BSI Scope Final Design Changes

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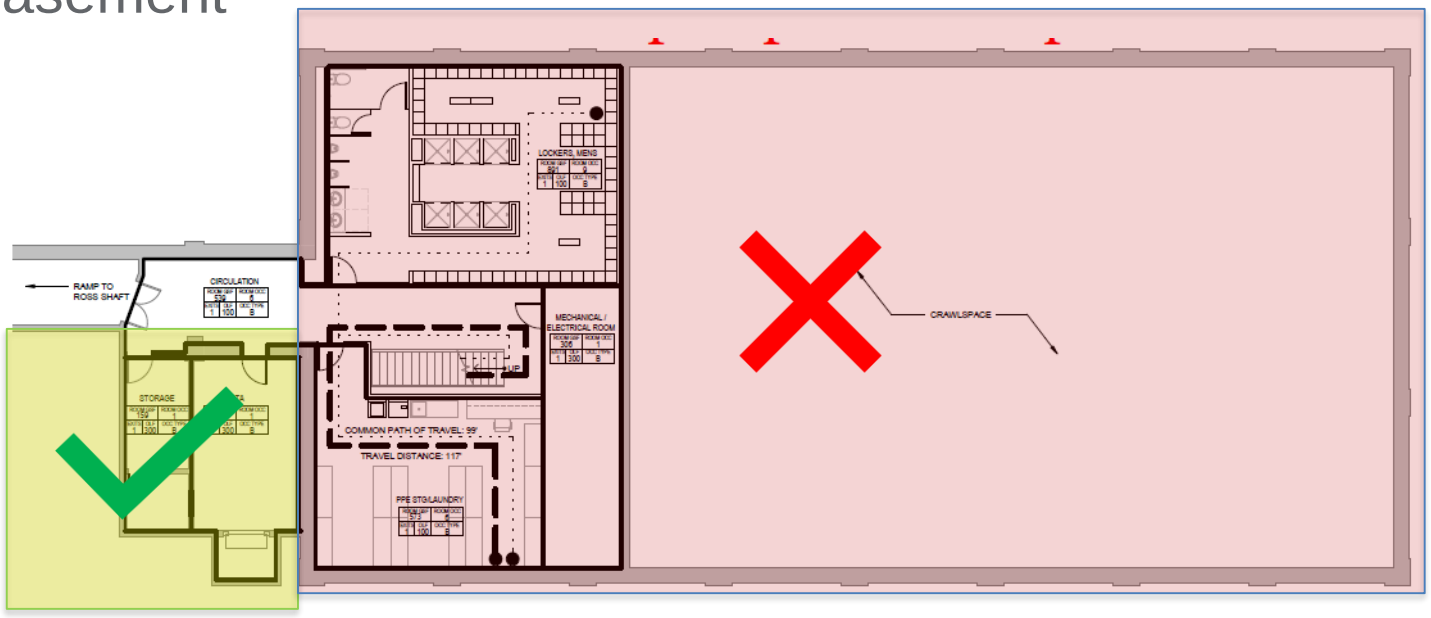
Arup Final Design Kick-Off Meeting

November 7, 2017

BSI Scope Design Changes

Surface Architectural - Ross Dry Renovations

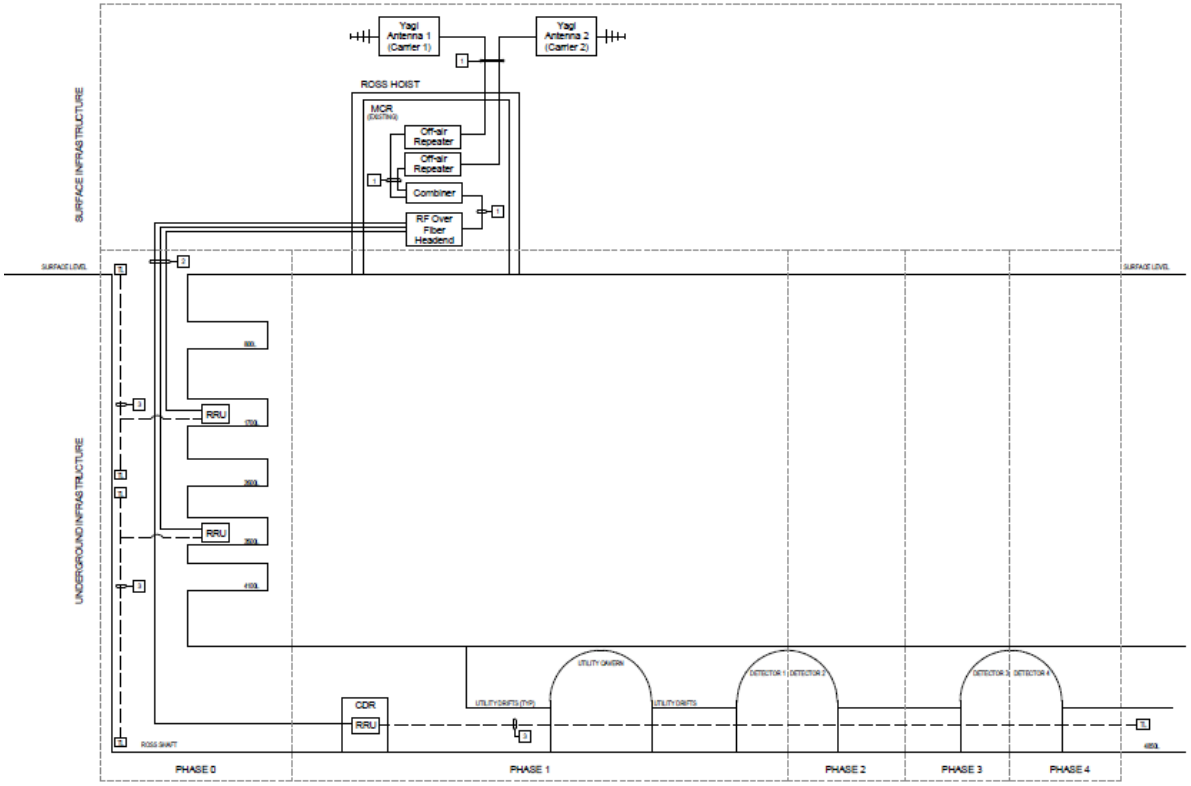
- Previously identified as a “Scope Option” with Control room kept in Scope
- Current scope does not include any renovations or Control Room construction except that which is required for fiber in the basement



