Fermilab

September 23, 2025

September 2025 LBNF/DUNE – Project Update

Joshua Willhite (BSI Project Manager) and Jolie Macier (FDC Project Manager)

U.S. DEPARTMENT of ENERGY

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FERMI NATIONAL ACCELERATOR LABORATORY

Agenda

Welcome – *Zach Burton, Communications Manager*

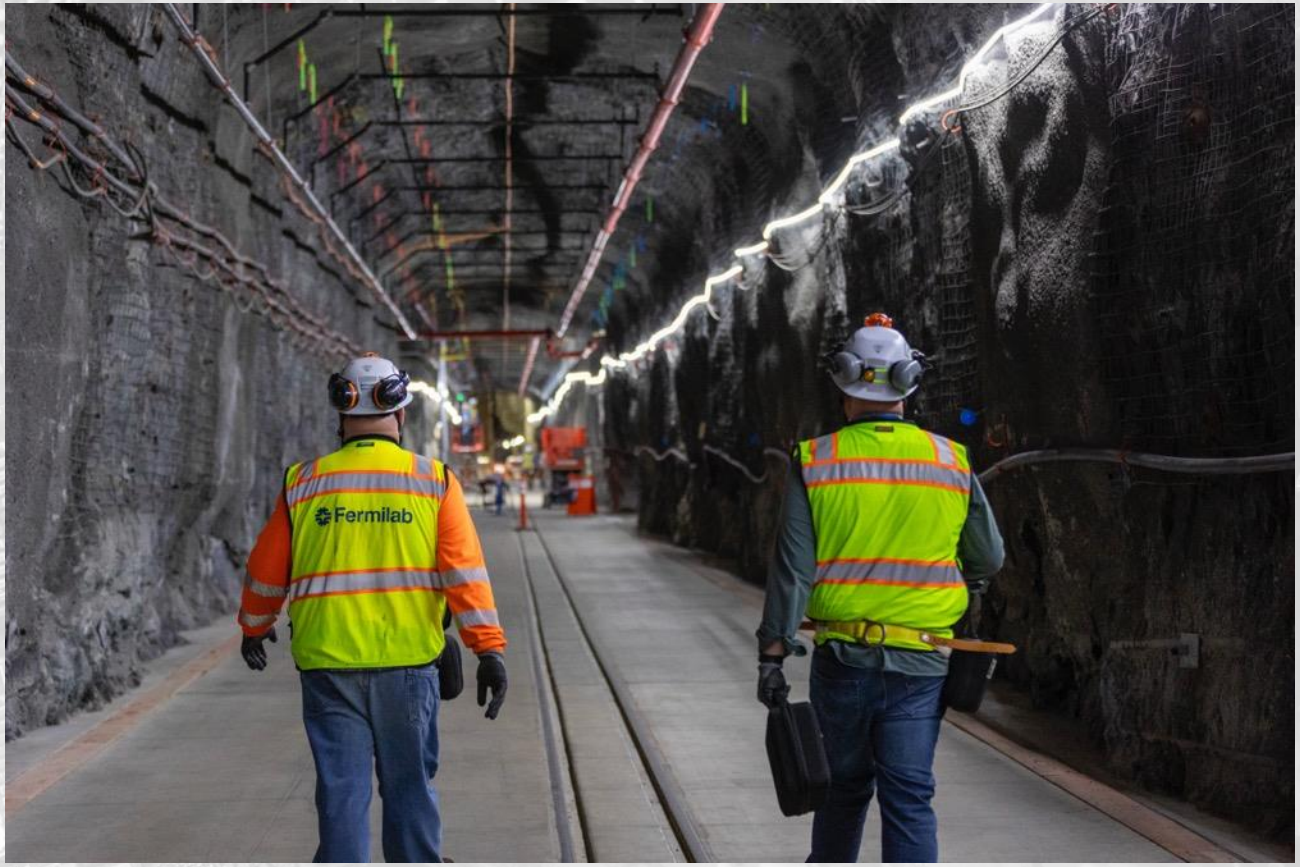
BSI Update – *Joshua Willhite, BSI Project Manager*

FDC Update – *Jolie Macier, FDC Project Manager*

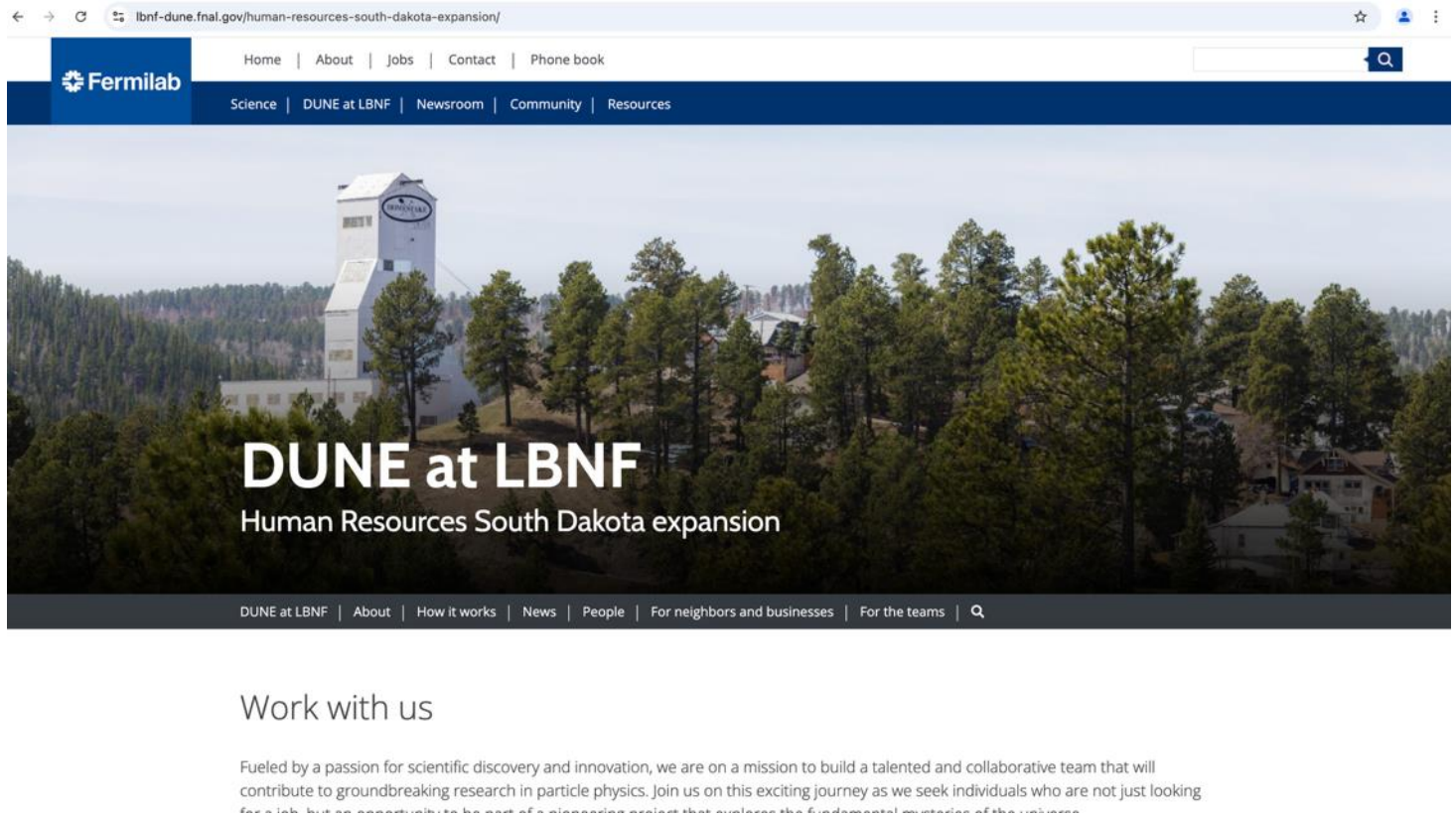
Q&A

Welcome

Zach Burton, Communications



Job Opportunities



Employment: https://lbnf-dune.fnal.gov/human-resources-south-dakota-expansion/

Contracts: SAM.gov

Follow Our Journey!

