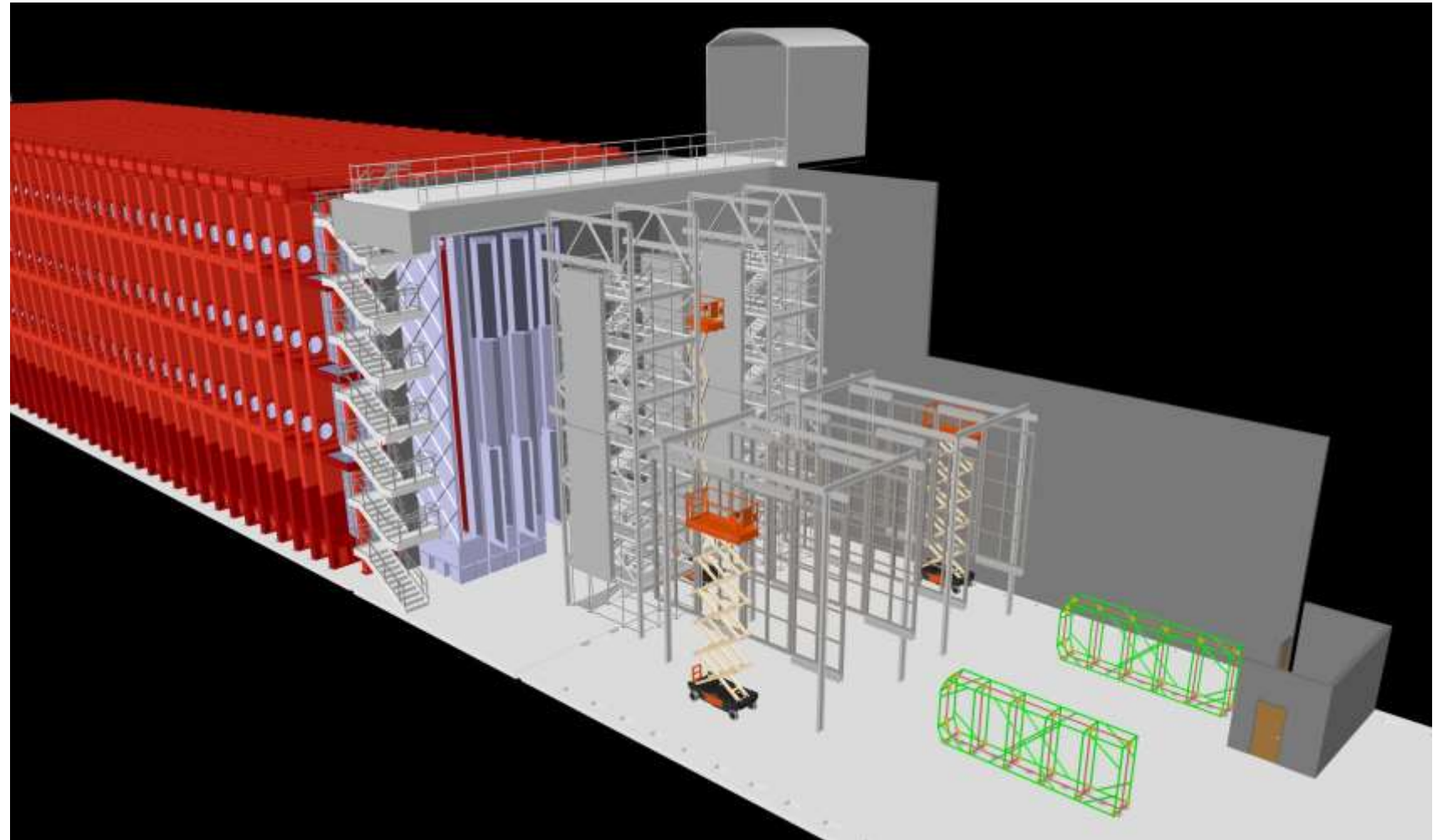


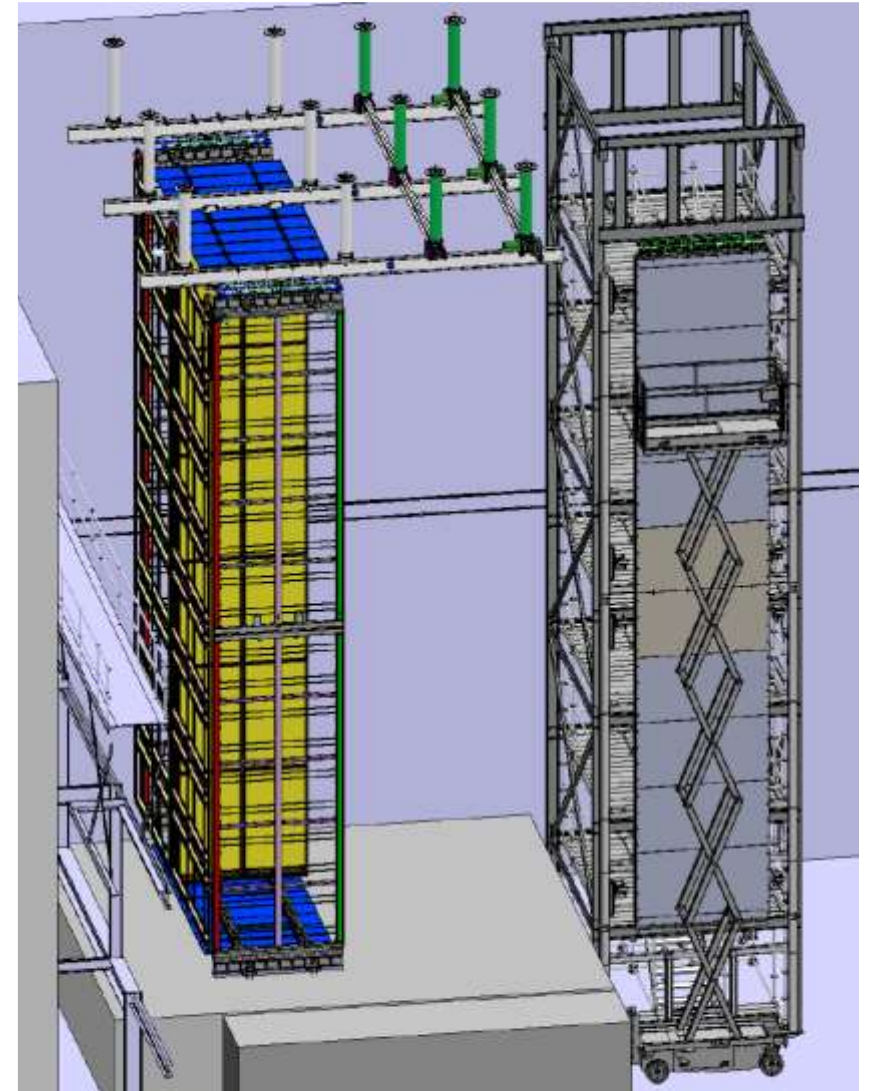
DUNE-SP Cleanroom Concept

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Trial Assembly at Ash River FY19-21