BSI Scope Design Changes

Underground Communications

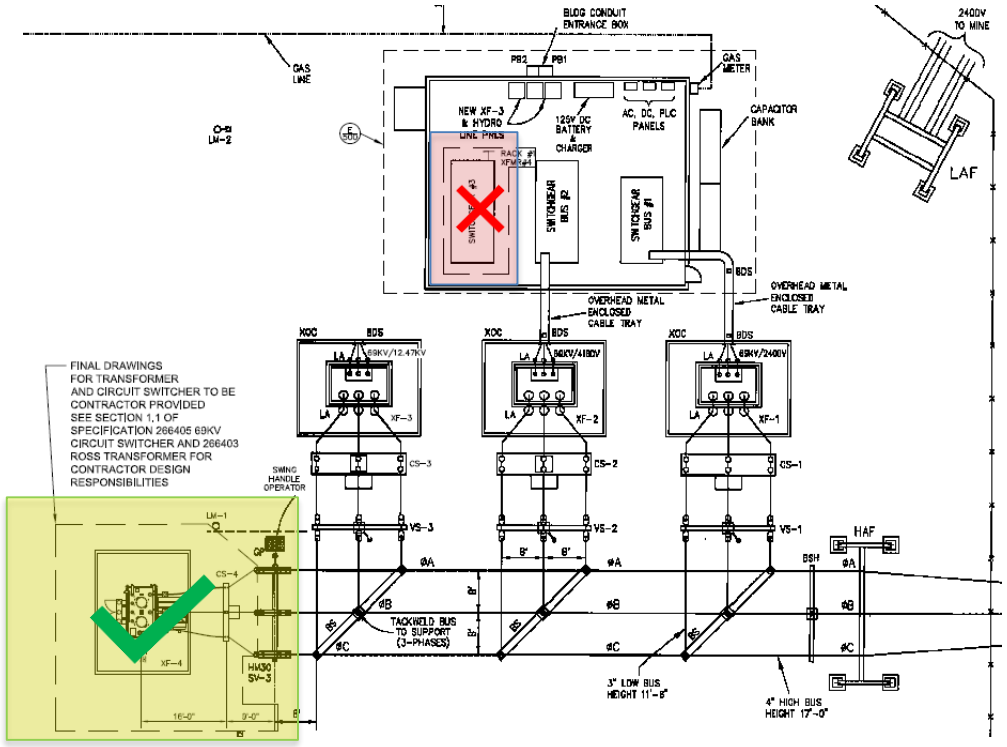
- Preliminary Design Scope for Leaky Feeder System – Scope Option
- Final Design Scope – To remain as a Scope Option



BSI Scope Design Changes

Surface Electrical

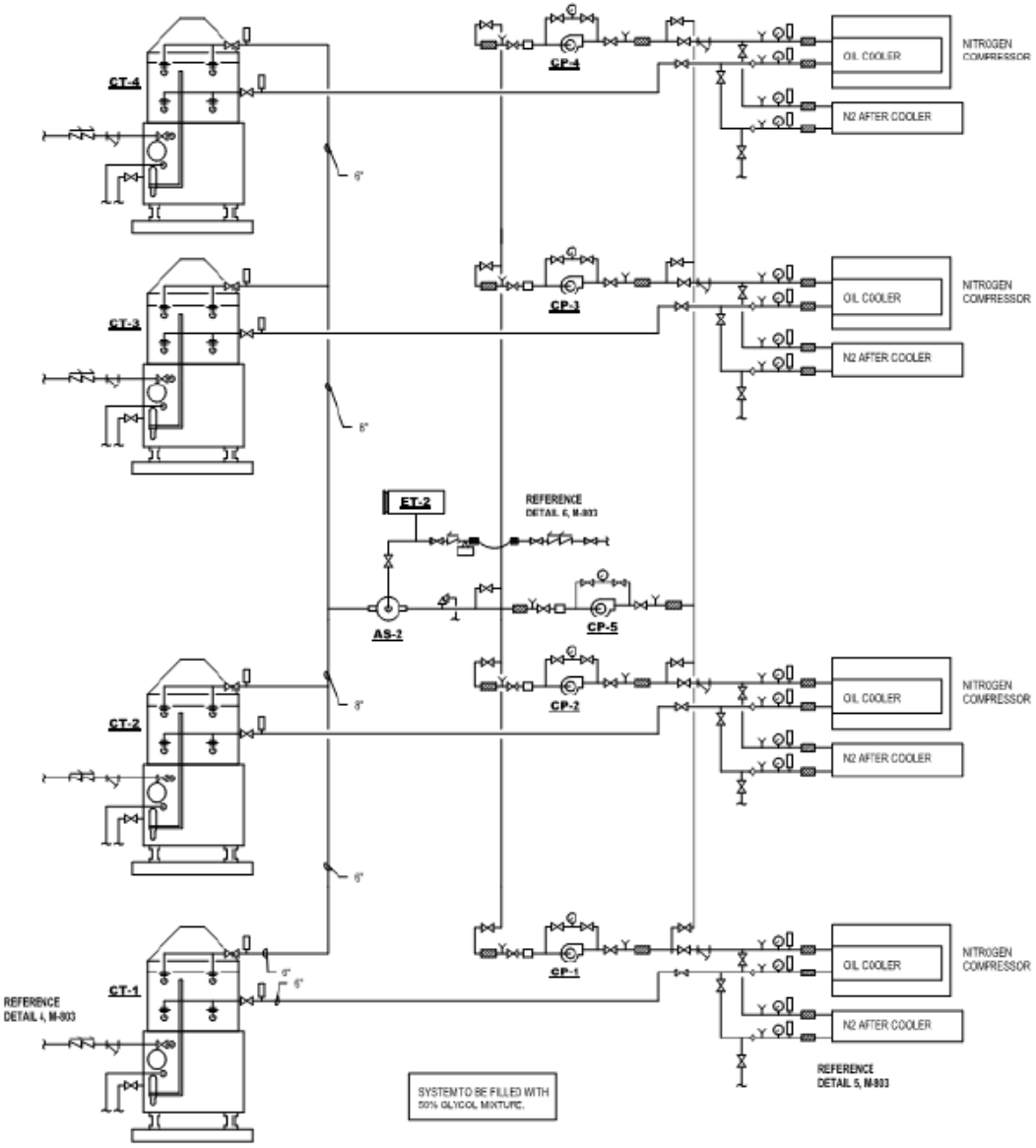
- Preliminary Design Scope for Surface Electrical included provision for design of Ross Surface Substation upgrades to be performed in Final Design
- Design for Ross Substation Upgrades has been completed in Pre-Excavation Final Design. Scope for Final Design requires inclusion of Costs for Transformer Installation in FD Cost estimate