Stay informed with project updates:

LBNF/DUNE

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- https://www.facebook.com/LBNFacility
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- Email: zburton@fnal.gov

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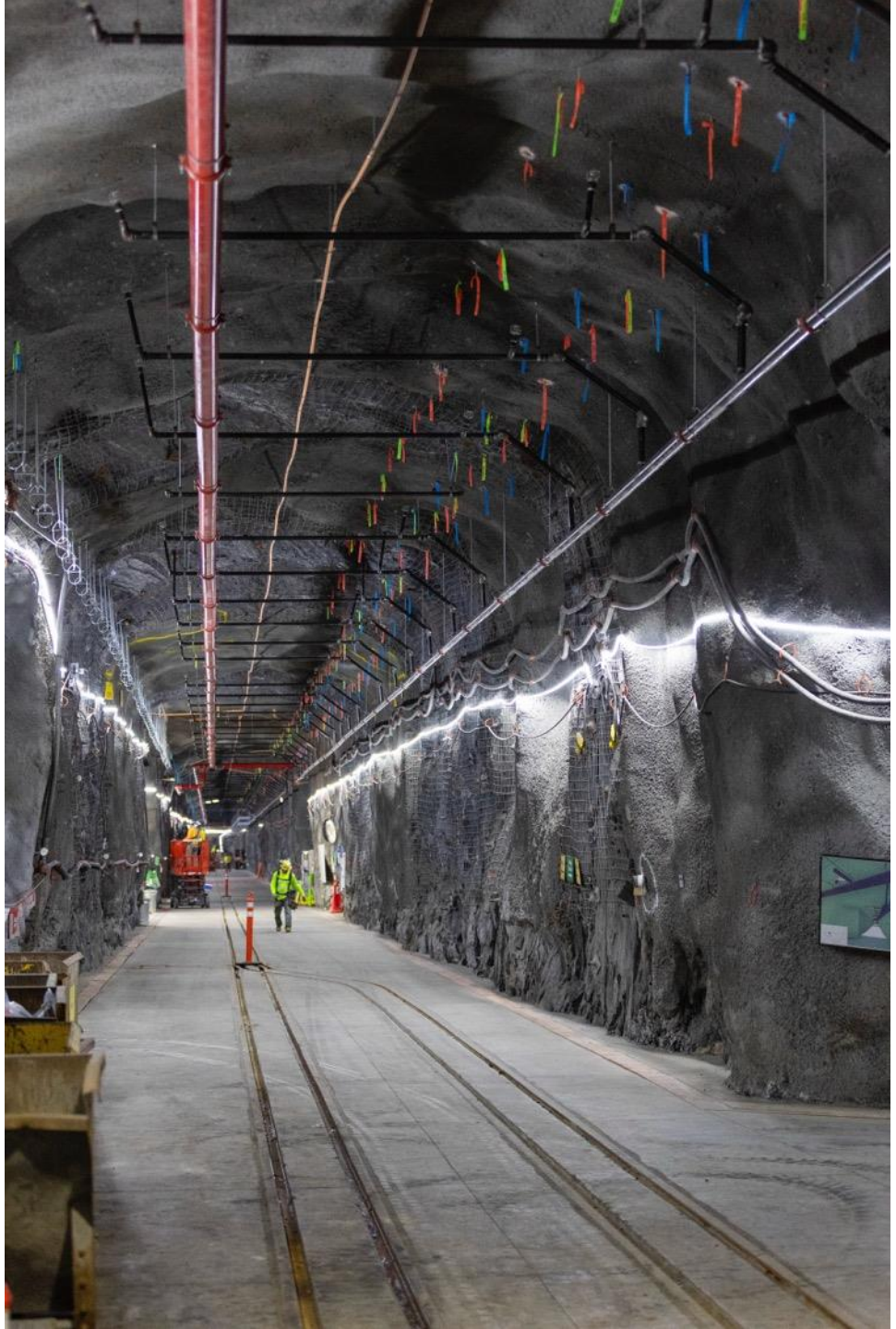

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Project update - BSI

Joshua Willhite, BSI Project Manager

Project Footprint

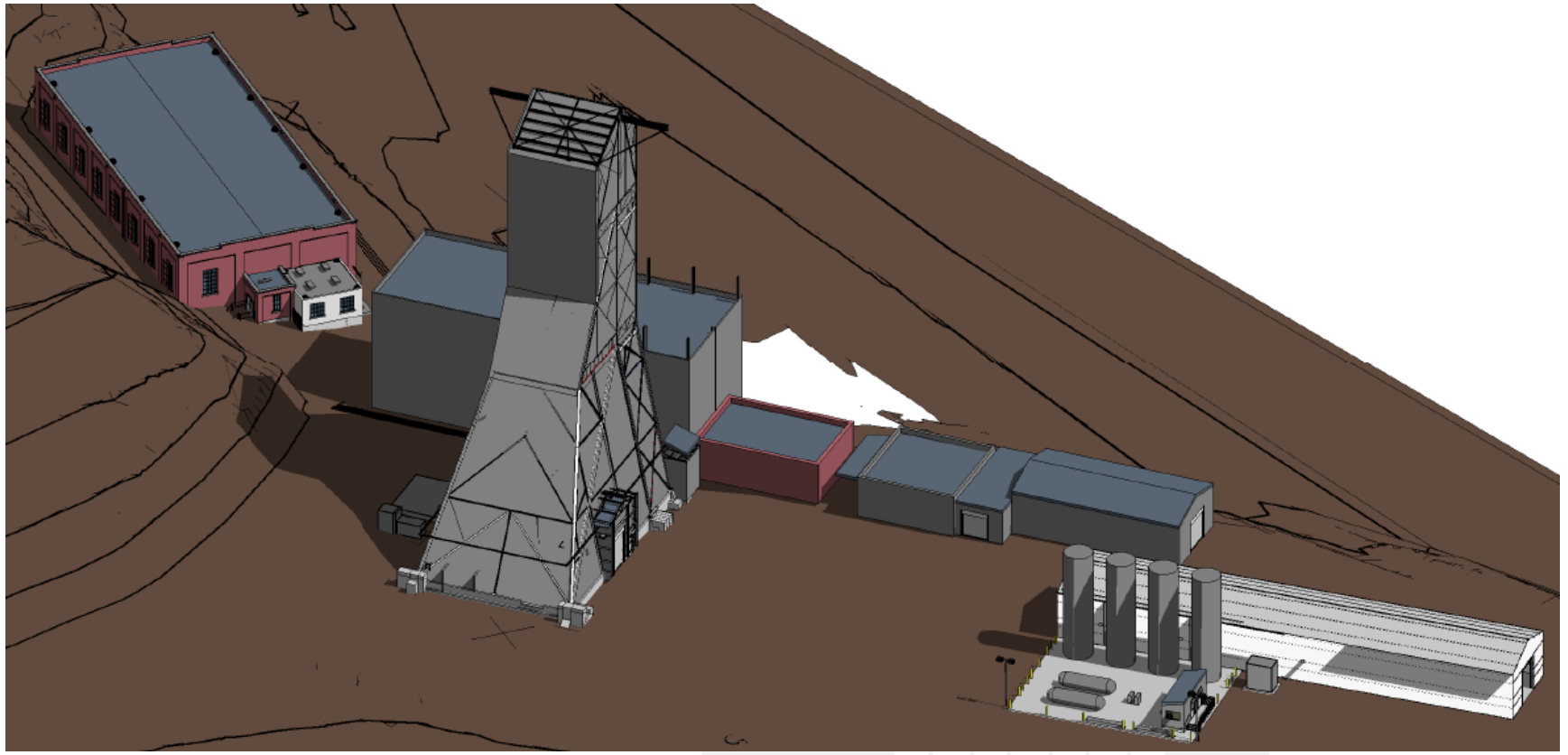
Project Overview

Project Overview

- Infrastructure installation happening now (BSI)!
  - Power, lights, fire sprinklers and detection, HVAC, etc.
- Detector parts have arrived in South Dakota!
- Expect to start detector installation in late 2025/early 2026
  - Overlapped with infrastructure phase
- Construction will continue through the early 2030's
- First detector will begin taking data while second detector is still being built

BSI – Surface

- Some remodeling in the Ross dry for offices and communications
- Trench for argon pipe
- Preparations for argon receiving equipment
- Civil grading



