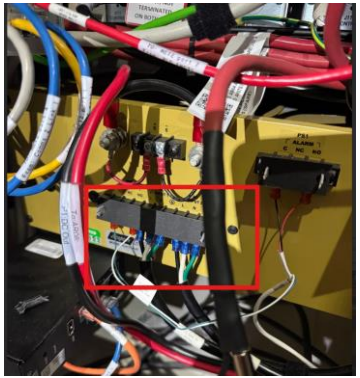
Issue: All racks have been powered down including the vacuum rack due to this issue.

Possible solutions:

- Install plexiglass on all devices that are not finger safe
- Racks must be worked on by QEW-2 individuals only. That entails that all subsystem testing will be done by QEW-2 individuals and labels added to the racks to state the same.

Path forward: Subsystem owner is creating a prototype to create an enclosure ,which will be inspected and approved by AHJ.

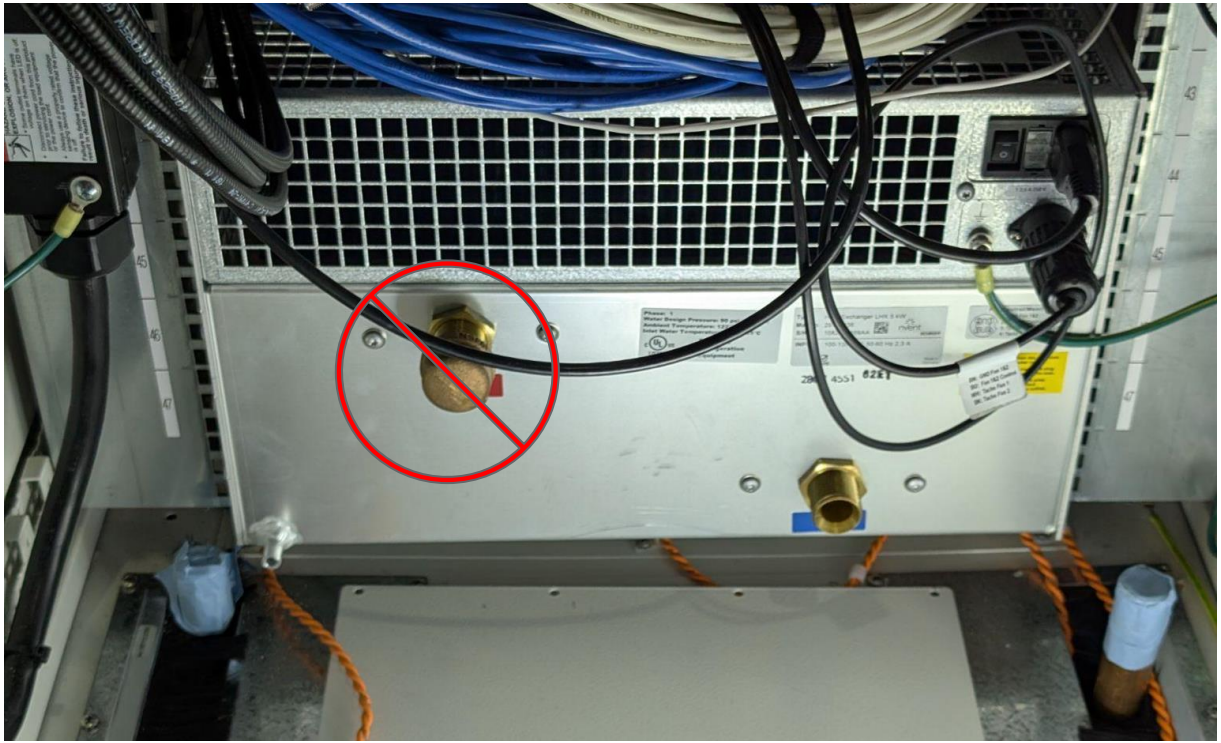
Other observations and recommendations from AHJ- Add labels to devices to show voltage levels so its easily identifiable



Lessons Learned

- Leave cables in a safe state when not working in the area to prevent damage.

Lessons Learned



Heat exchangers in ALS-U racks have British Pipe Thread, NOT NPT.

Verify your connection types and tools before installing. If unsure stop work and reach out to the SME

Thank you

Questions? Contact *priyankagupta@lbl.gov*