BSI Scope Design Changes

Surface Mechanical

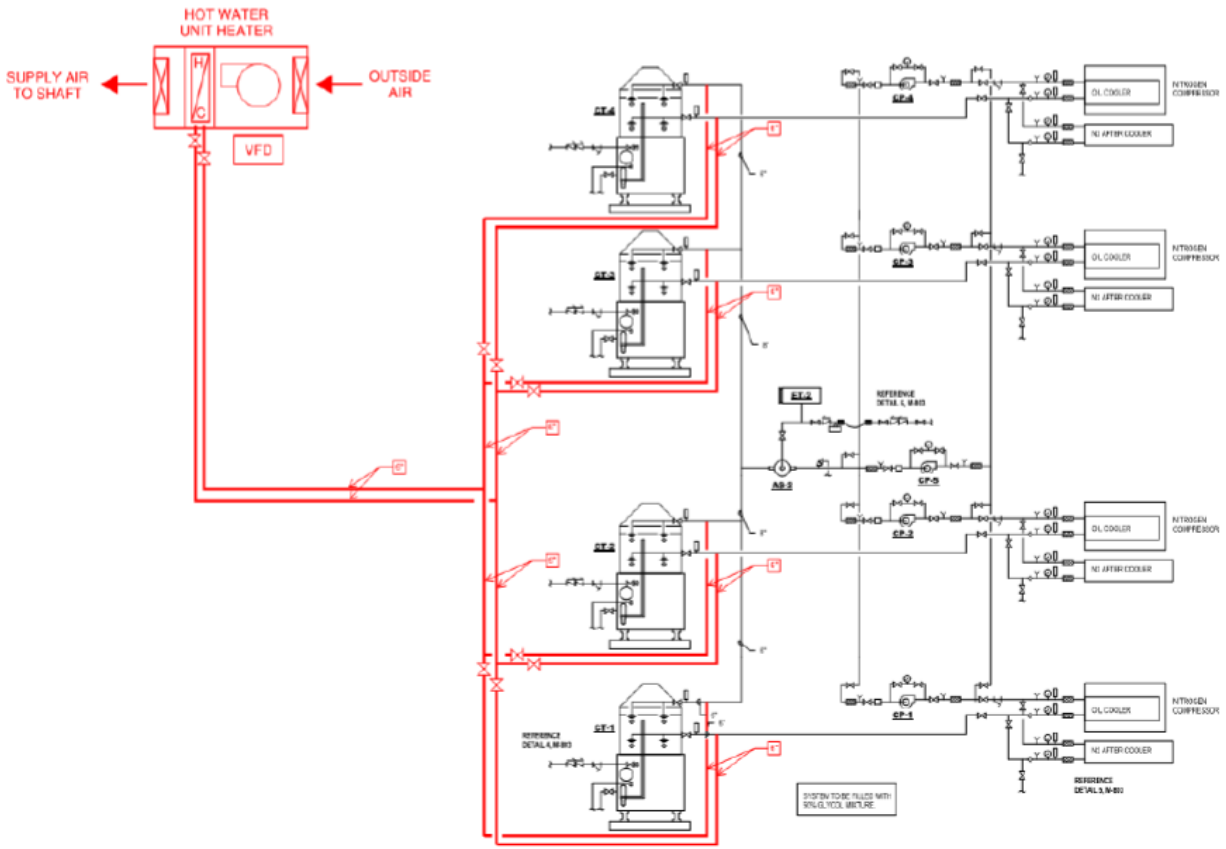
- Current Preliminary Design utilizes Cooling Towers for 100% Heat Rejection



BSI Scope Design Changes

Surface Mechanical

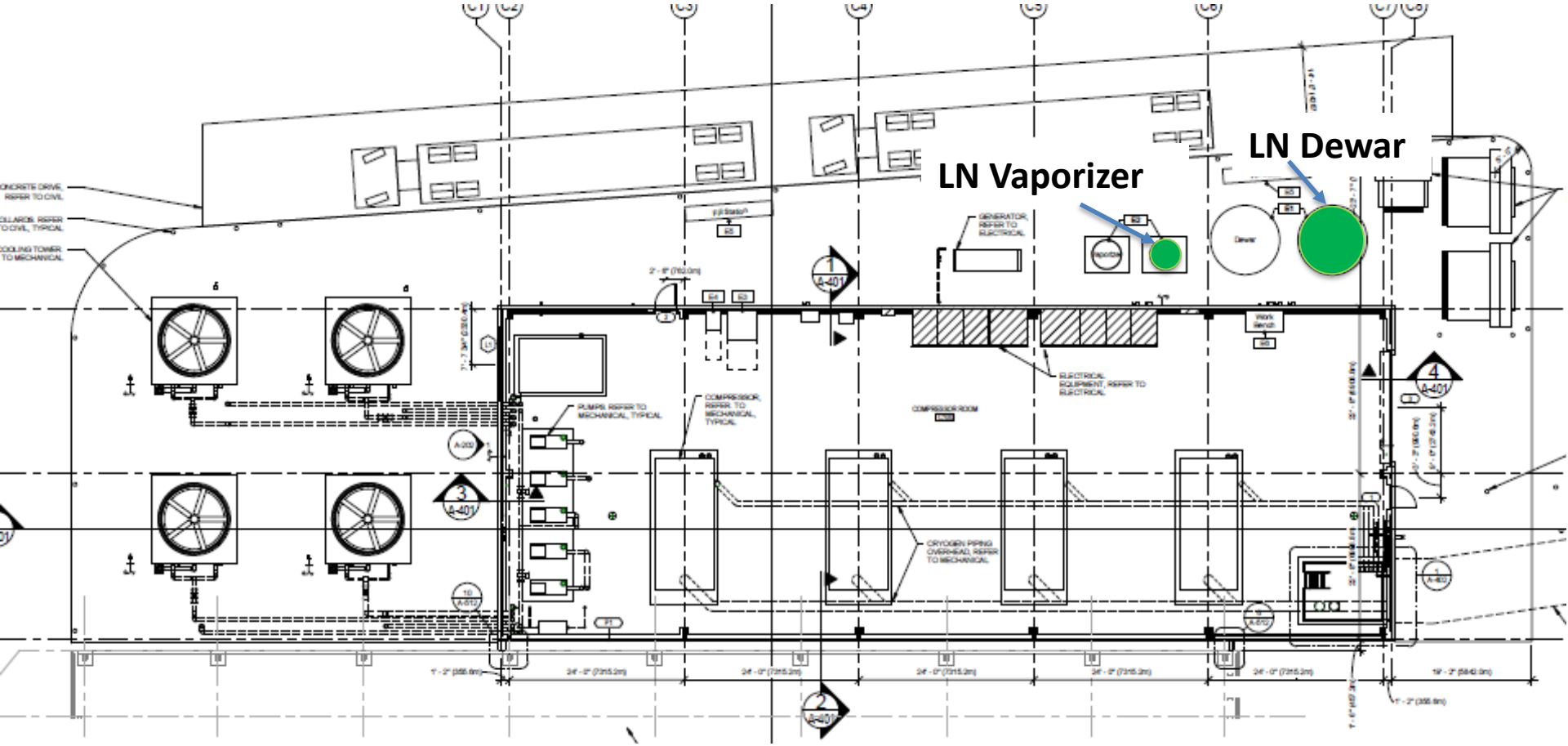
- Incorporate the plan from the Advanced Preliminary Design task for utilization of waste heat from the Cryogen compressors to heat the Intake Air for the Ross Shaft
- Cooling Towers are to remain to provide cooling during warm periods where Shaft Intake air does not require heating