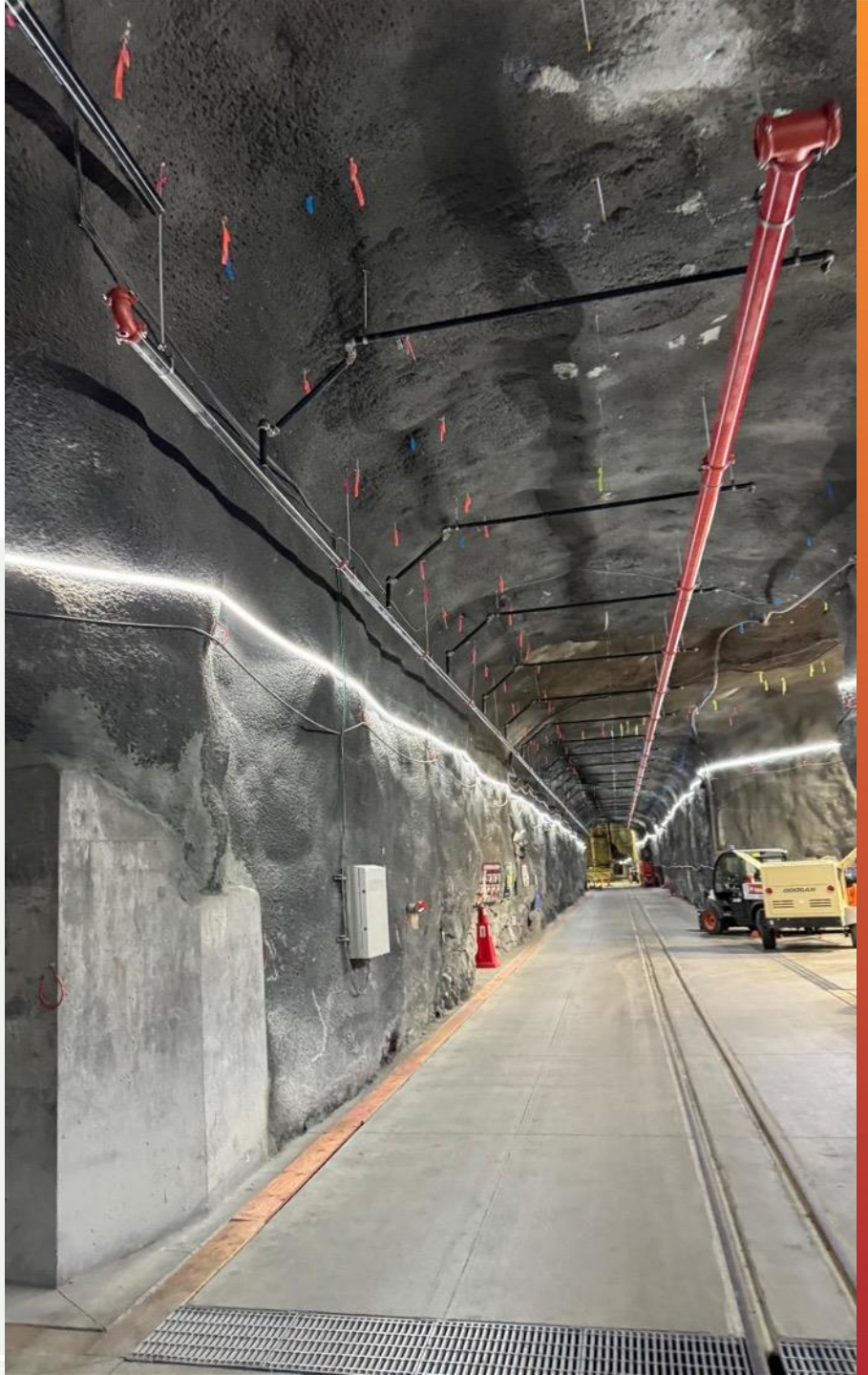
BSI - Underground

Most surface work already complete, focus is underground

- Mostly regional contractor pool
- Anticipate similar number of staff as during excavation (~150-200 divided between day and night shift)
- Generally working 5 days/week, 2 shifts/day. Occasional Saturday day shifts as well

Type of work being performed:

- Civil, architectural, and structural features
- Mechanical and plumbing including HVAC, Chilled water and Water Supply
- Electrical including Normal, Emergency, Standby
- Fire Detection, Protection and Alarm
- Cyberinfrastructure
- Security
- Argon gas pipe (incl shaft)



BSI - Underground

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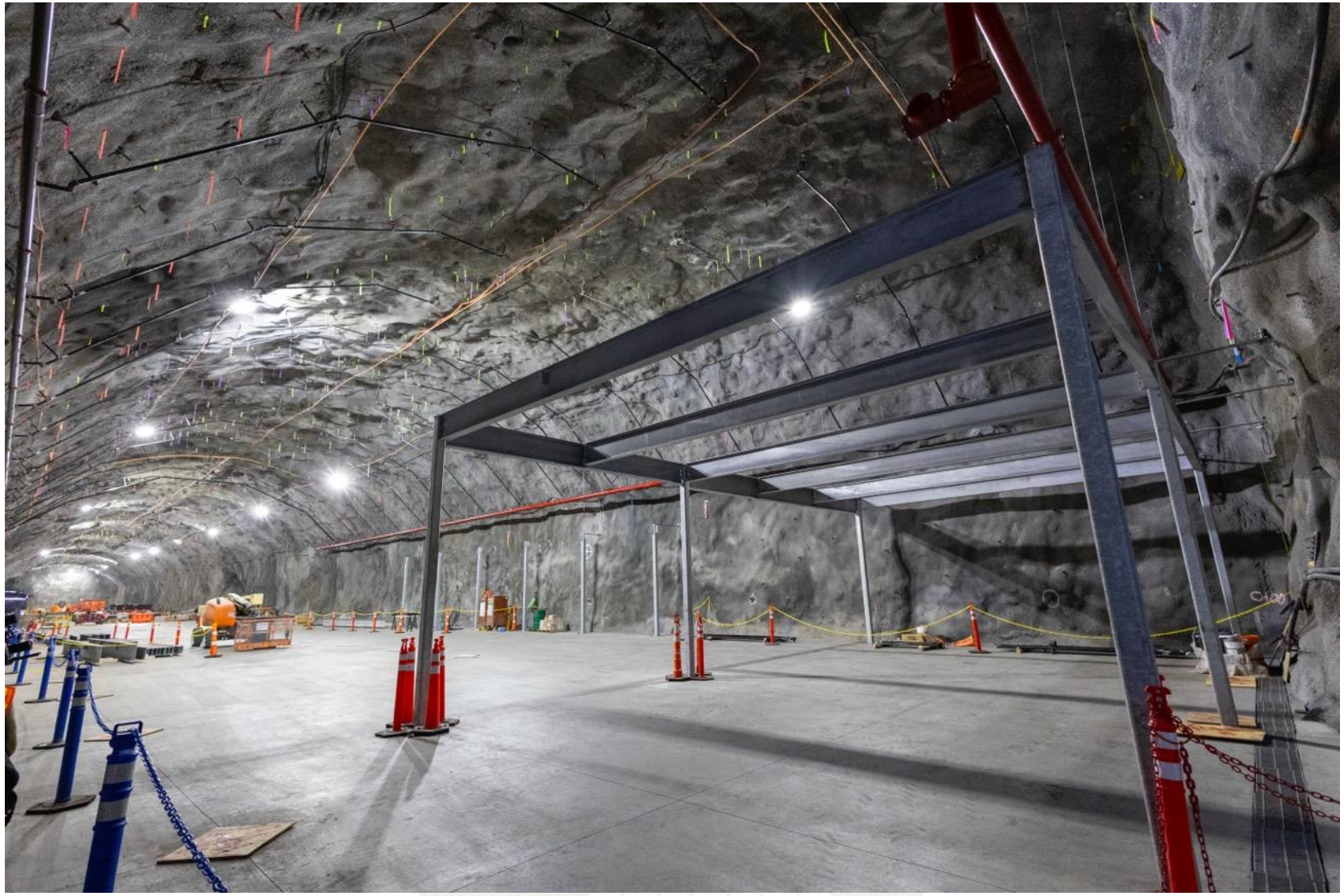
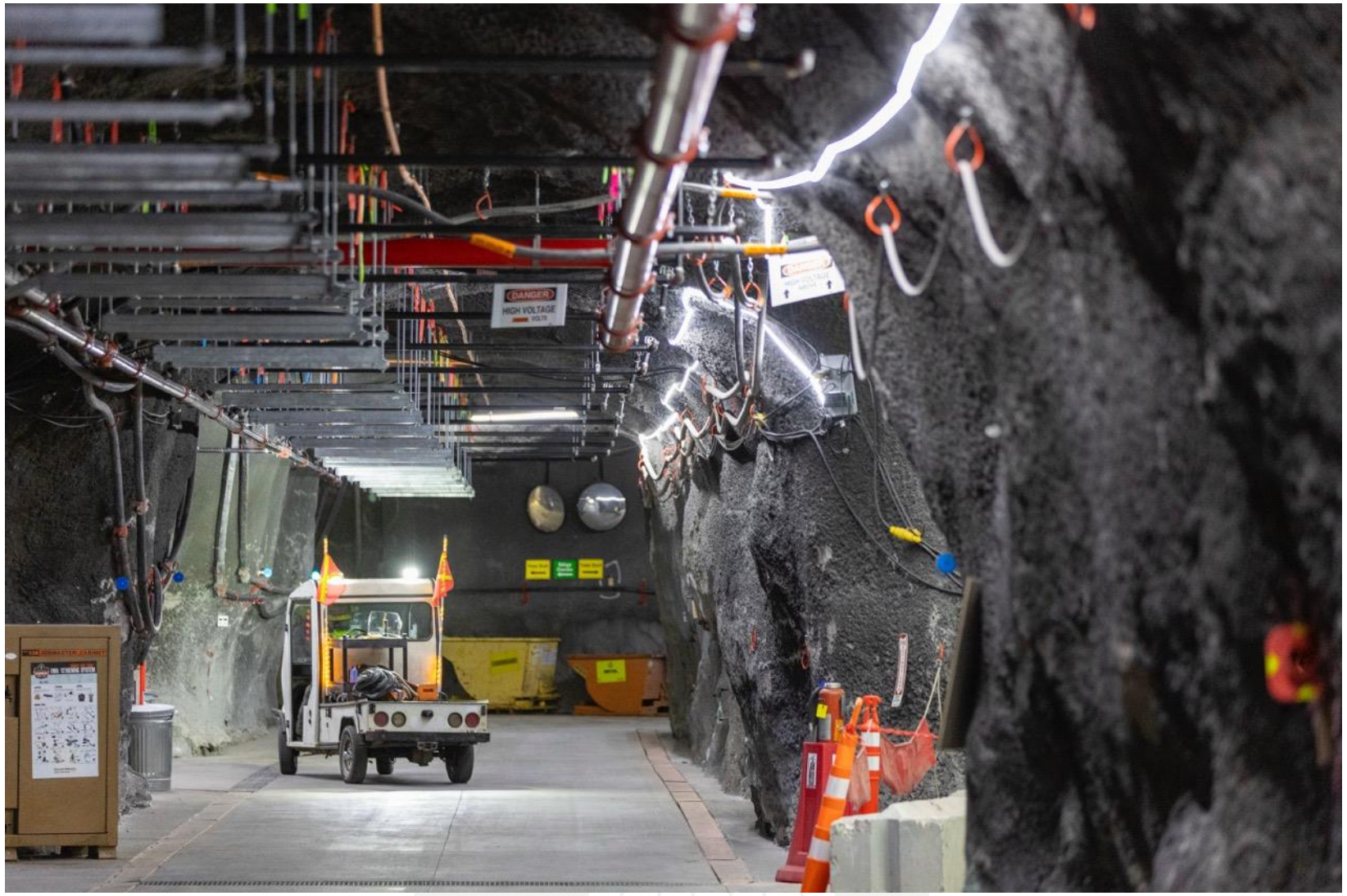


