

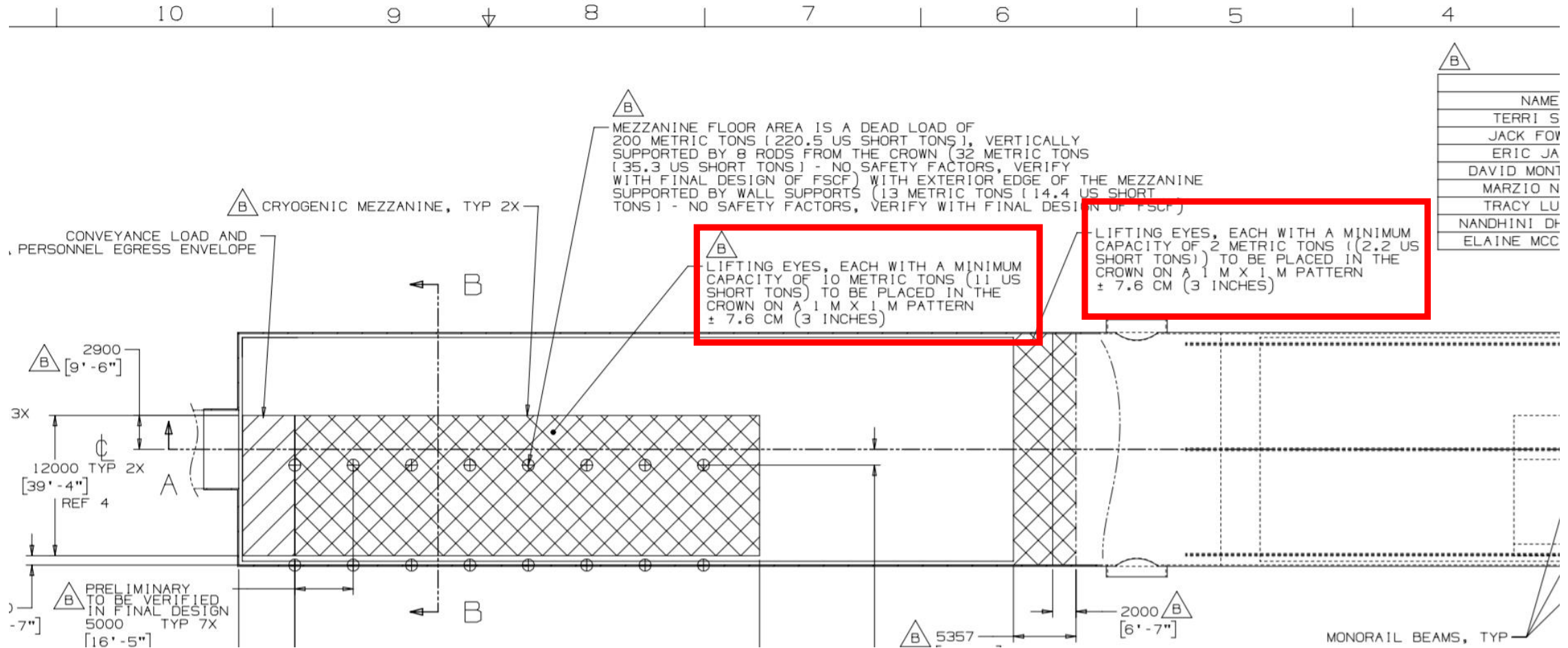
Chamber 1 cranes and lifts:  
fresh look, rethinking the  
monorails

- - what functions do cryostat, cryo systems, and FD need to accomplish with cranes?
- - do we need for the duration of the installation of CF infrastructure, cryostat warm, cryostat cold, cryogenics, detector a set of dedicated and movable elevators? Which type? Who will be responsible?
- - define an action plan for all of the above