BSI Scope Design Changes

Surface Civil – Cryogen Building

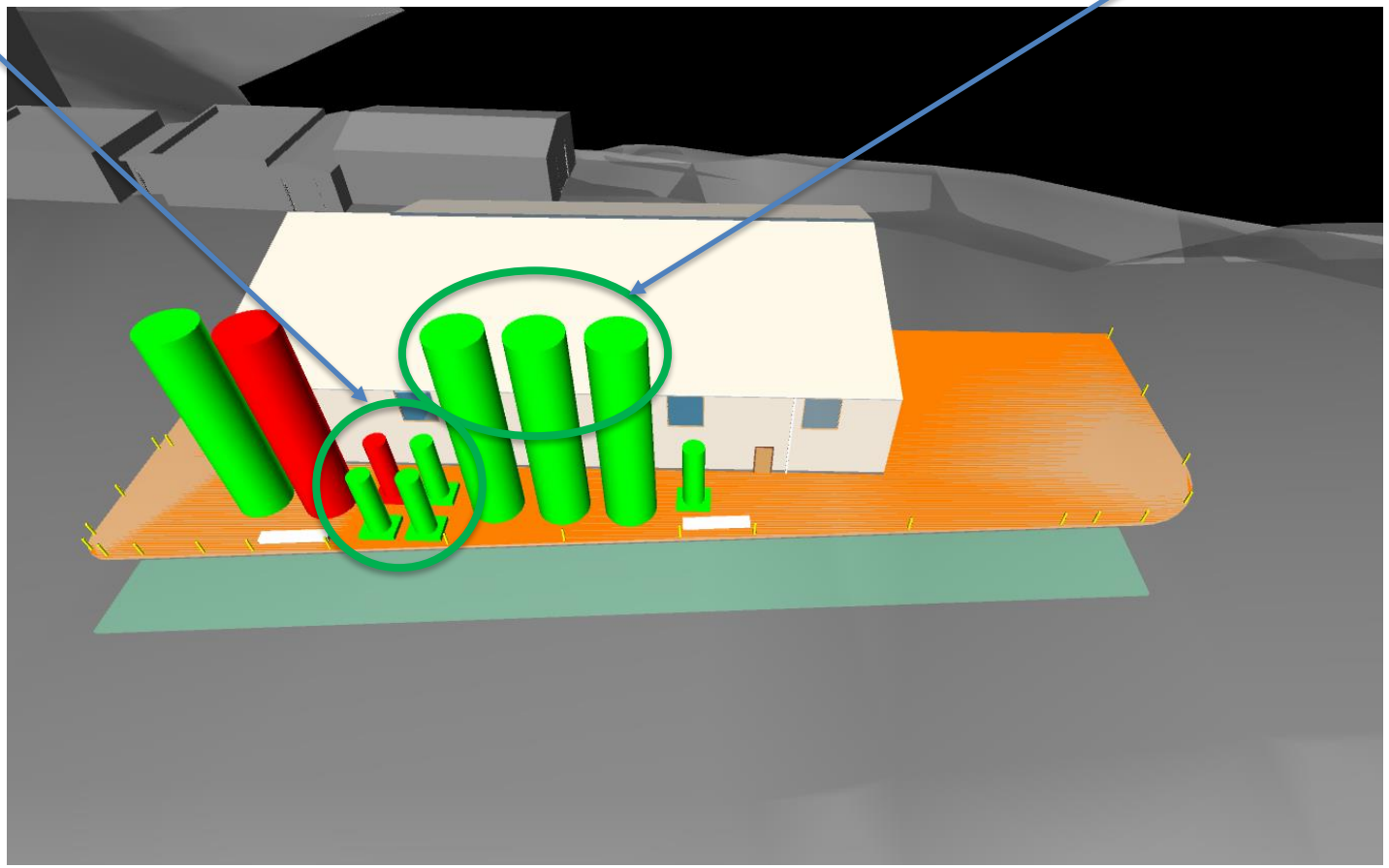
- Preliminary Design for the Cryogen Building considered only 1 Liquid Argon Storage Dewar and 1 Vaporizer



BSI Scope Design Changes

Surface Civil – Cryogen Building

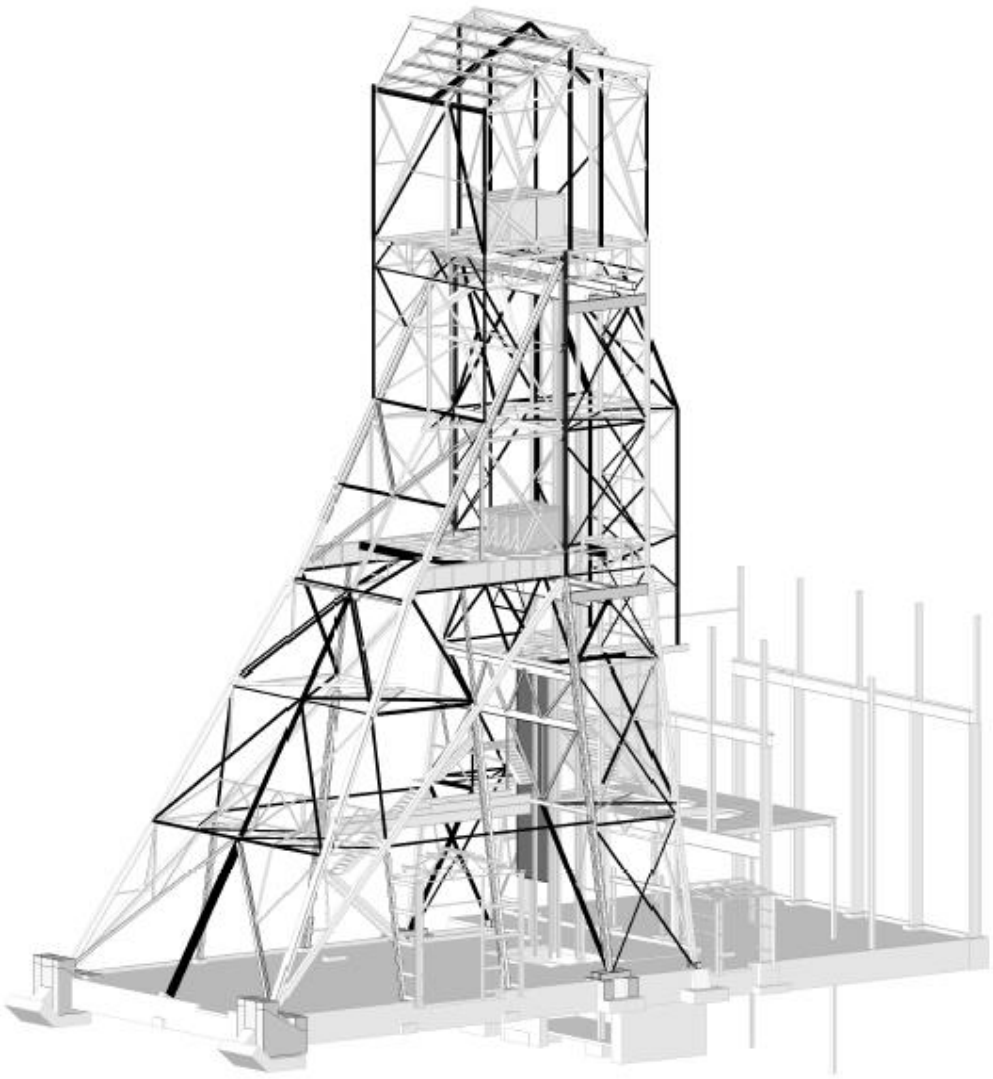
- Final Design for the Cryogen must incorporate an additional 3 Liquid Argon storage dewars into the design
- Also need 3 additional Liquid Argon Vaporizers



