

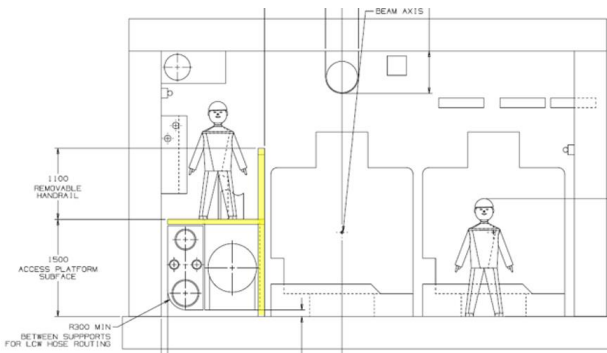


Final Talk- CDS Access Platform

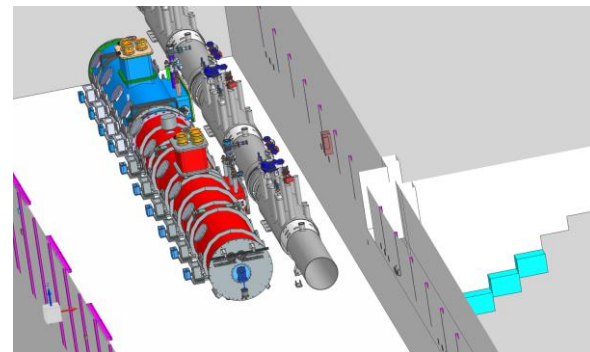
Victor Aguado Rodriguez
ASPIRE Fellowship Final Talk
11 August 2022

PIP-II Background

- The Cryogenics Distribution System (CDS) will be positioned adjacent to the cryomodules
- Unfortunately, the space in between the components is limited
 - There is about enough space for one person
- Access to high up components of the cryomodules and CDS is limited
- For this reason, an access platform above the CDS is needed



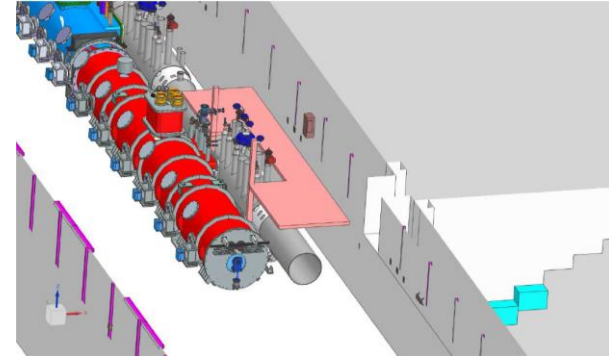
Tunnel Walkway Diagram



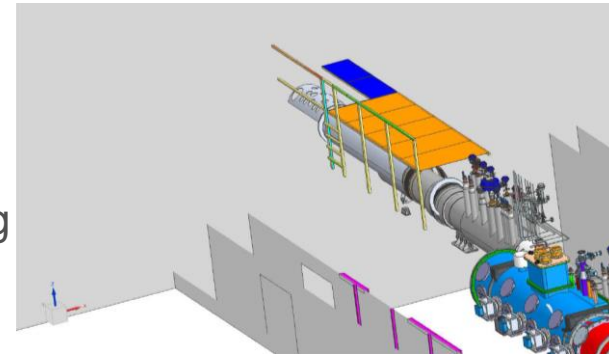
Model of a cryomodule and the CDS

CDS Access Platform Requirements

- Standard design and implementation while allowing for maintenance access
- Provide clearance around CDS bayonet boxes and include cut-outs for 25 Bayonet Boxes
- Designed to accommodate frequent pedestrian access by multi-person crews and small wheeled equipment
- Designed for a service load of not less than 150 lbs. per square foot
- Access Platform shall have removable handrails
- Access Platform shall have removable, solid-surface decking
- Access Platform shall interface to concrete wall and floor of the PIP-II tunnel