# Main functions

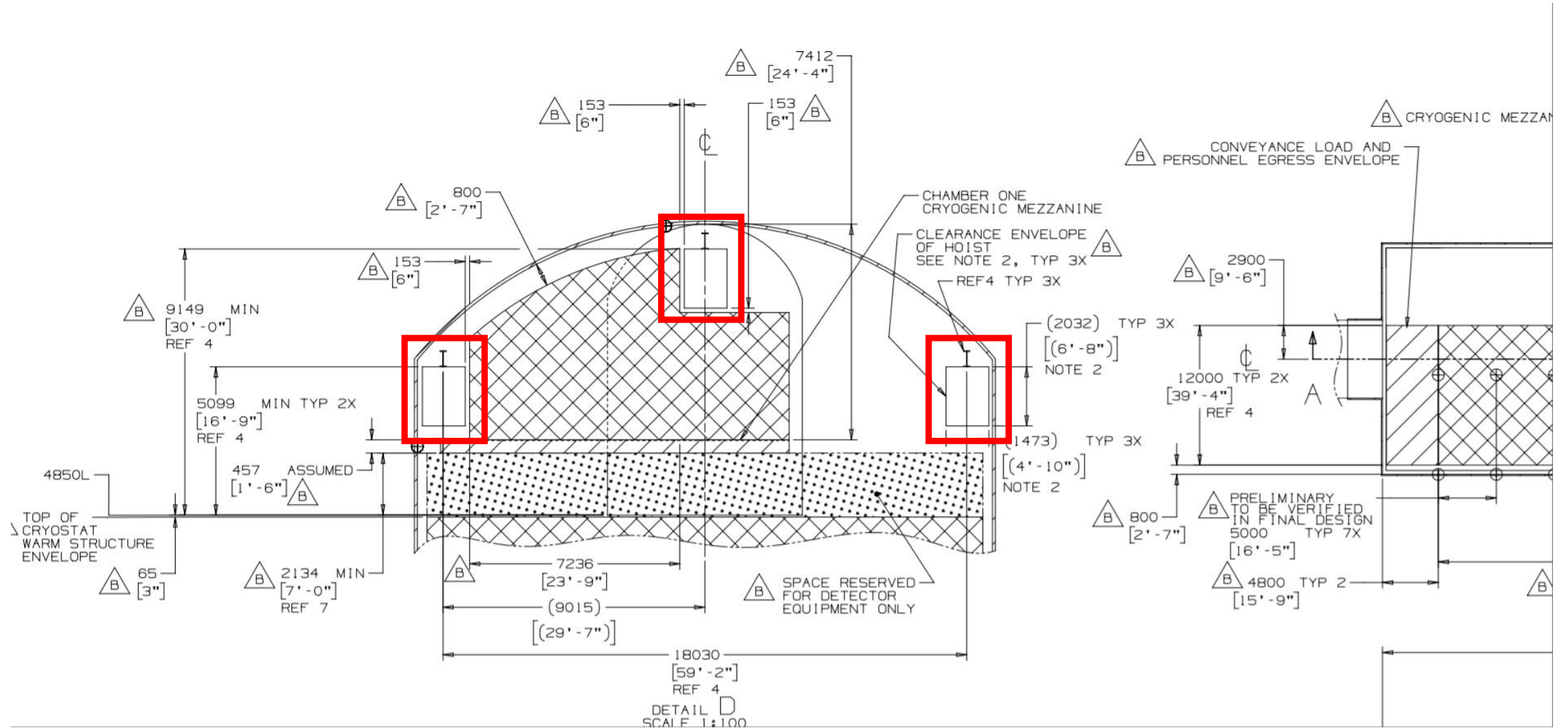
- Install cryostat warm structure.
  - Bridges E and W ends?
- Install cryostat insulation and cold membrane.
- Install detector elements
  - includes TPC , electronic racks, DSS, internal cryo piping, cleanroom, movable work platforms, warm flanges and feed thrus, etc.
- Install mezzanine.
- Install proximity cryogenics and supporting equipment on mezzanine.
- Installation of the valves, pumps and piping in the slot
- Installation of any flooring, stairs, cat walks, safety railings on top of the warm structure
- Temporary or permanent “elevator” for the transport of people and material down to the bottom of the chamber