BSI Scope Design Changes

Ross Shaft Headframe Strengthening Design – Foundations

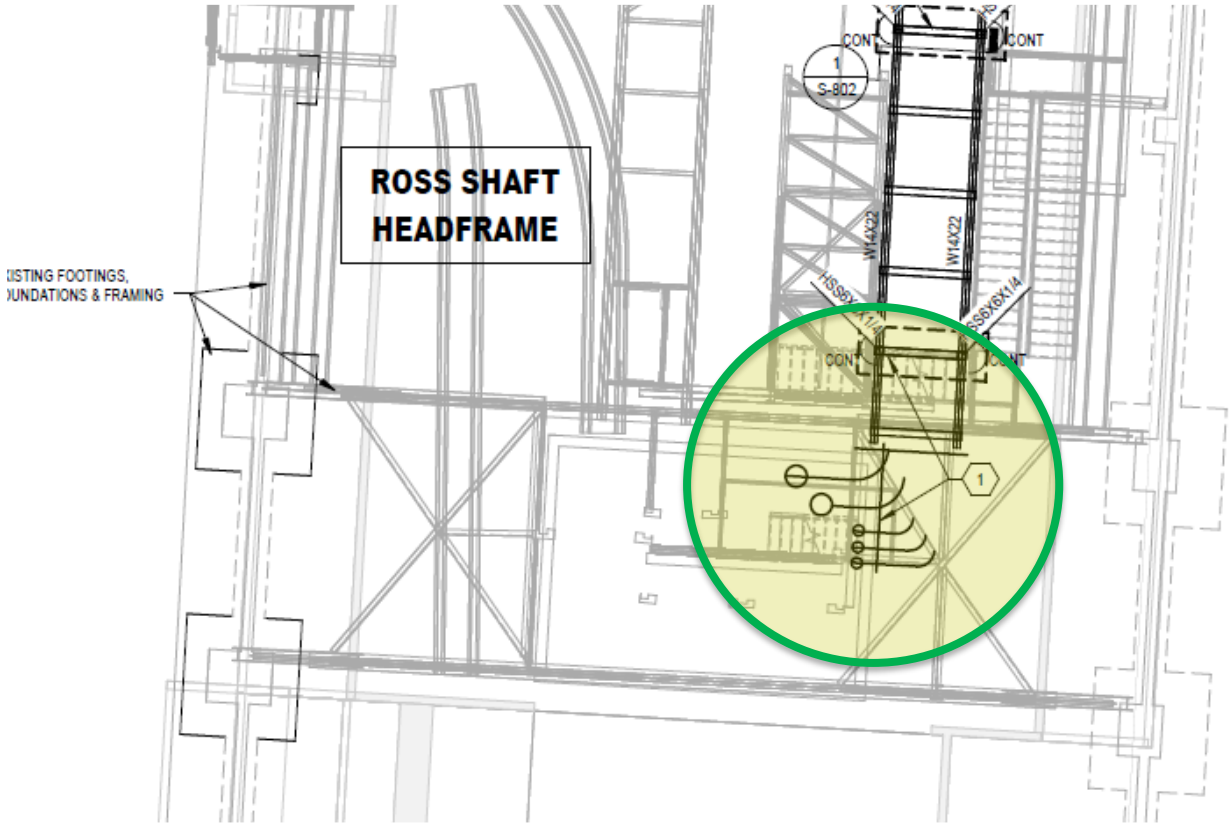
- Current design based on visual assessment
- Design update required that incorporates more extensive in situ testing. This testing will be performed as part of EXC which will inform the design update to be completed as part of BSI



BSI Scope Design Changes

Surface Structural – Ross Shaft Headframce

- The current Preliminary Design does not provide for a Pipe Support structure to transition the Gas Piping from horizontal to vertical at the Shaft Collar. The Final Design will require this



BSI Scope Design Changes

Underground Mechanical

- Preliminary Design requirement for minimum Cavern Temperature – 40º F
- Final Design Change – minimum 67º F