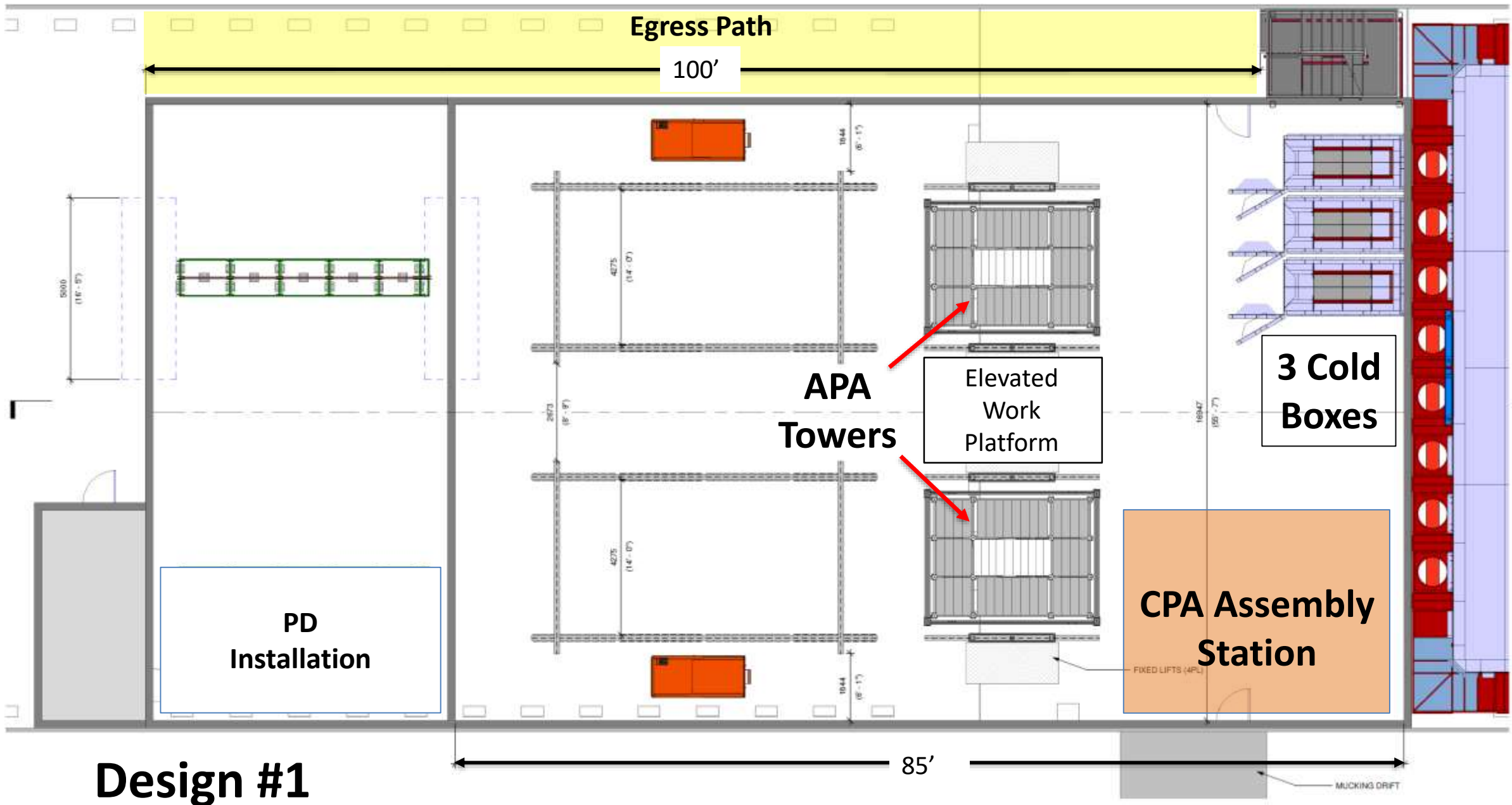
- Test all full scale TPC (Time Projection Chamber) components during assembly stages and inside the cryostat including
 - APA Assembly including manipulation of APA shipping frames, joining an APA pair together, testing of PD (Photon Detector) components, CE (Cold Electronics) cabling, APA protection, movement on shuttle beam, cryostat cabling and final deployment in cryostat.
 - DSS (Detector Support Structure) and shuttle beam system including final detector configuration
 - Assembly of HV system including construction of an End Wall, CPA pairs, movement on shuttle beam and final deployment in cryostat
 - Future Assembly of Dual Phase detector components
- Write full set of Hazard analyses and assembly procedure documents including gathering all component documentation
- Test access equipment (scaffold, scissor lifts, work platforms) and lifting fixtures
- Assembly time and motion studies including labor estimates



First layout concepts

- Need 3 assembly lines to keep assembly time the same as baseline plan
- 4th assembly line for repairs/problems
- Minimize APA handling and reduce risk
- Need efficient and safe access to work areas-most at 7m and 14m with enough room for test equipment
- **Critical issues about egress need to be understood**
- Potential large cost and schedule savings if we can use cavern walls for sides of cleanroom