# Current requirements



NAME
TERRI S
JACK FOV
ERIC JA
DAVID MONT
MARZIO N
TRACY LU
NANDHINI DE
ELAINE MCC

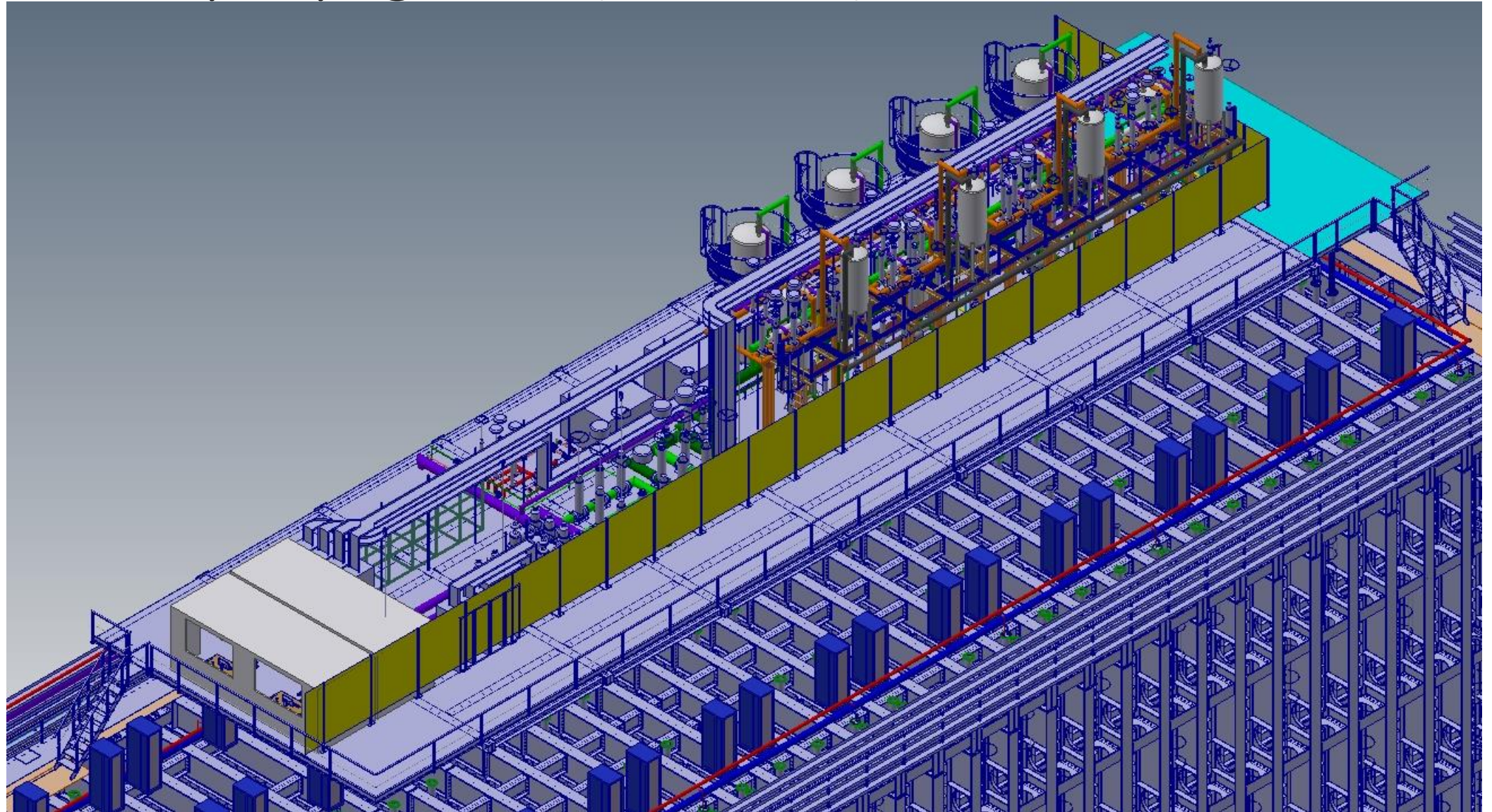
# Current monorail locations



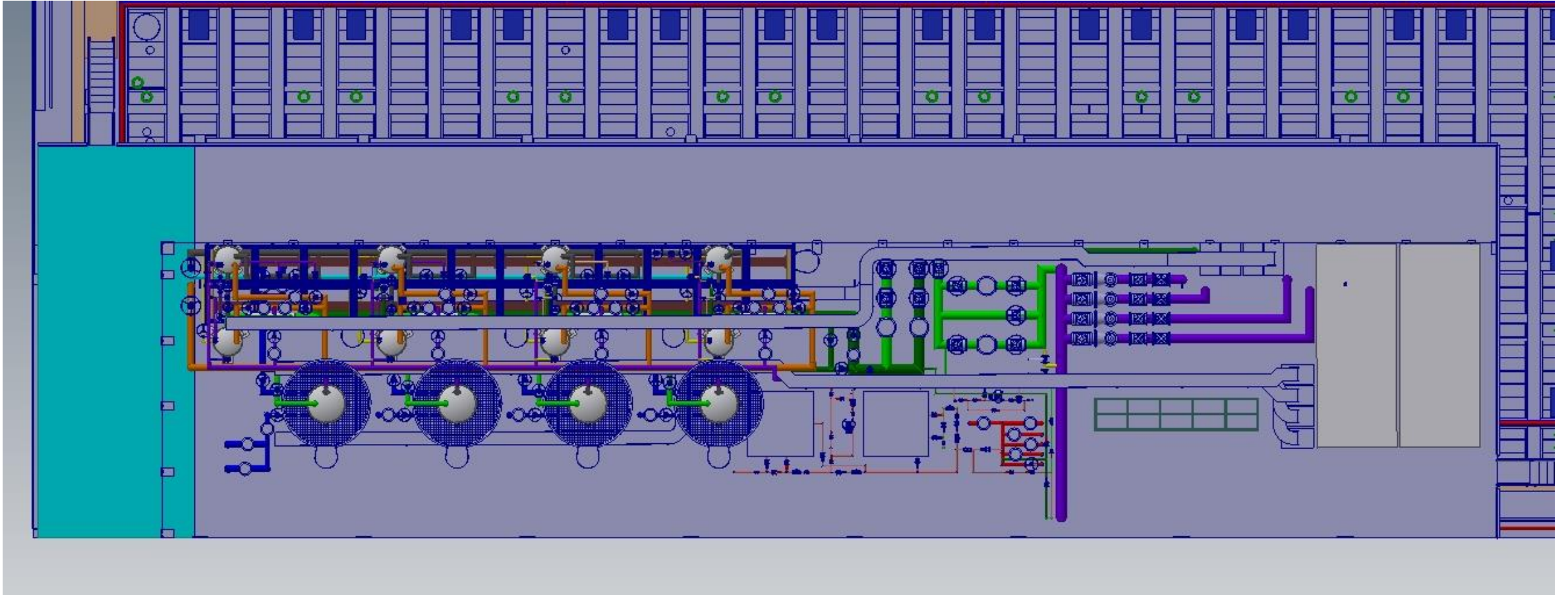
# Current monorail requirements

Monorail Requirements for Caverns					
ID	Heading	Requirement	Rationale	Notes	7/14/16 Status of requirement agreement between CF, cryostat, cryogenics, single phase and dual phase
1	Monorail Quantities	Each excavated chamber shall be equipped with 3 monorail beams the locations of which shall comply with OSHA standards for minimum clearance from the wall/roof as applicable and as specified in the minimum clearance definition drawing F10043159	This quantity is needed for the installation of cryostat pieces		all parties agreed 7/14/2016
2	Monorail Configuration	It must be possible to bridge across exterior hoists by a lifting beam spanning between hoists designed and procured by Cryostat	This will enable greater flexibility, efficiency	Assumption	all parties agreed 7/14/2016
3	Monorail Longitudinal Travel	The hoists shall be capable of a longitudinal travel distance as shown in the minimum clearance definition drawing F10043159	This will cover a continuous travel required for one chamber		all parties agreed 7/14/2016