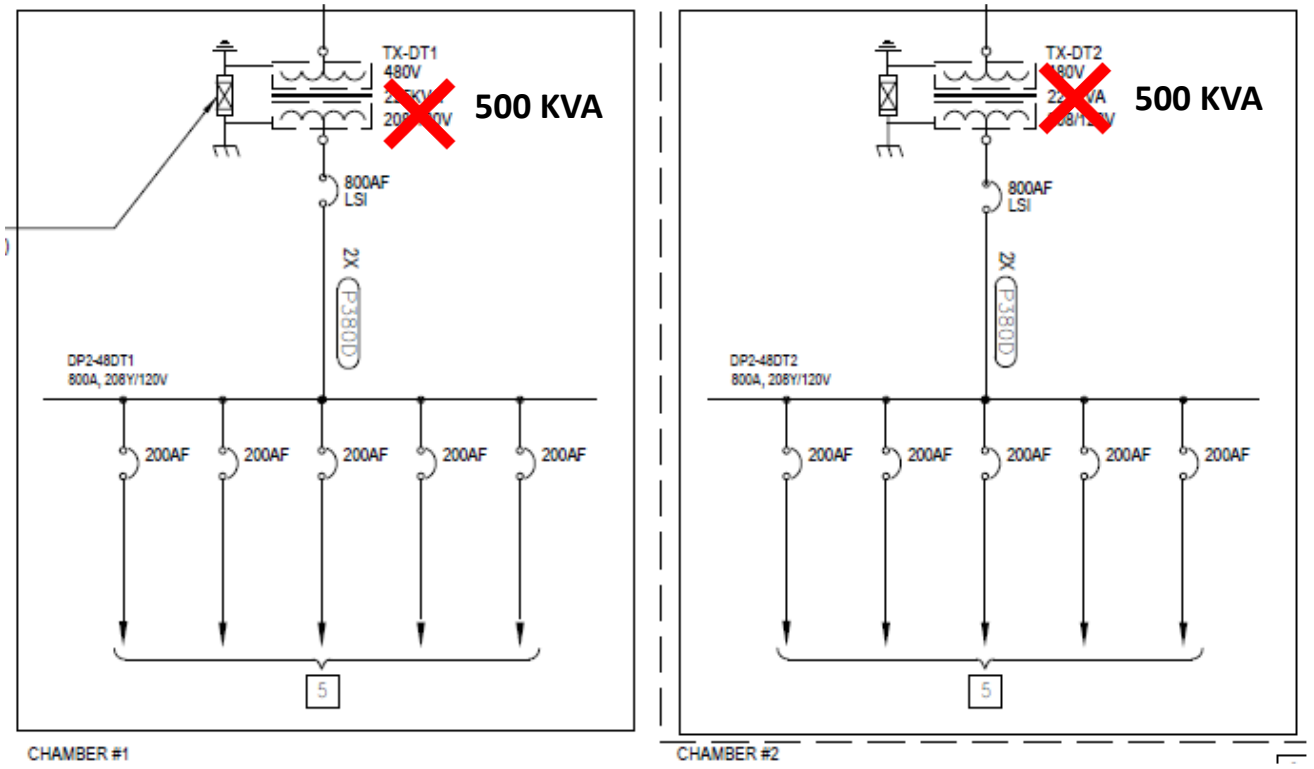
Table 6.13: Indoor Design Conditions by Space Type. [6] [21]

	DBT Minimum/ Maximum	RH Minimum/ Maximum	DPT Maximum	Minimum Ventilation Rate	Occupancy Assembly / Operation
Space Type	[°F] ([°C])	[%]	[°F] ([°C])	[-]	[#]
.01 ACCESS DRIFTS- 4850 LEVEL	40.0 / 104.0 (4.4 / 40.0)	Not Controlled	Not Controlled	Based on face velocity of 4m/s	0 / 0
.02 OTHER EXCAVATIONS	40.0 / 104.0 (4.4 / 40.0)	Not Controlled	Not Controlled	-	0 / 0
.03 CRYOSTAT/UTILITY CAVERNS	40.0 / 85.0 (4.4 / 29.4) **67.0/85.0**	15 / 85	48.0 (8.9)	Greater of 1 Air Change Per Hour or Oxygen Deficiency Hazard Limit	50 / 4

BSI Scope Design Changes

Underground Electrical - Detector Electronics

- Preliminary Design requirement for Detector Electronics – 225 KVA Transformers
- Final Design Change – 500 KVA Transformers



BSI Scope Design Changes

Underground Electrical - Detector Electronics

- Preliminary Design requirement assumption for heat generated from Detector Electronics – 3 KW per Rack
- Final Design Change – TBD

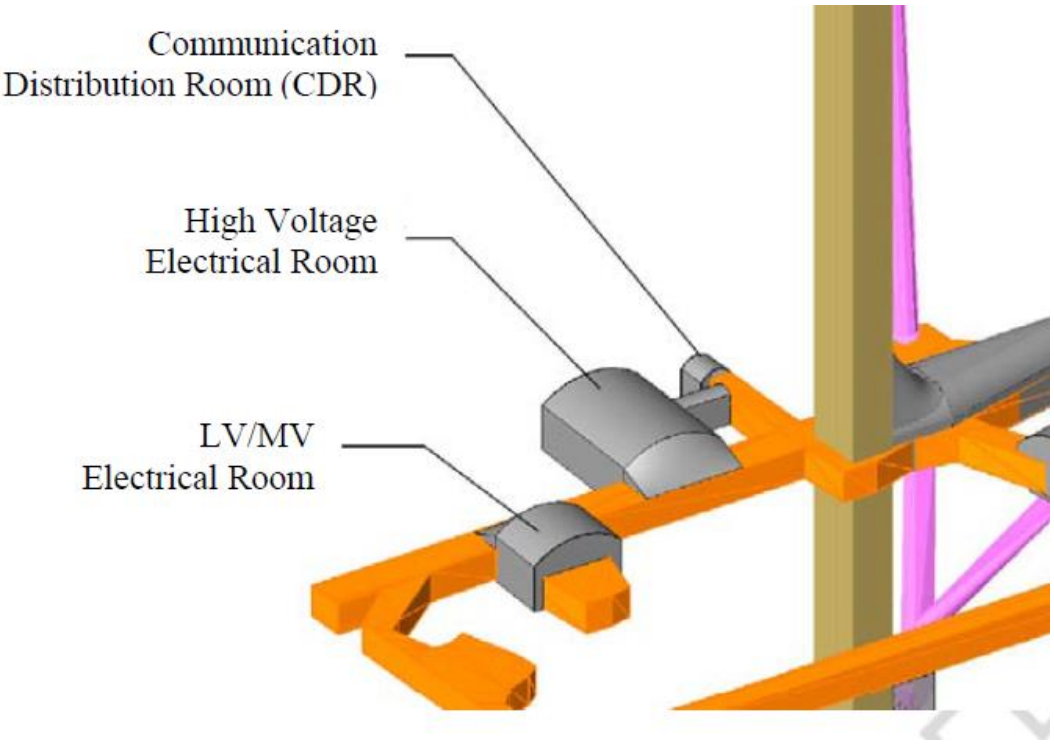
Equipment [-]	Quantity [#]	Quantity Duty [#]	Power [W]	Electrical Heat Gain [W]	Mechanical Heat Gain [W]	Total Airside Heat Gain [W]	Total Waterside Heat Gain [W]
RP-48AS	1.00	1.00	0.00	0.00		0.00	0.00
10kT Cryostat	1.00	1.00			-32,100.00	-32,100.00	0.00
Detector Electronics Racks	77.00	77.00			3,0[illegible].00	231,[illegible].00	0.00