BSI - Underground



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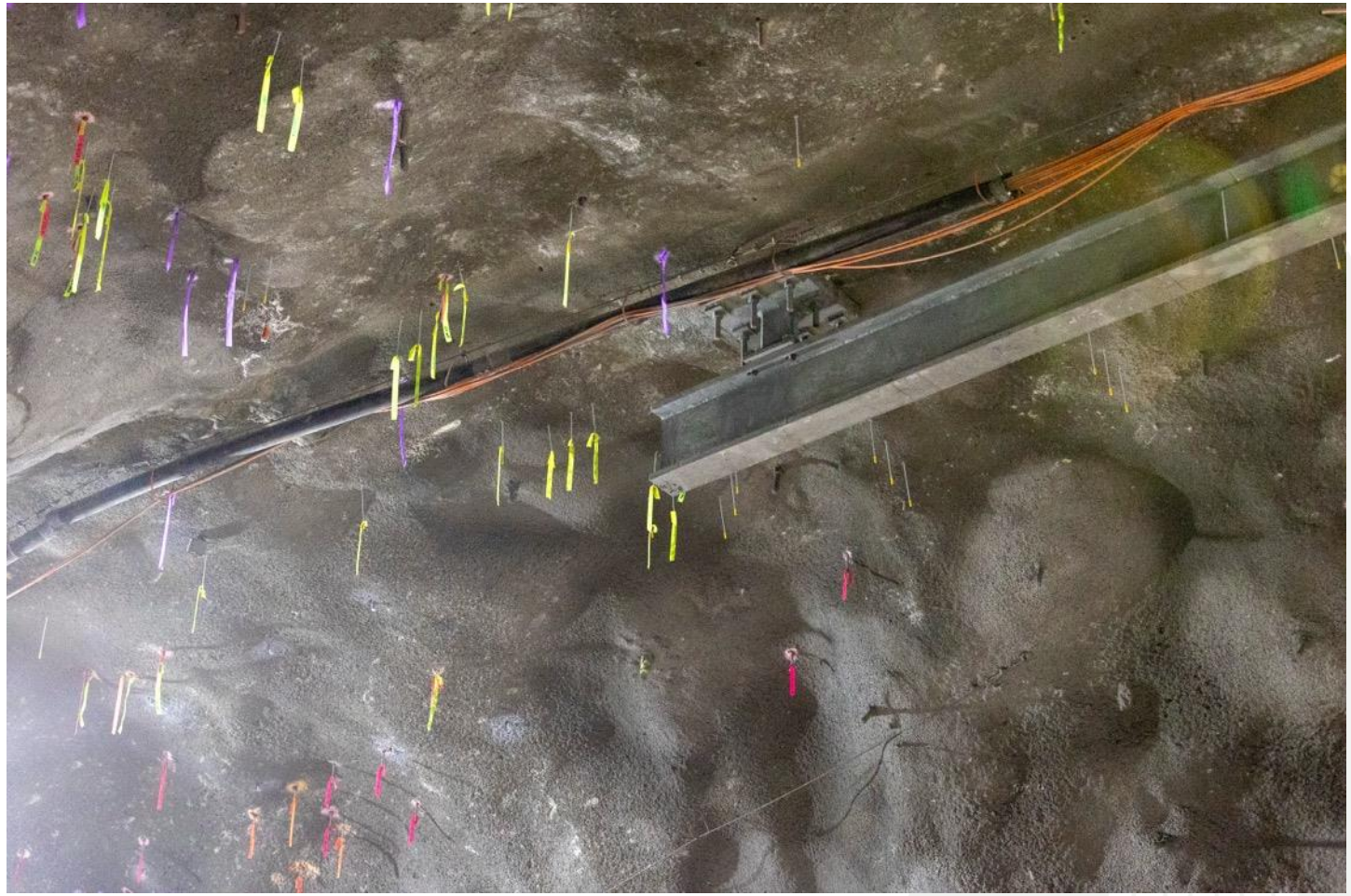
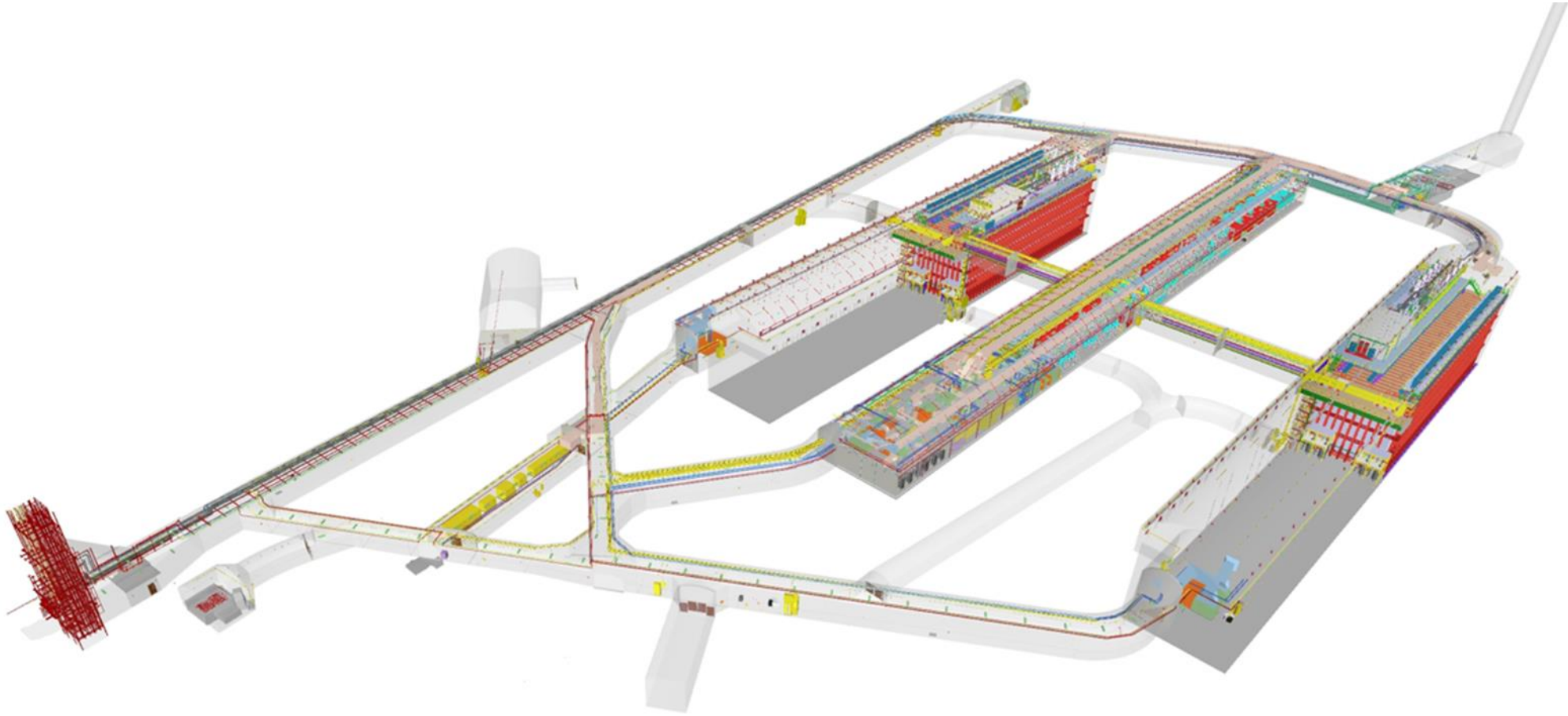


Project update - FDC

Jolie Macier, FDC Project Manager

Next Phase: Far Detectors & Cryogenics (FDC)

Installs **cryostats**, **cryogenics**, two time-projection chamber **detectors**
EACH filled with 17,000 metric tons of LAr