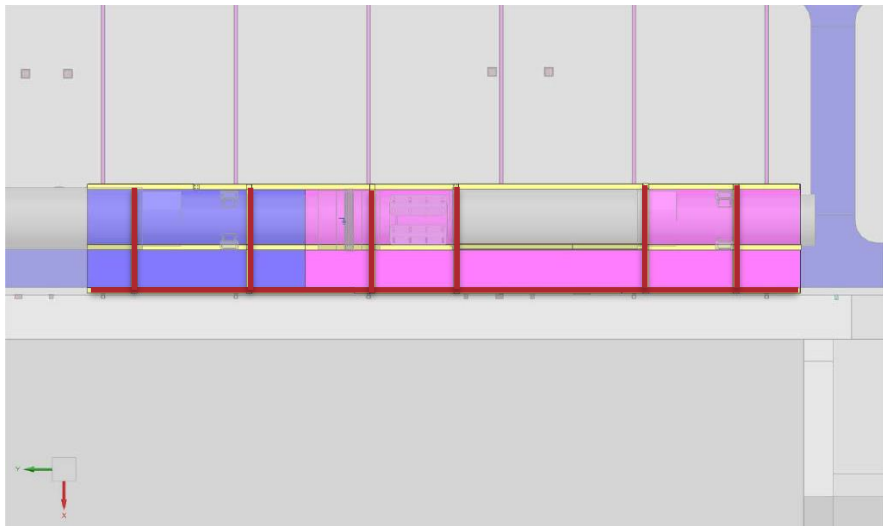


Space dedicated for CDS Access Platform

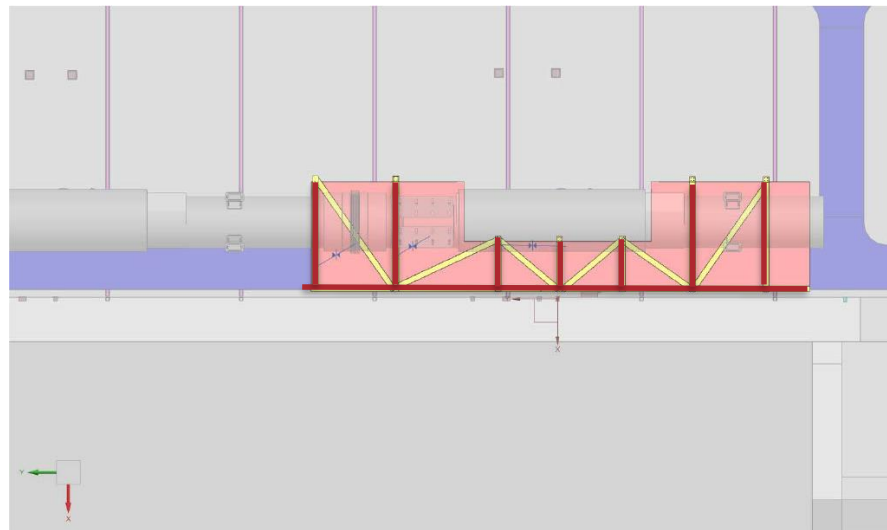


Start of a design from Argonne employee

General Design Discussion



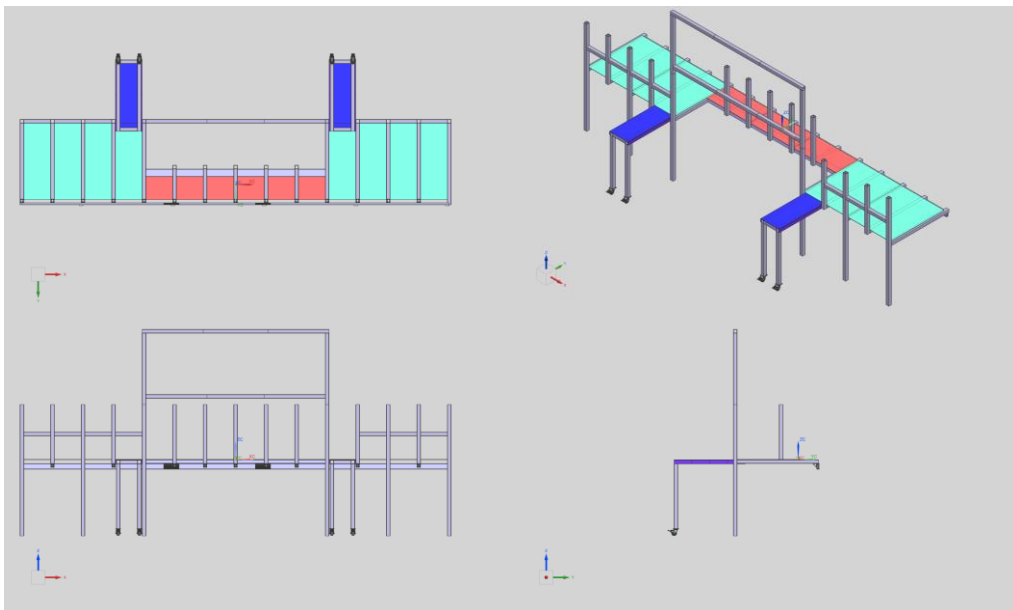
A more square support system (Bottom View)