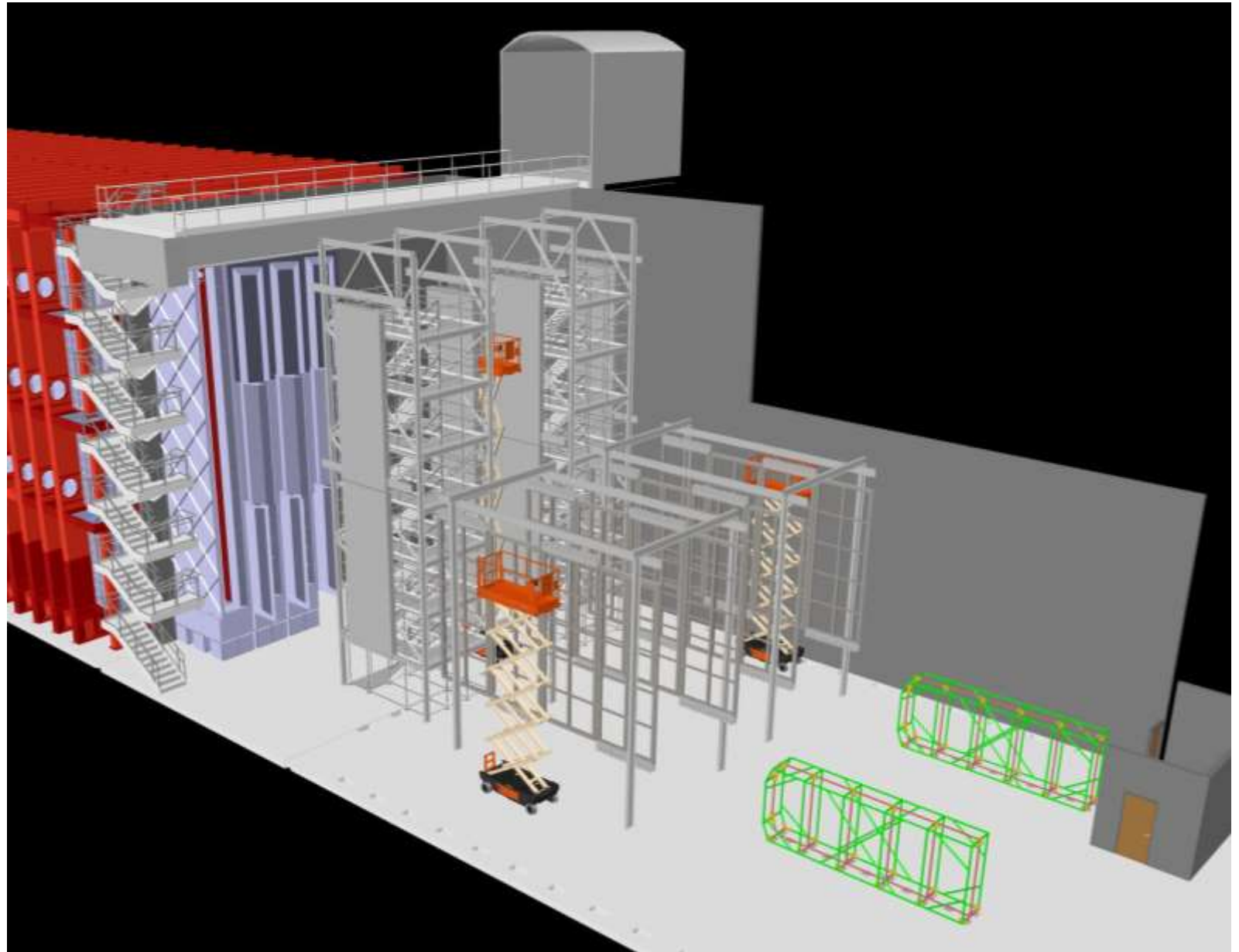
Task	APA	CE	PD	survey	Crew
APA Pair #1	# FTE	# FTE	# FTE	# FTE	# FTE
Test CE FEMB		2			
Test PD in scanner			2		
Move APA Pair into SAS, clean, and remove covers	3				3
Rotate box to vertical, put on cart, and move APAs to PD integration area	1				3
Move APA box to line#1, mount top APA on rail, remove protective cover	3				3
Move top APA tension station, mount bottom APA, remove protective covers	3				3
Move bottom APA to tension station	3				3
Wire tension test APAs	6				0
Move APAs to CE installation station	3				3
Install protective panels	3				3
Install CE top and bottom/install cabletray		6			
Move top APA to assembly tower, install conduits, lift APA, move to side.	3				3
Move bottom APA to assembly tower, install conduit, attach APA to fixture	3				3
Connect PD cable/Install linkage	3				3
Insert Cables	1	3			3
Cable management/CB Cable		4			0
Test electronics warm +Bias test		4			
Remove Protective panels	3				3
Photogrammetry/survey				2	0
Move to cold box and cable		2			2