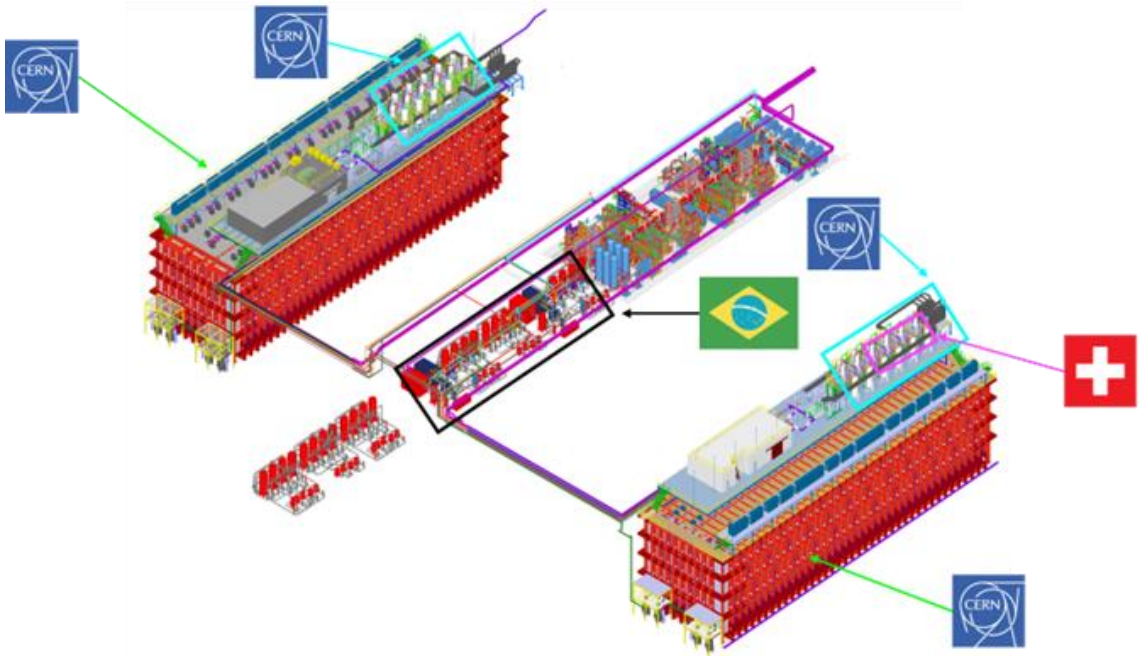


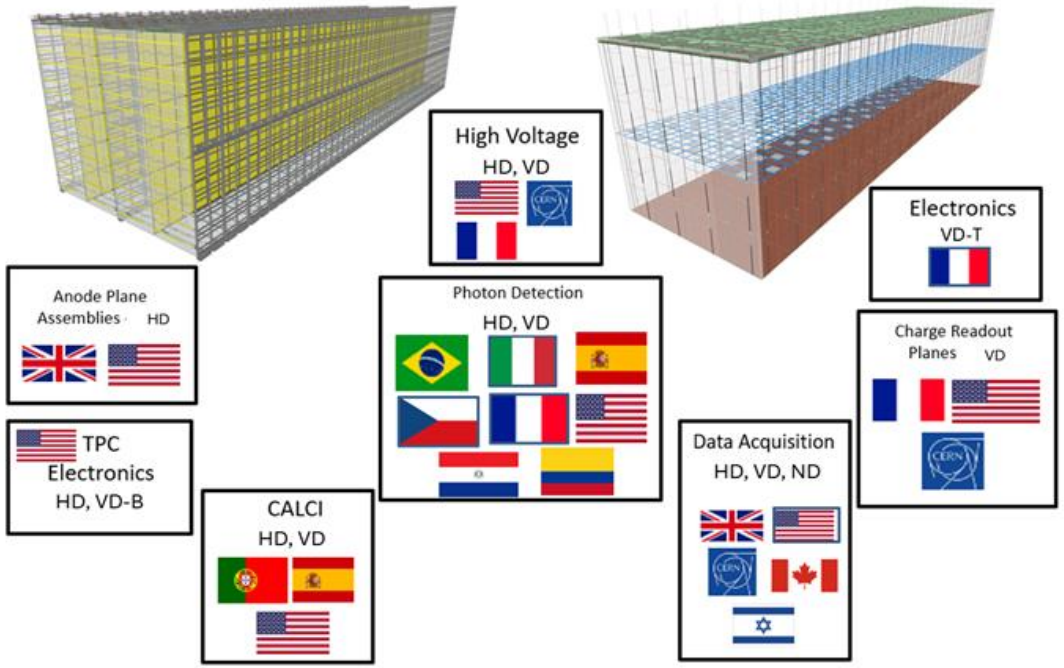
LBNF/DUNE-US Project

- Excavation subproject created the underground cavern space, installs cranes, wall supports & ceiling anchors for cryogenics mezzanine
- Buildings & Site Infrastructure subproject installs all house services: electrical, ventilation, architectural, chilled water, fire protection
- **Far Detector & Cryogenics subproject builds & installs cryostats, detectors & cryogenics; liquid argon filling**

Anode Plane Assembly (APA) Production Facility at University of Chicago

FDC includes international partners





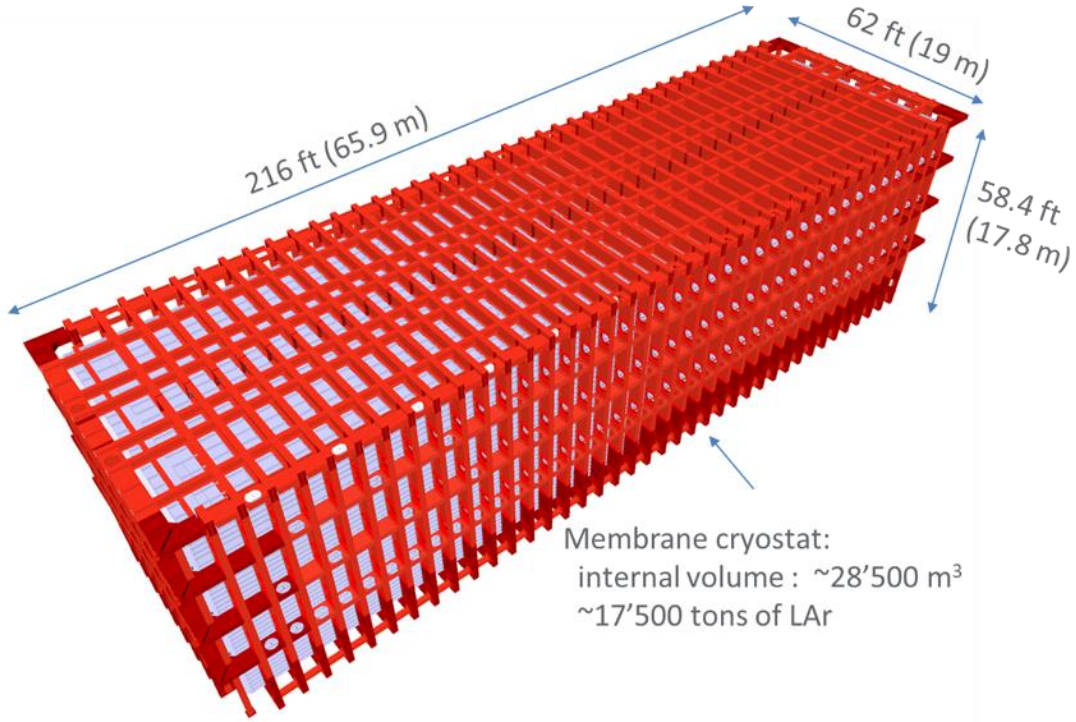
FDC Planning for Underground Work

Installation Prototyping at University of Minnesota's NOvA facility in Ash River, Minnesota

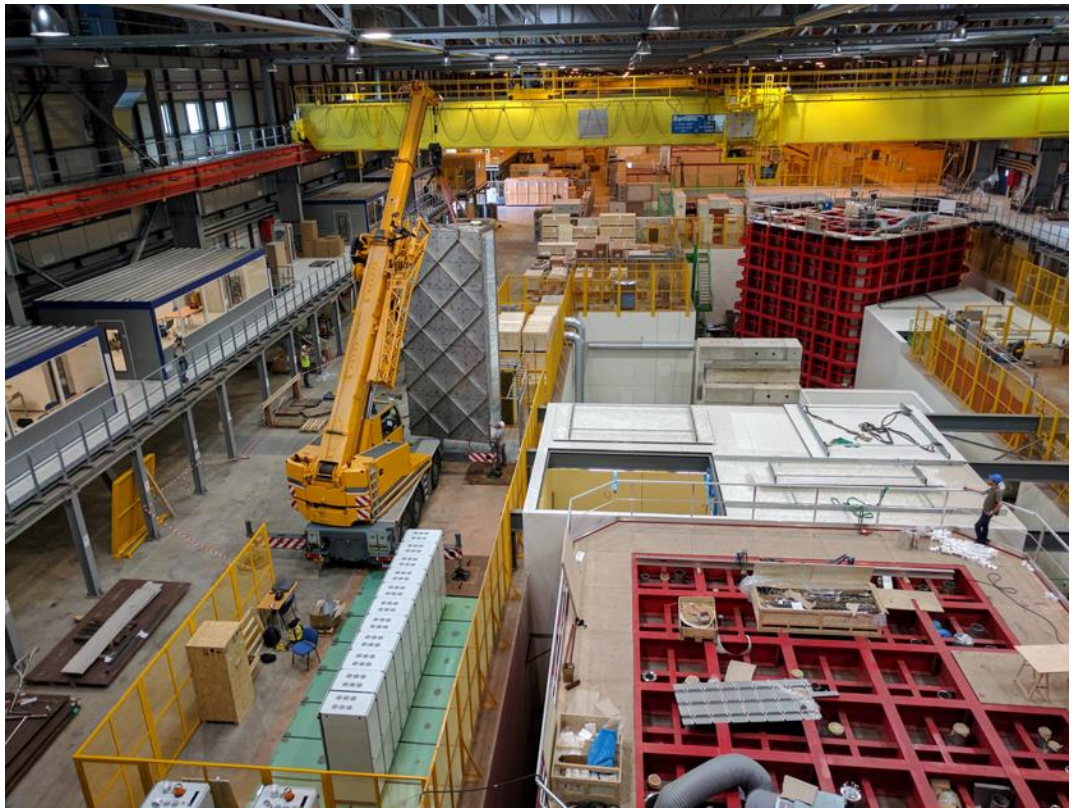
Each Detector is housed in a Cryostat

- CERN contribution
- Material & installation
- Two components
- Steel
- Insulation
- Each is 3 million pounds of steel
- 5 stories high
- Each is two basketball courts long