A more triangular support system (Bottom View)

- Both designs have similar ideas, but are executed differently
- Areas most susceptible to failure are the center and the unsupported end of a section
- Both designs make sure to have support there

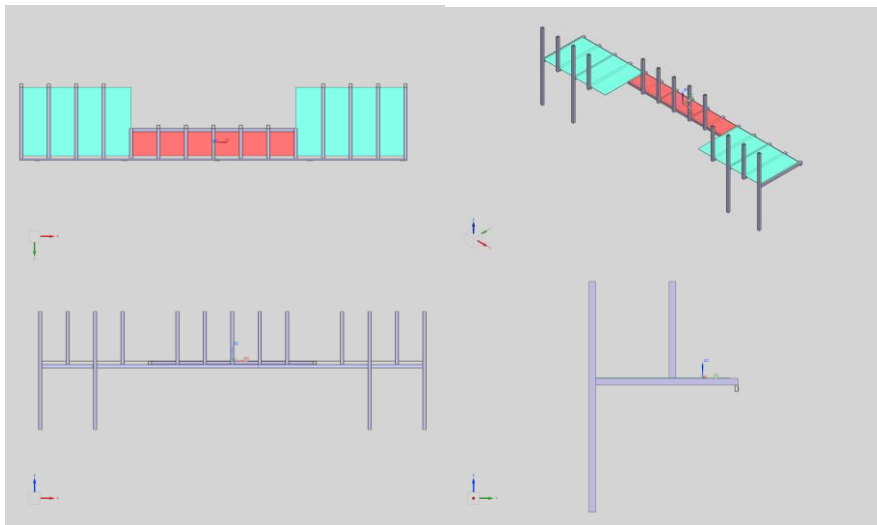
The Design



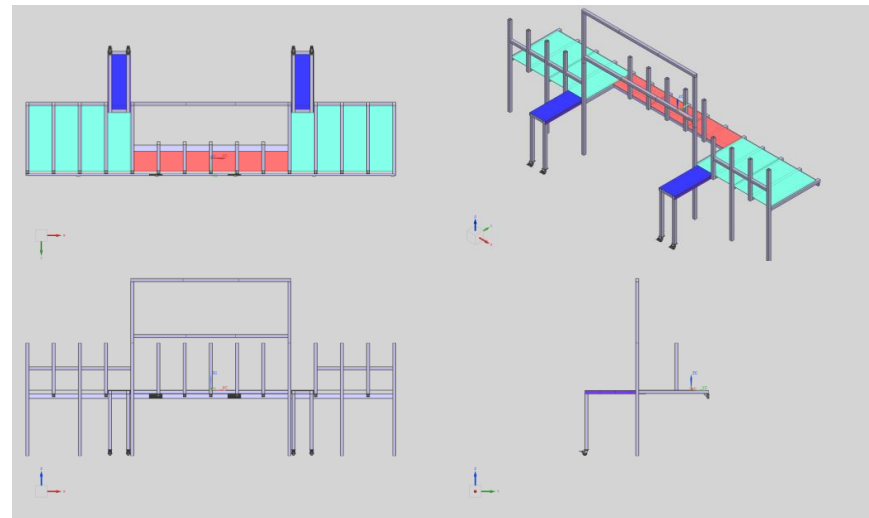
Different Views of Latest Design

- On this slide, the latest design for the Access Platform can be seen
- Many of the ideas from the previous slide are incorporated into this design, but there are also many meaningful additions
- Multiple factors were taken into consideration during creation of this design
 - Cost, manufacturability, convenience, etc.