4	Monorail Controls	The monorails shall be equipped with radio controls which shall provide individual or simultaneous controls for the 3 monorails, i.e. all 3 or a combination of 2 shall be wirelessly controlled simultaneously	This is a wireless control mechanism that will prevent interferences during travel of hoists		all parties agreed 7/14/2016
5	Monorail Design	The lifting beam and the spool piece design shall be provided by cryostat taking into consideration the space availability	Due to restricted space availability an optimal design of the beam and spool piece is desired		all parties agreed 7/14/2016
6	Monorail Extension	The monorails shall extend 3m into the eastern-most and western-most drifts to facilitate loading of the cryostat pieces. The monorails shall also extend over the rock septum to the extent shown in the minimum clearance definition drawing F10043159.	This extension needs to be calculated by cryostat/CF for the loading of largest possible pieces		all parties agreed 7/14/2016
7	Monorail Power Supply	The monorails shall be provided with a shoe-style power supply strip that runs along the length of the monorail beam	The shoe-style power supply will help prevent interference caused by the use of festoon power supply wires during travel		all parties agreed 7/14/2016
8	Monorail Capacity	Each monorail beam shall have a minimum capacity of 15 metric tons (16.54 US short tons). The design of the monorail beams shall establish the minimum distance that must be maintained between hoists if multiple hoists will be operating on the same beam.	This capacity provided by cryostat takes into account the weight of the largest piece to be assembled. The intent is that IF multiple hoists operate on the same beam the minimum design capacity of 15 metric tons is not exceeded.		all parties agreed 7/14/2016
8a	Monorail Capacity	Monorail hoists shall be equipped so that the hook reaches the floor of the detector pit.	This is necessary to provide maximum flexibility of use.		all parties agreed 7/14/2016
9	Monorail Hoists	Two sets of three monorail hoists shall have a minimum capacity of 15 metric tons (16.54 US short tons).	These two sets are to be installed in caverns 1 and 2. Hoists for caverns 3 and 4 will be provided at a later date; however, monorail beams shall be provided in all four caverns.		all parties agreed 7/14/2016
9a	Monorail Hoists	Monorail hoist motors shall have a heavy (H5) duty cycle	This is due to the 24 hrs/day, 7 days/week, multiple year initial usage planned		all parties agreed 7/14/2016
10	Monorail Hoist Power	Hoists shall be equipped with back-up power capable of supplying power for 10 minutes in the event of a power failure	If the power goes out while a load is in the air, the load be be able to be lowered to the ground in a safe manner		all parties agreed 7/14/2016