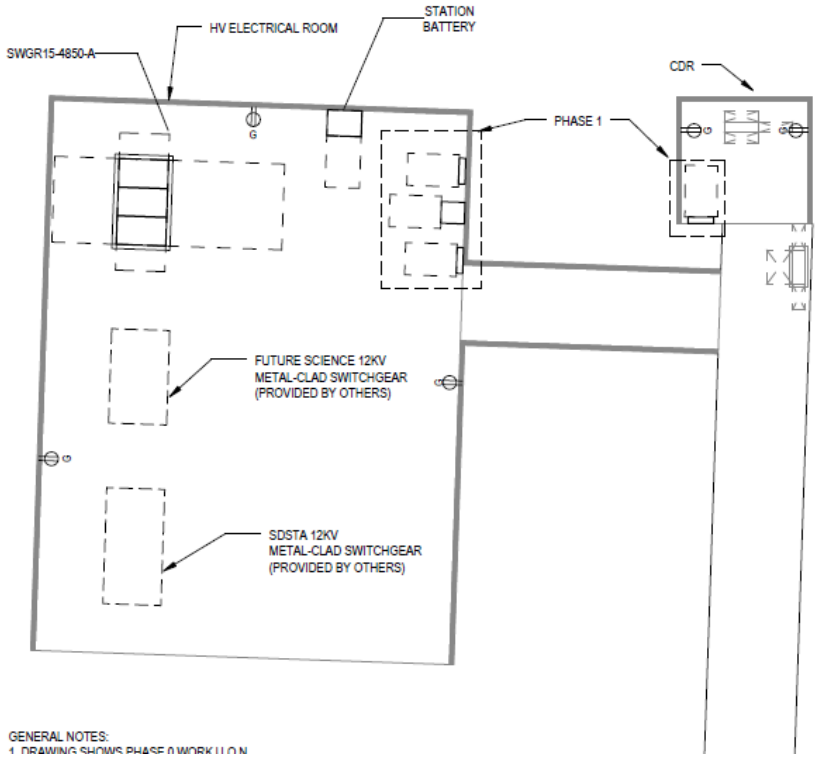
TBD TBD

BSI Scope Design Changes

Underground Electrical

- Design for Underground Substation to be updated as per Advanced Preliminary Design Concept



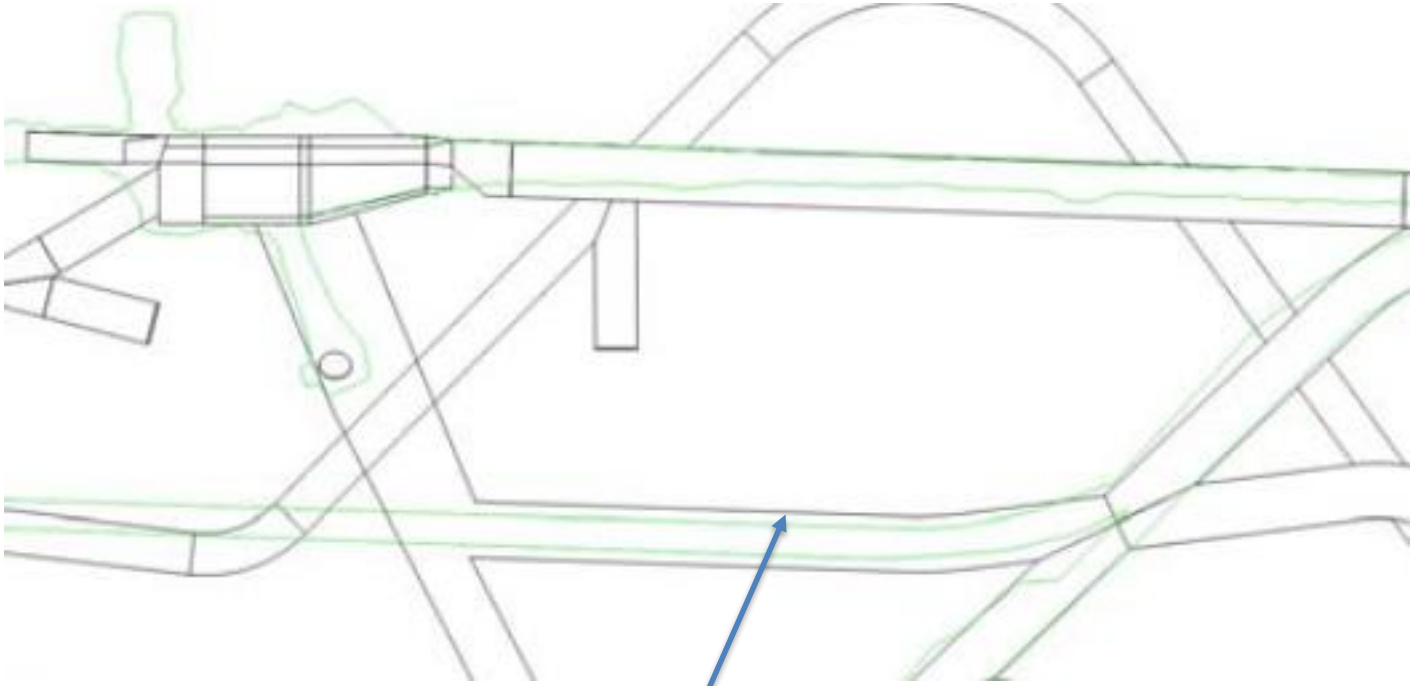


Current 100% Preliminary Design

BSI Scope Design Changes

Underground Electrical

- Design for Underground Substation to be updated as per Advanced Preliminary Design Concept
- Will also serve as Maintenance Shop during Excavation