- CERN = European Organization for Nuclear Research, located in Geneva Switzerland

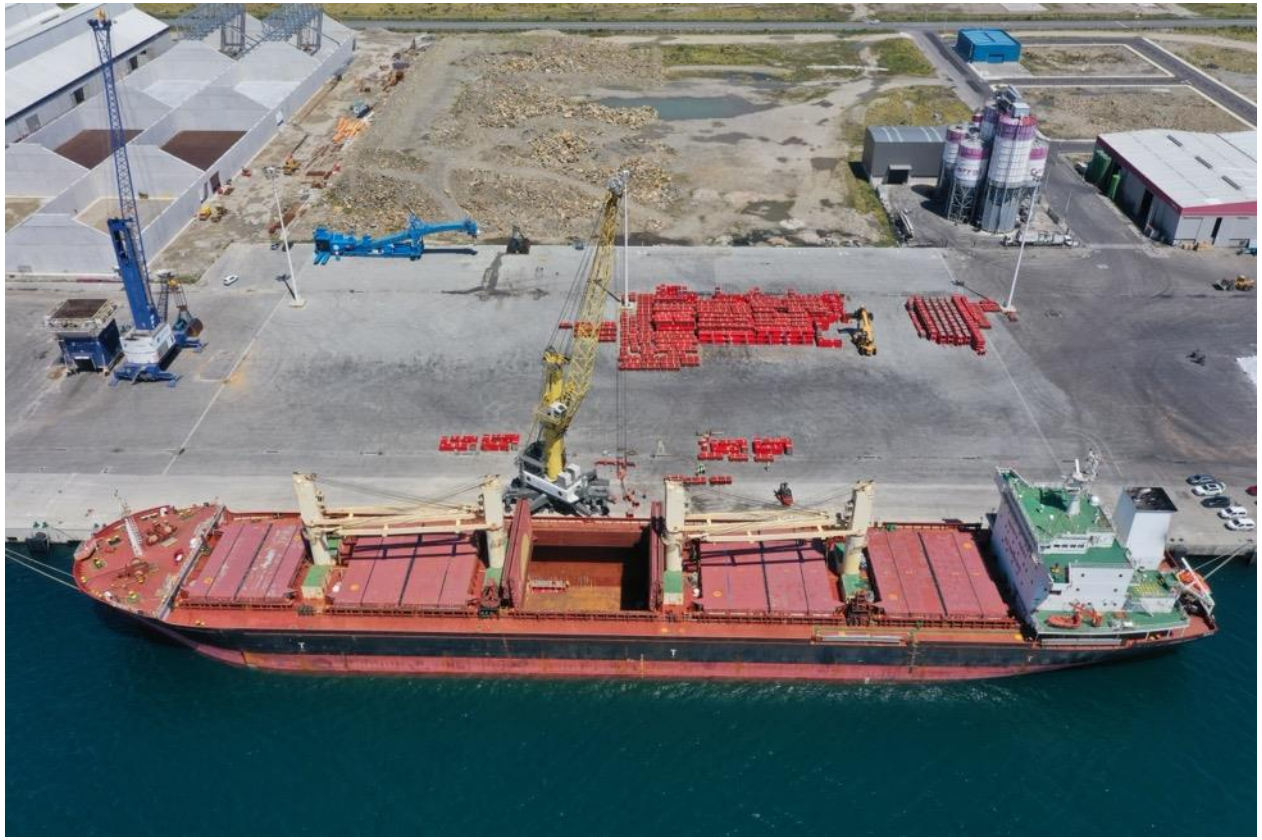


Prototyping precedes FDC underground activities in Lead



ProtoDUNE detectors (red boxes) at CERN (left); wire plane Anode Plane Assemblies in ProtoDUNE (right)

Cryostat steel fabricated in Spain (CERN contribution) and shipped to Houston



Steel arrived in Houston in early 2025

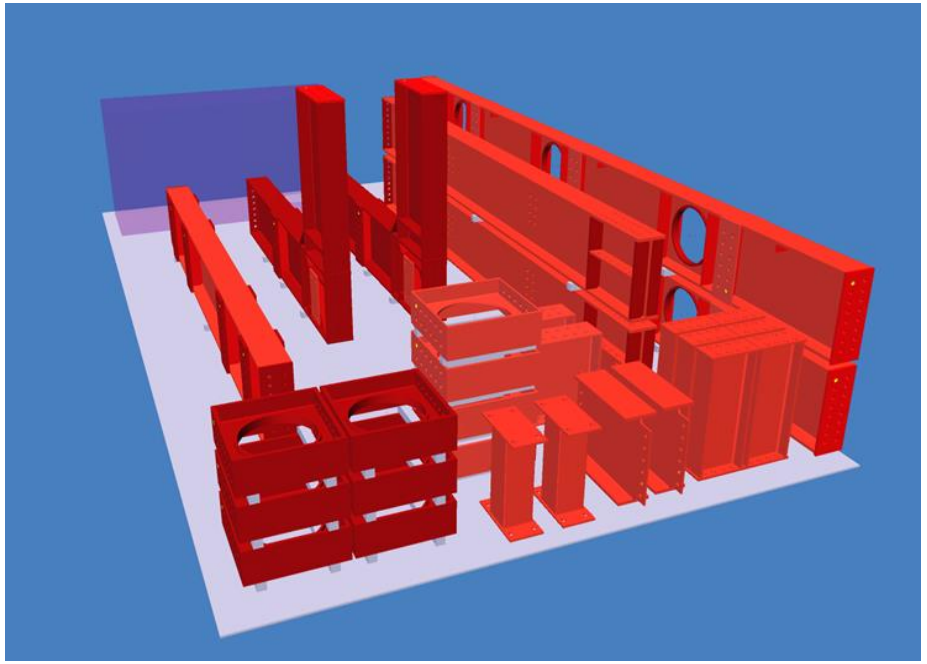
Steel is in Rapid City, awaiting transport to Lead!

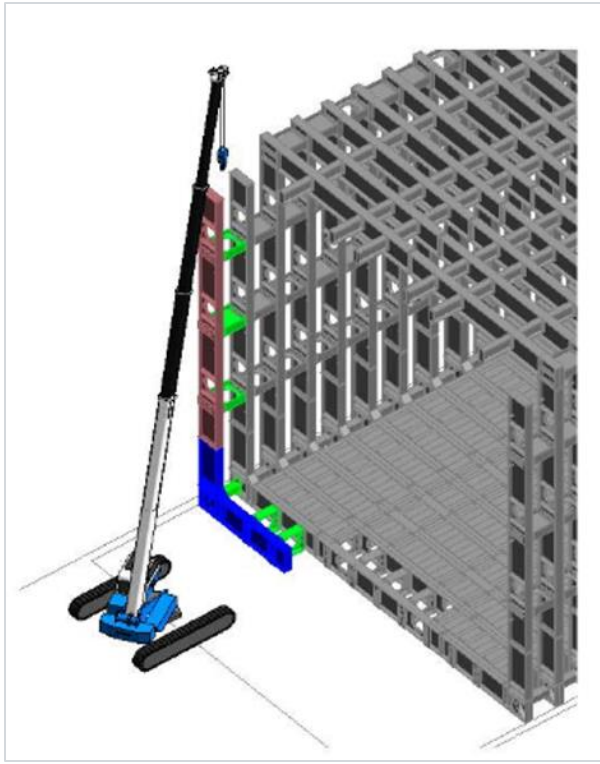
Steel arrival in Lead anticipated in early 2026

- Truck transport from Rapid City
- LBNF/DUNE truck traffic ~20 trucks per week during excavation
- Anticipate LBNF/DUNE truck traffic during FDC at 15-20 trucks per week
  - Anticipate max 45 ft trailers, 53 ft proven to make transport route
- Mill St. remains main route for deliveries to SURF based upon guidance from City of Lead
- Leverage SURF assistance to transport steel underground