Design Updates



Early Design

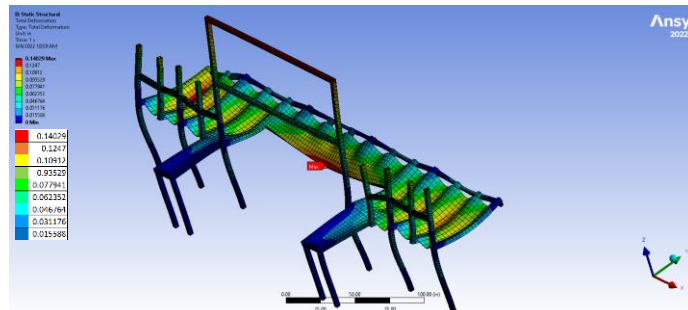


Latest Design

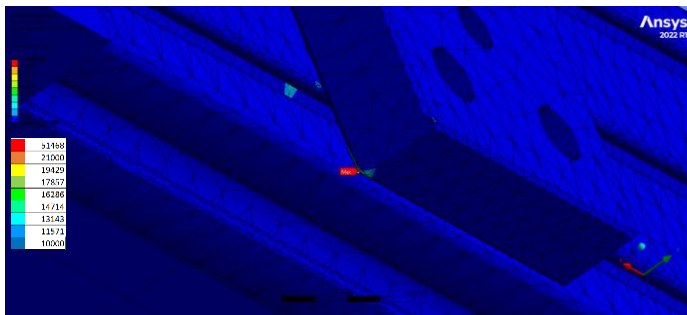
- Extending Platform added
- Cut-off structure added
- Updated guard rails
- Increased size of back support
- Increased size of cut-off support
- Added 90° supports

Finite Element Analysis

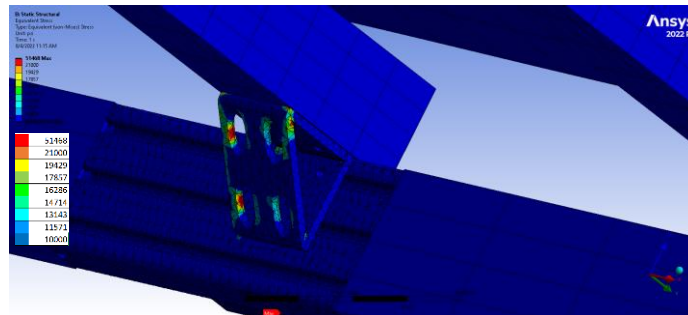
- Focus was concentrated on deformation and stress
 - Initial condition of around 1.1 psi (around 158 lbs. per ft.²)
- Goals:
 - Keep max deformation under 1/4" preferably around 1/8"
 - Keep max stress under 21 ksi, preferably around 10 ksi
 - Yield stress of 80/20 is 35 ksi, 60% of that is 21 ksi



Deformation Simulation



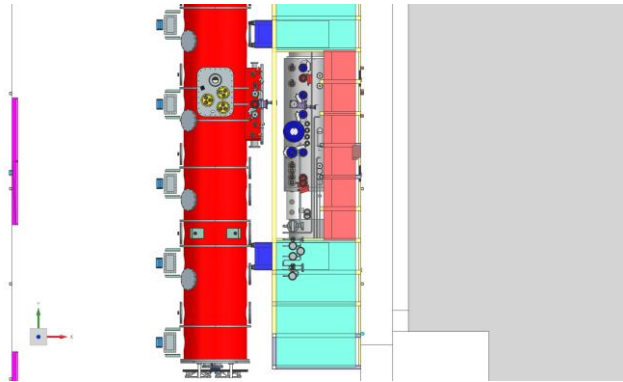
High Stress Point Example



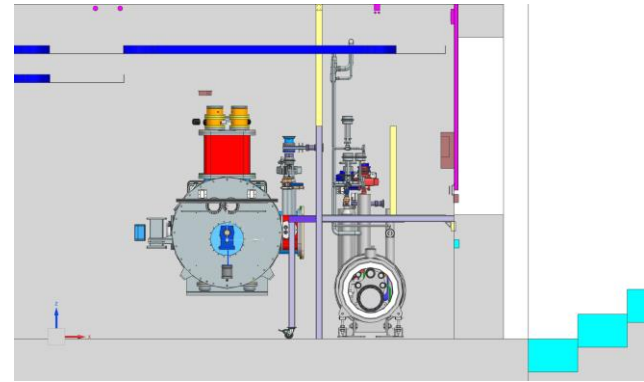
High Stress Concentration Area

CDS Updates + U-Tubes

- Recently, the engineer working on U-tube fabrication and installation reached out
- He was curious about the Access Platform and wondered if modifications could be added to assist with installation of U-tubes
 - The drawer and structure at the cut-out were added for this reason
- Updates to the CDS model also require more updates the platform



Top View of Platform with updated CDS



Side View of Platform with updated CDS

Summary and the Future

- I began the design for the CDS Access Platform
 - Acclimated to NX
 - Refreshed my knowledge of Finite Element Analysis (FEA)
 - Used data from FEA and “advice” to modify design to meet specifications
- The Future
 - Design modifications/additions (U-Tubes, CDS updates, stress)
 - Analysis and Documentation
 - Thesis

Acknowledgements

A special thanks to:

- My supervisor Curtis Baffes
- Everyone I've met working on PIP-II
- The organizers of the ASPIRE program