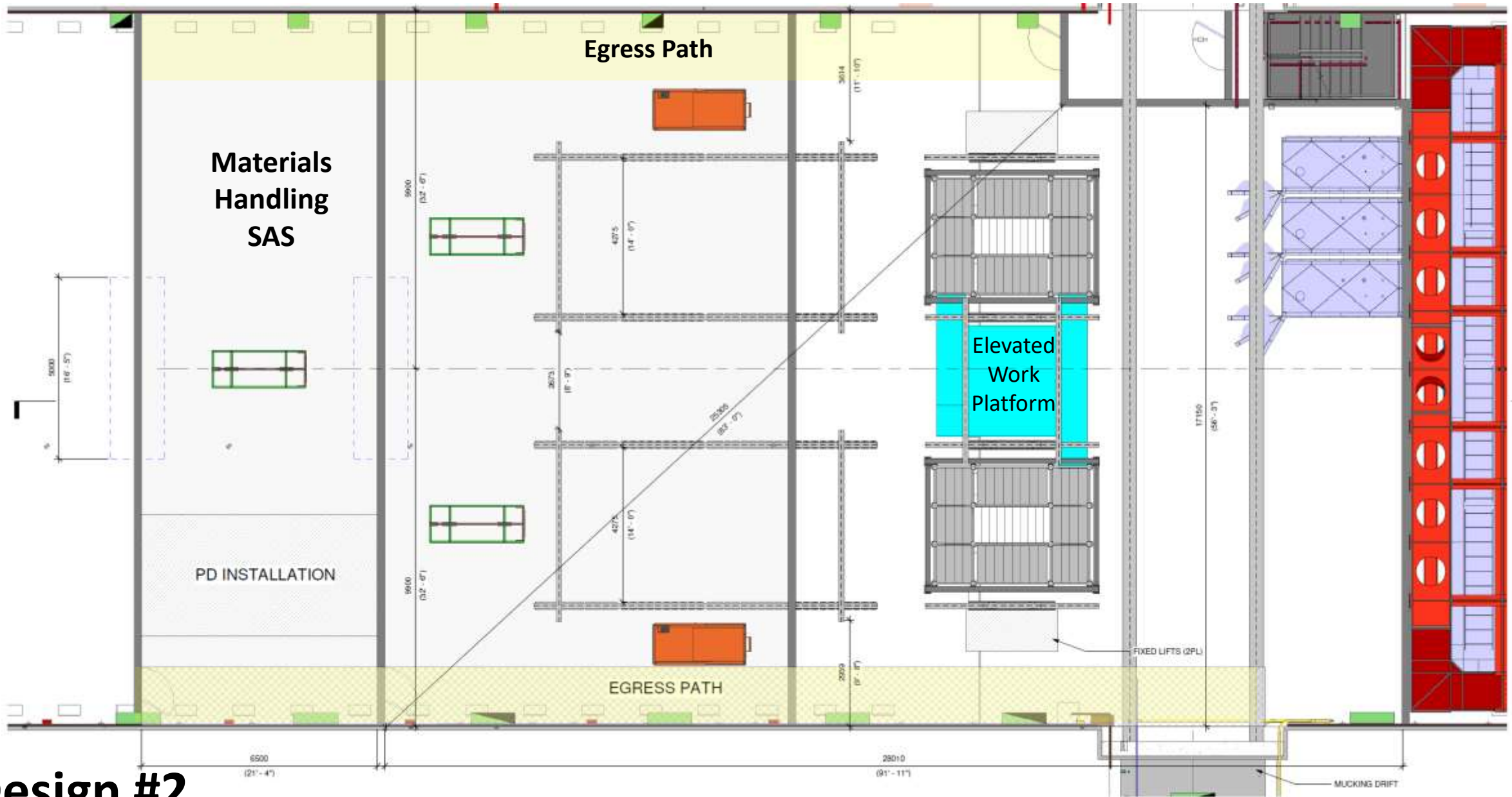


Design #1

Design # 1

- To get this layout to work we had to rotate towers 90 degrees from original design.
- Egress lanes are still tighter than we would like
- The tall cleanroom wall structures required increasing costs and schedule for time to build and move to South Cavern