Cryostat assembly requires precise sequencing

- I beams
- L beams
- Connectors
- Tertiary Membrane
- Plates





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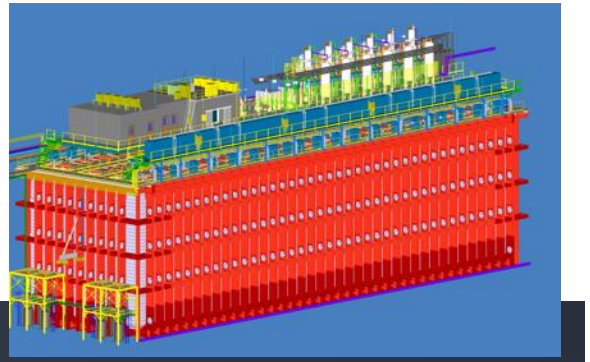
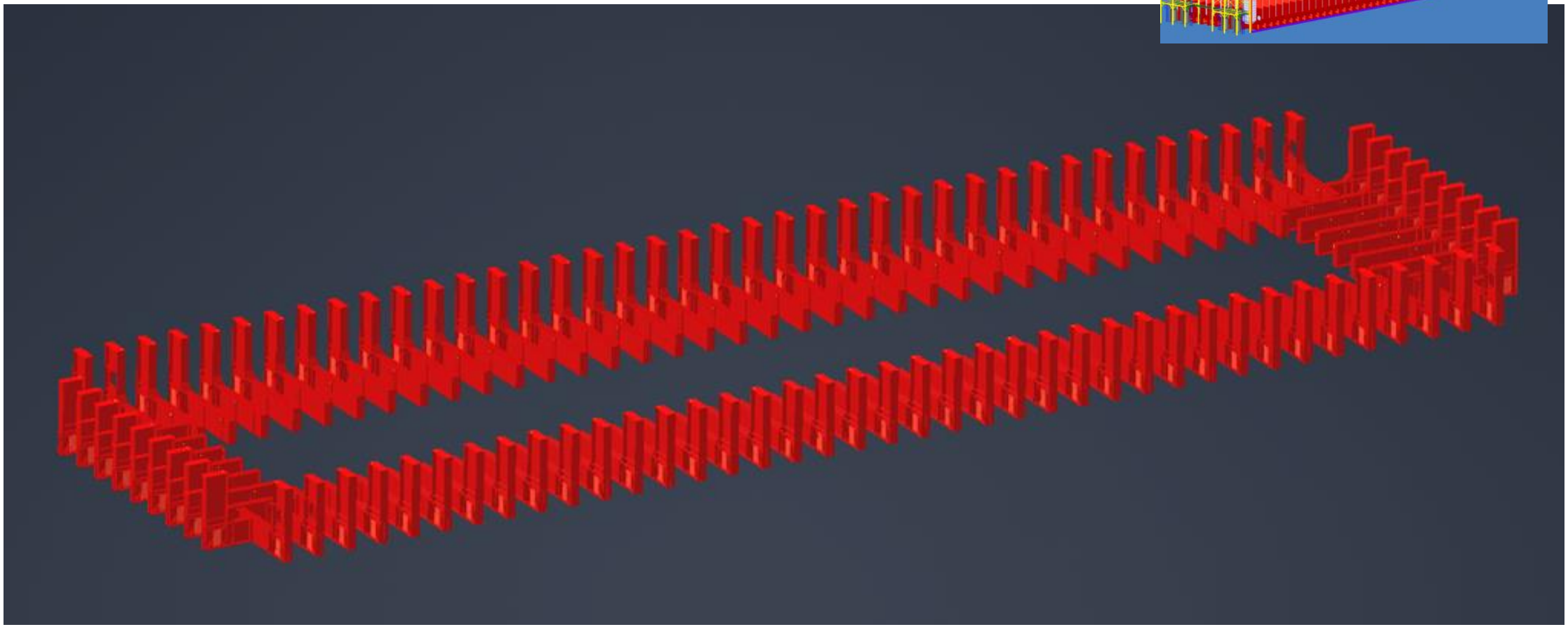
L-beams: Underground Transport

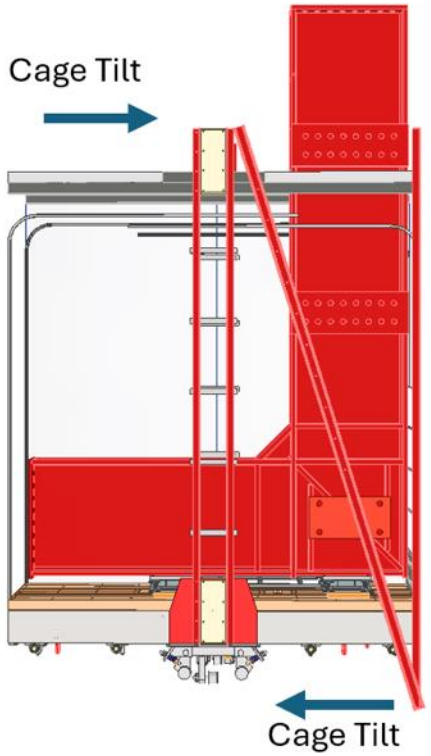
Two DUNE cryostats consists of 192 L-beams