# Proximity cryogenics (iso view)

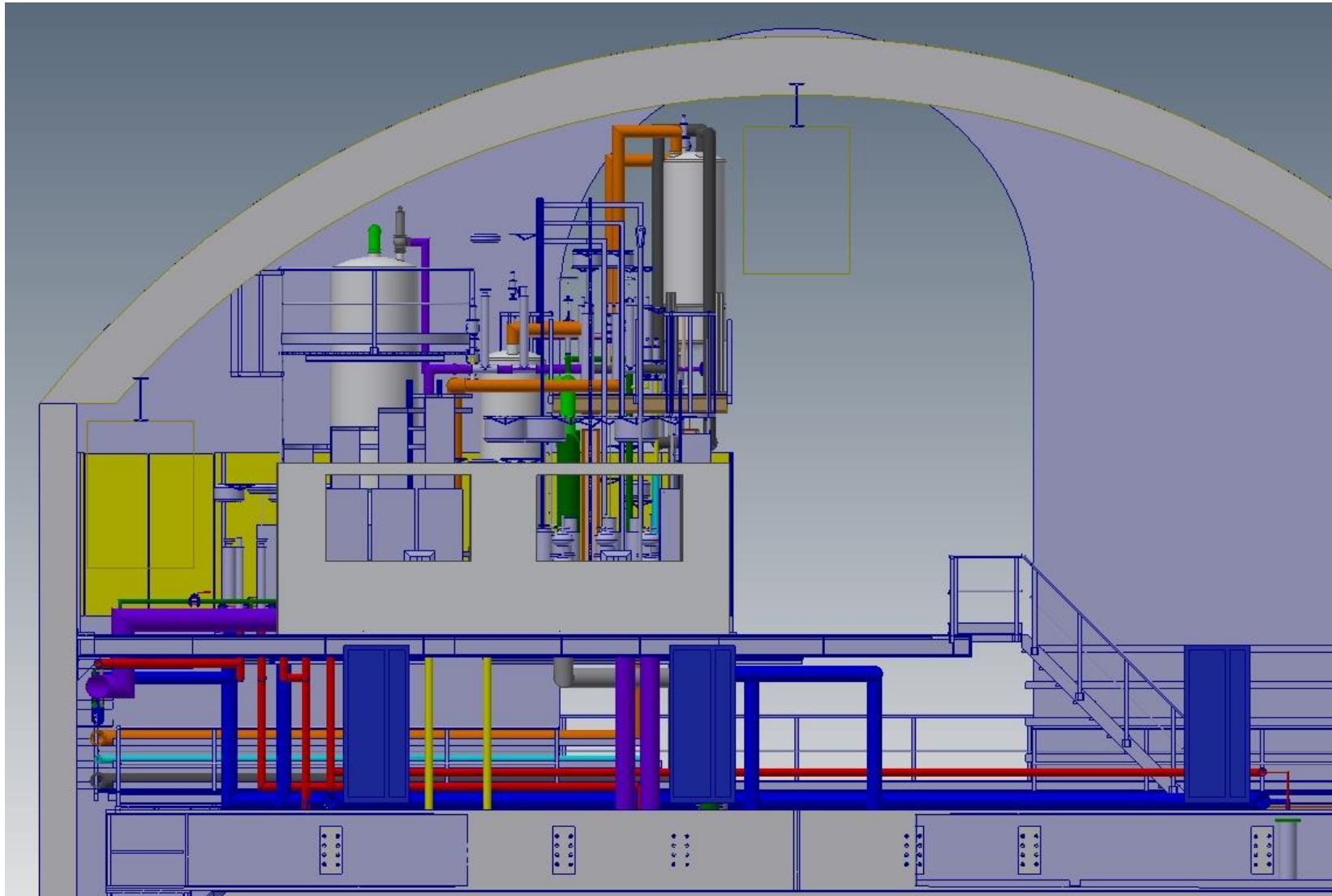


# Proximity cryogenics (plan view)





# Proximity cryogenics (elevation view)



Current estimate of mezzanine loading (at 35 m) needs updating as we pursue the additional 4.8 m

Item ID	Item Name/Description	N. of items	Unit Dry Load	Total Dry Load	Unit Wet Load	Total Wet Load
			<i>kg</i>	<i>kg</i>	<i>kg</i>	<i>kg</i>
1, 2, 3	PSVs block with valves and pipes (Purple)	16	719	11,509	721	11,531
4, 5	Vent block with valves and pipes (Green)	14	1,052	14,722	1,053	14,745
6	Main Platform (LN2 Phase Separators, Valves, Pipes)	21	2,822	59,252	3,095	64,995
7	Warm panels with valves and pipes	1	3,600	3,600	3,600	3,600
8	LAr Phase Separators (2-4)	12	1,549	18,589	2,707	32,484
8*	LAr Phase Separator (1)	4	2,146	8,585	3,457	13,829
9	LAr Buffer and Condenser with valves and pipes	12	641	7,689	1,184	14,209
10	LAr Condenser Pump	4	1,184	4,736	1,385	5,540
11	PLC controls racks	4	1,361	5,443	1,361	5,443
-	Other items distributed over/under the mezzanine			11,988		15,987
	<b>Total</b>			<b>146,114</b>		<b>182,363</b>

Table 1 – List of the current loads: dry (no cryogenic fluid inside), wet (with cryogenic fluid inside).

