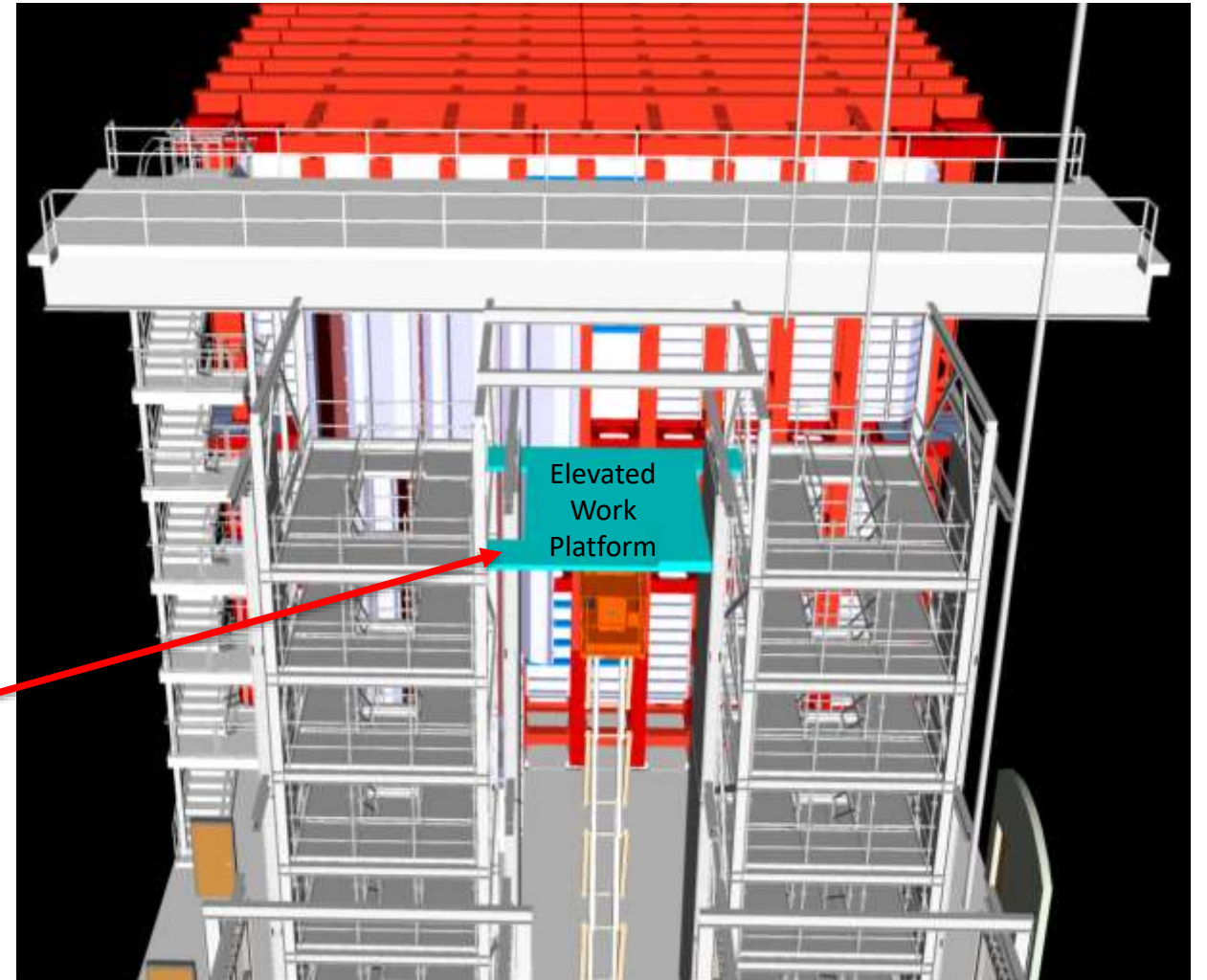
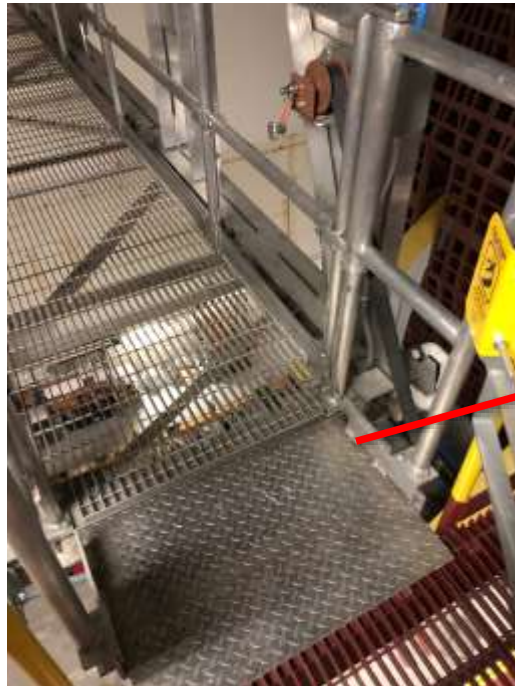