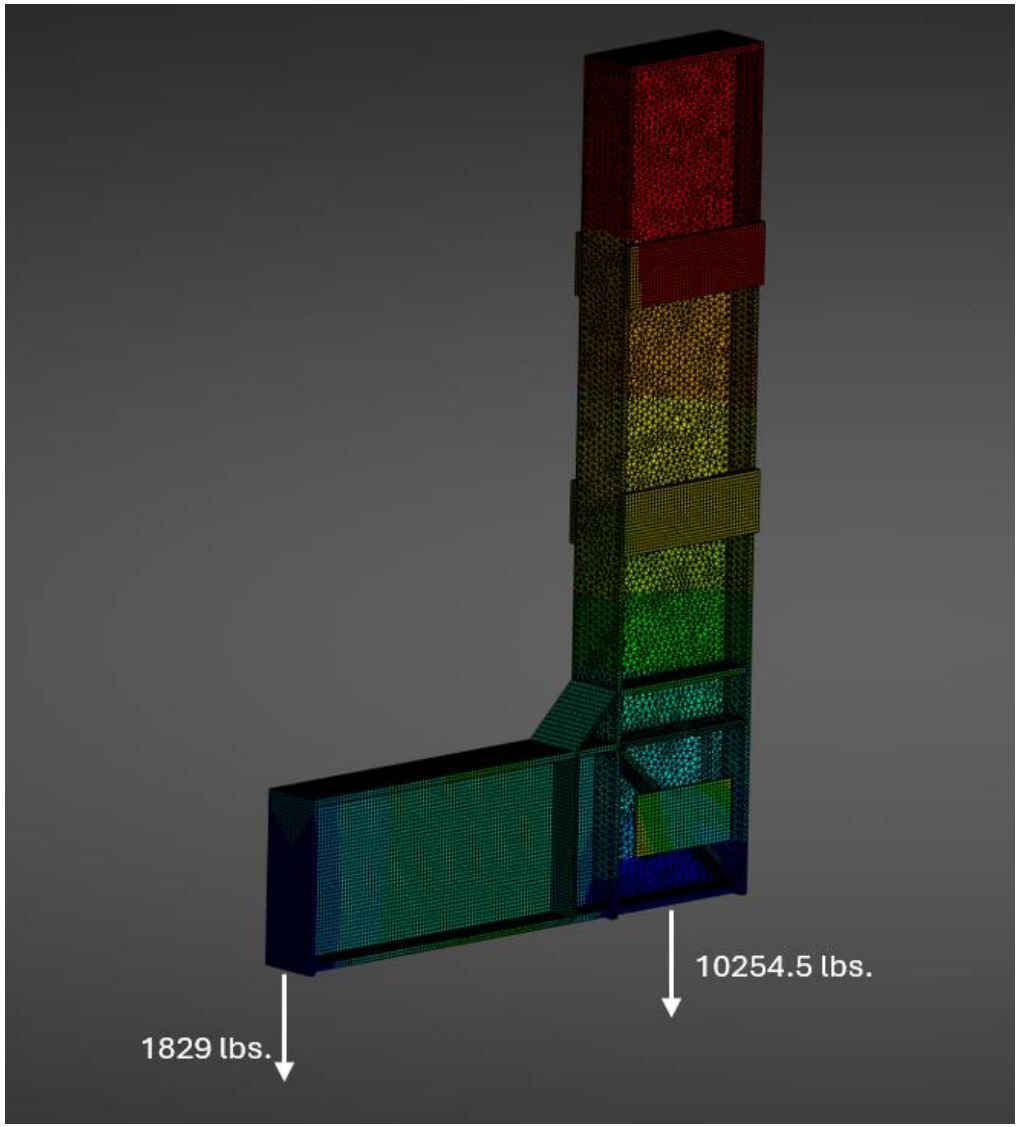




L-beam: Underground transport

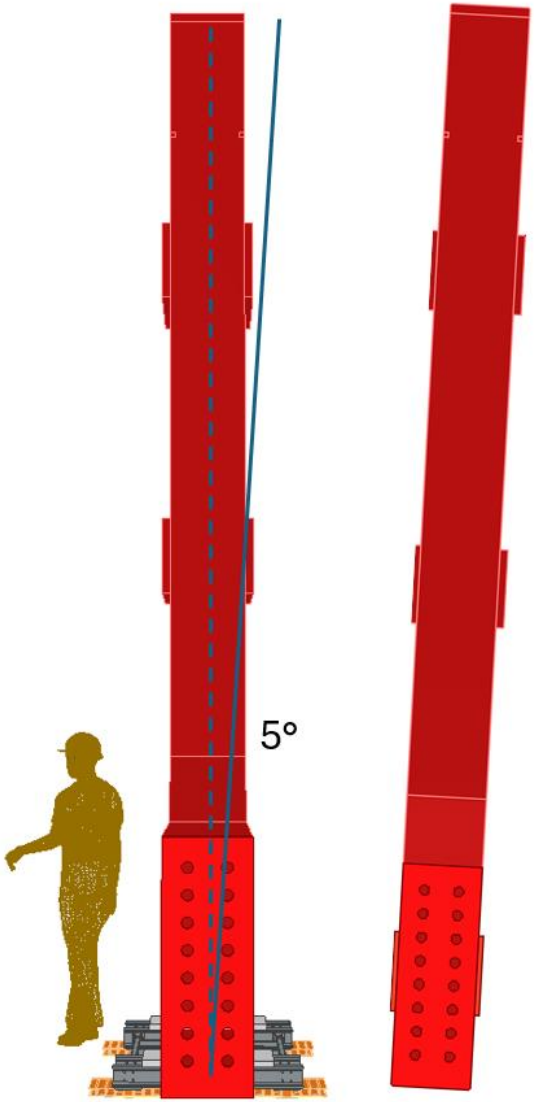
- L-beam load distribution
- Due to the shape of the L-beam, approximately 15% of the weight is distributed to the front of the cage and 85% to the rear.





L-beam: Underground transport constraints

- Tools and equipment required for the movement and to support the L-beam must weigh less than 1000 lbs.
- The equipment used for the transport must prevent the L-beam from tilting more than 5 degrees.
- The load distribution of the L-beam must be adjusted to comply with the cage limit.
- The L-beam must fit inside the cage.
- The movement must be safely repeatable for all 192 beams.
- All the tools and equipment must fit within the footprint of the cage.



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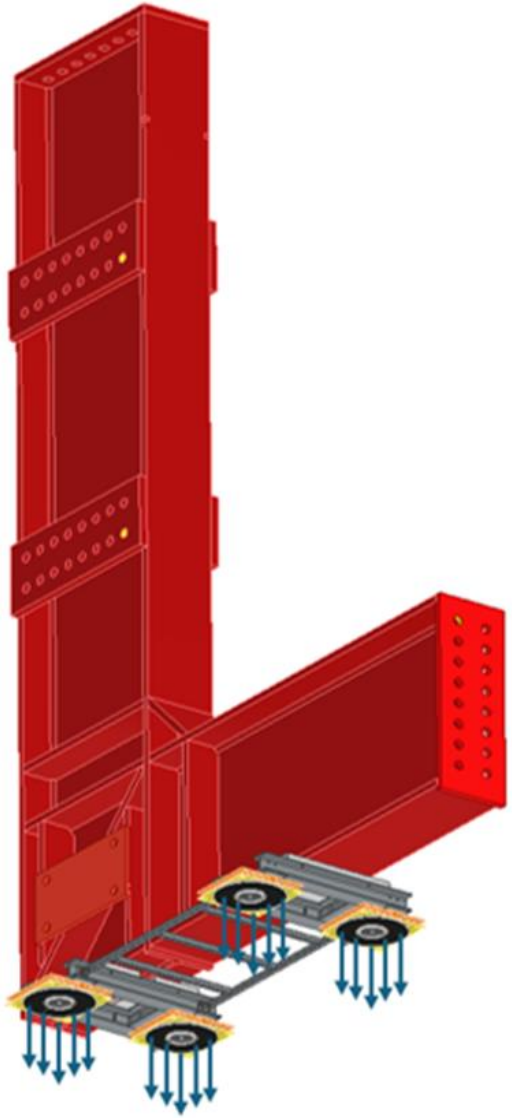
Sled (Maggie)

- Air-casters are pneumatic lifting devices used to move heavy loads.
- It uses compressed air to lift the load by creating a thin film of air underneath the load. Thus, reducing friction.
- A four air-caster based system was developed for this movement.
- Similar to an inverted air hockey table or a hovercraft.



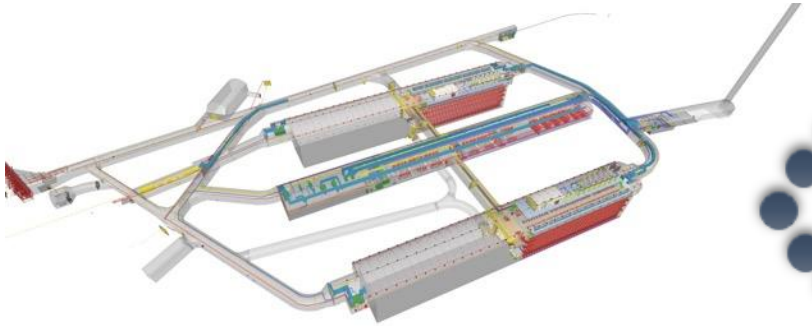
*(See our **Deep Talk** with SURF from May 2025 for more information!)*

Far Detector
Production Sites

Cryogenics
Manufacturing sites

SD
Storage

Infrastructure,
consumables, supplies



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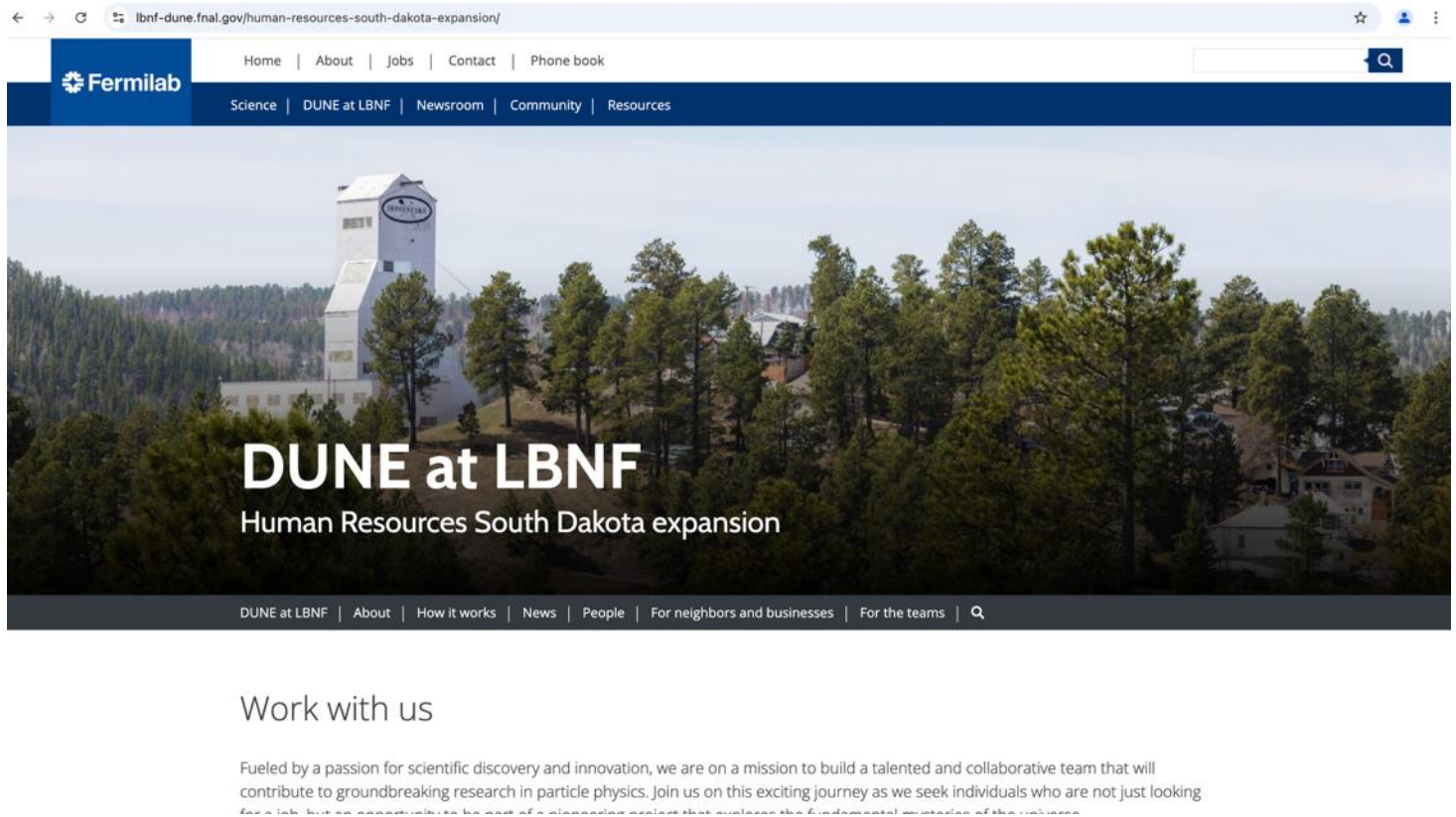
Reminder: Job Opportunities



Employment: https://lbnf-dune.fnal.gov/human-resources-south-dakota-expansion/

Contracts: SAM.gov

Thank you!

Q&A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