Design #2

Elevated work platform

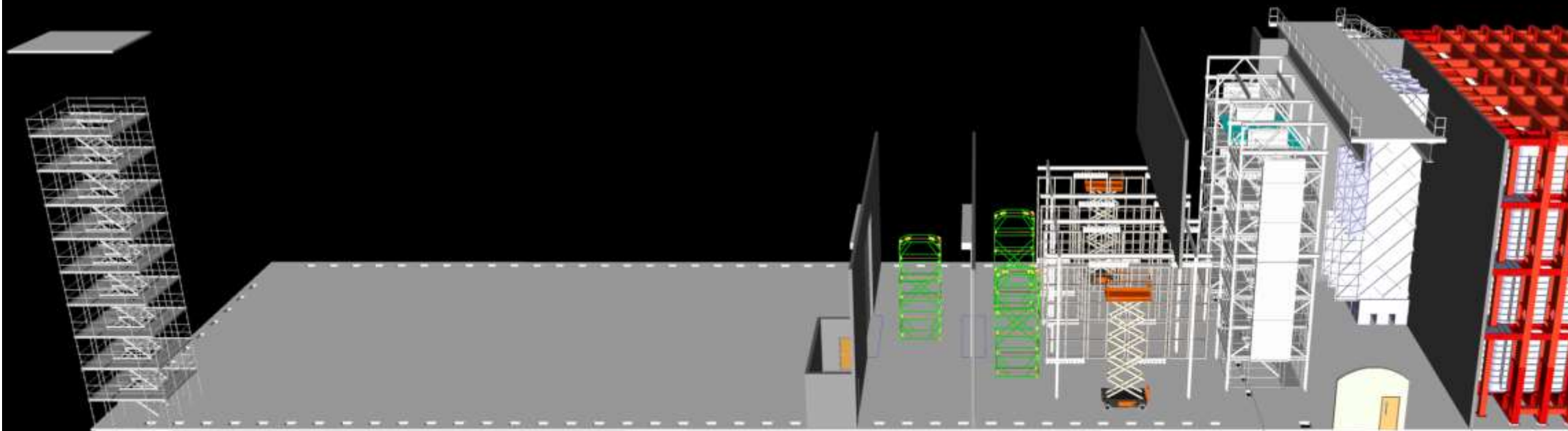
To eliminate the stationary scissor lifts to reach the ~50' elevation, we would like to use the beams that support the roof (not shown) to also hold a work platform at the proper elevation

At Ash River we have an access draw bridge that allows access to our movable access bridge. This same principle could be used for DUNE

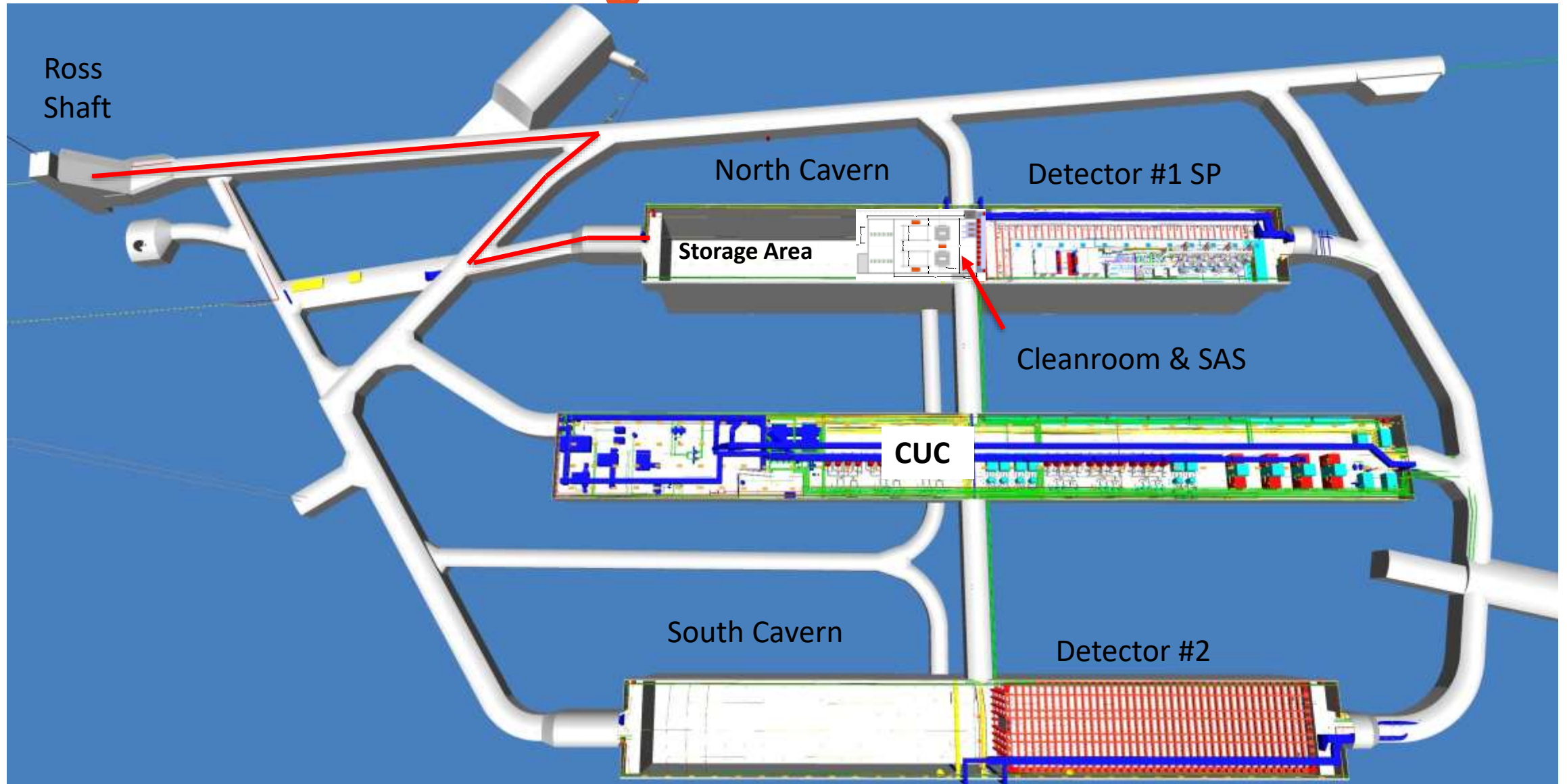


Egress Paths:

- Permanent stairs
- Stair tower east end of cavern
- Mucking drift



Materials Handling Flow



Estimated Total Number of FTEs 29-39 per shift on the 4910 level

Materials staging Area
2-3 FTE Riggers/Techs

Cleanroom and SAS
2 Manager-Safety
2-3 FTE Riggers
2 Techs
15-20 Consortia

Cryostat
2-3 FTE Riggers/Techs
4-6 Consortia