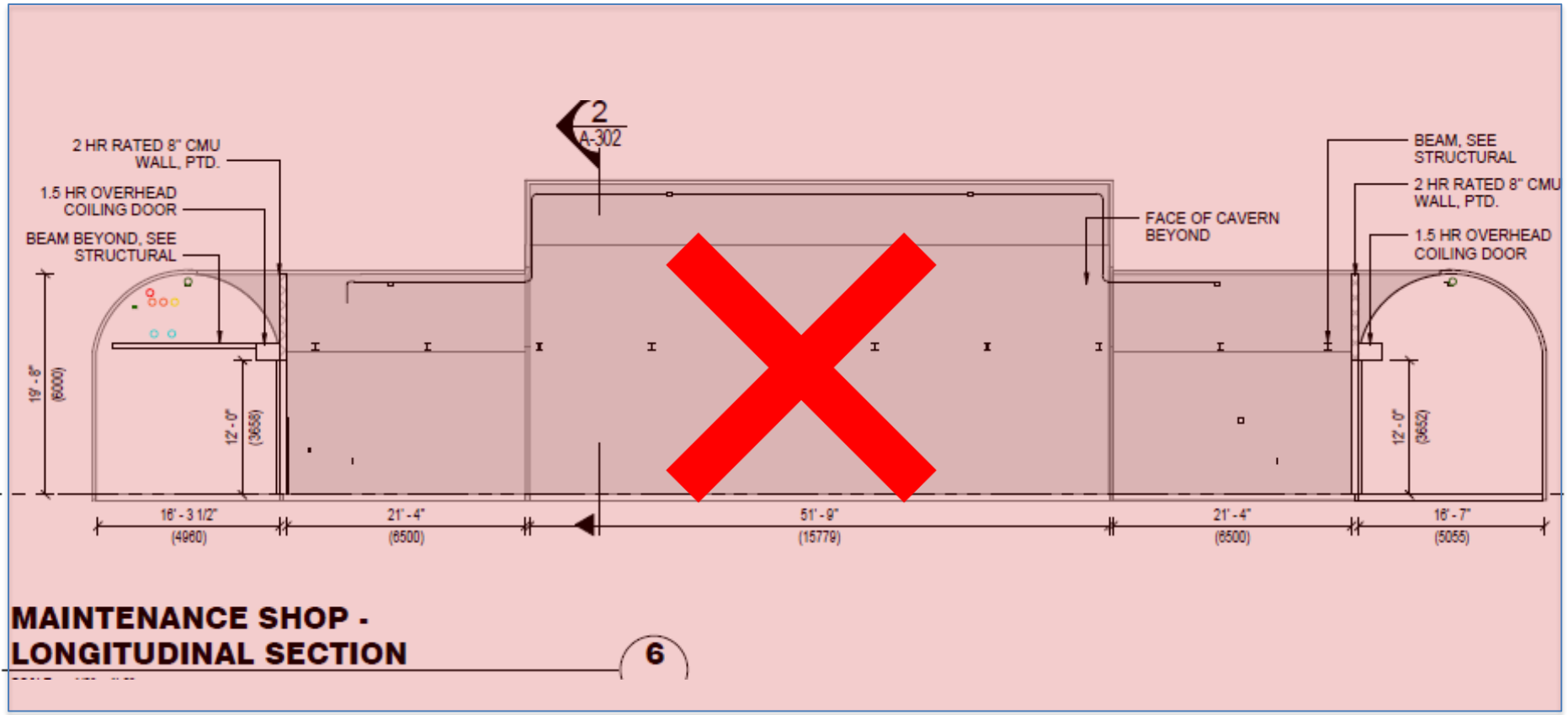


Updated Final Design Location

BSI Scope Design Changes

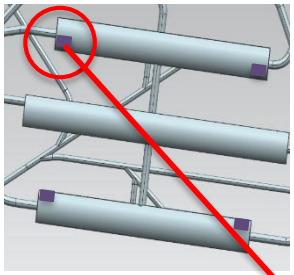
Underground Architectural/Electrical/Mechanical

- Separate Maintenance Shop no longer required. Therefore, no additional BSI required for Maintenance Shop



BSI Scope Changes – Underground Structural

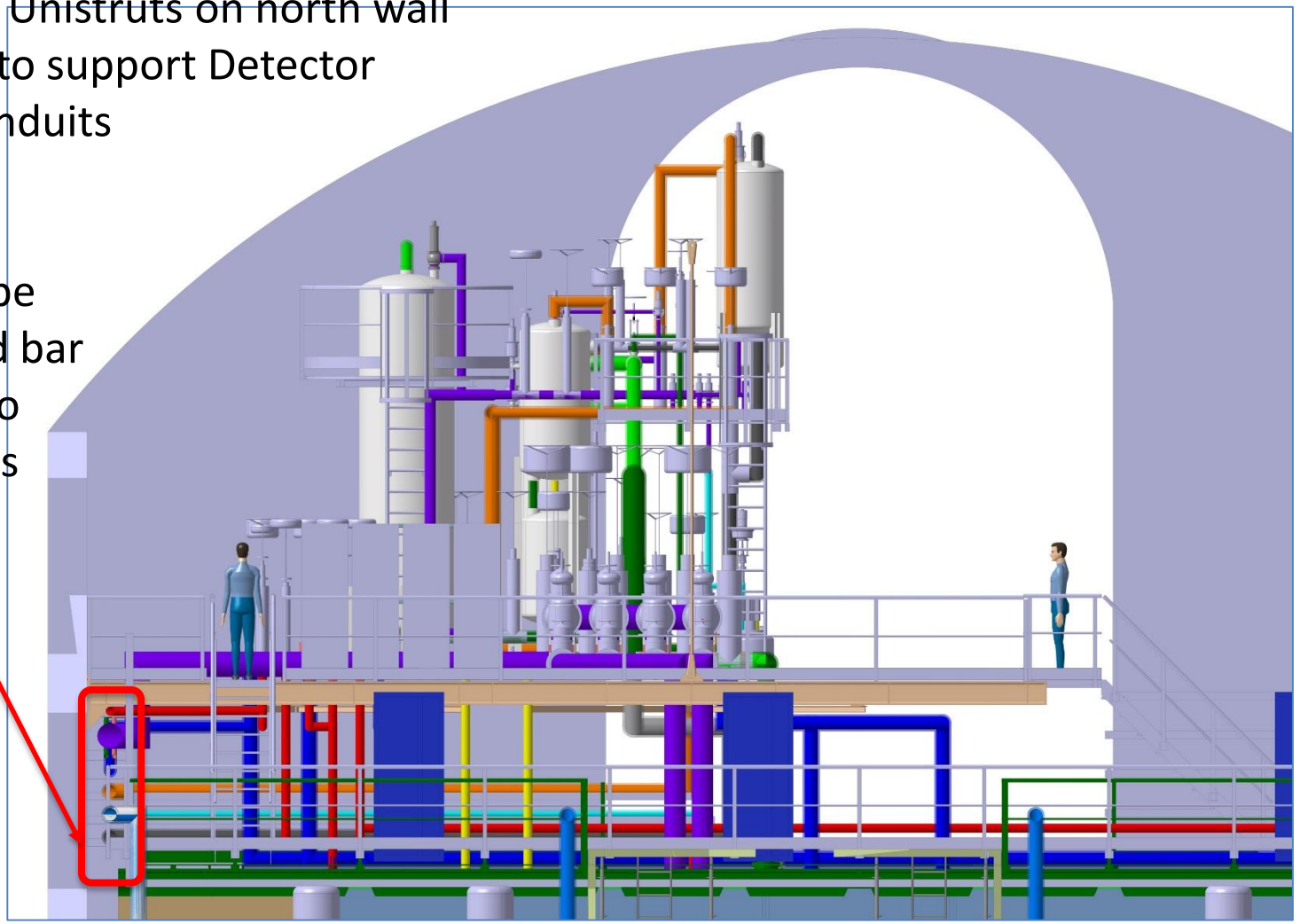
Add Vertical Unistruts on north wall of chamber to support Detector Pipe and Conduits



BSI Scope Changes – Underground Structural

- Add Vertical Unistruts on north wall of chamber to support Detector Pipe and Conduits

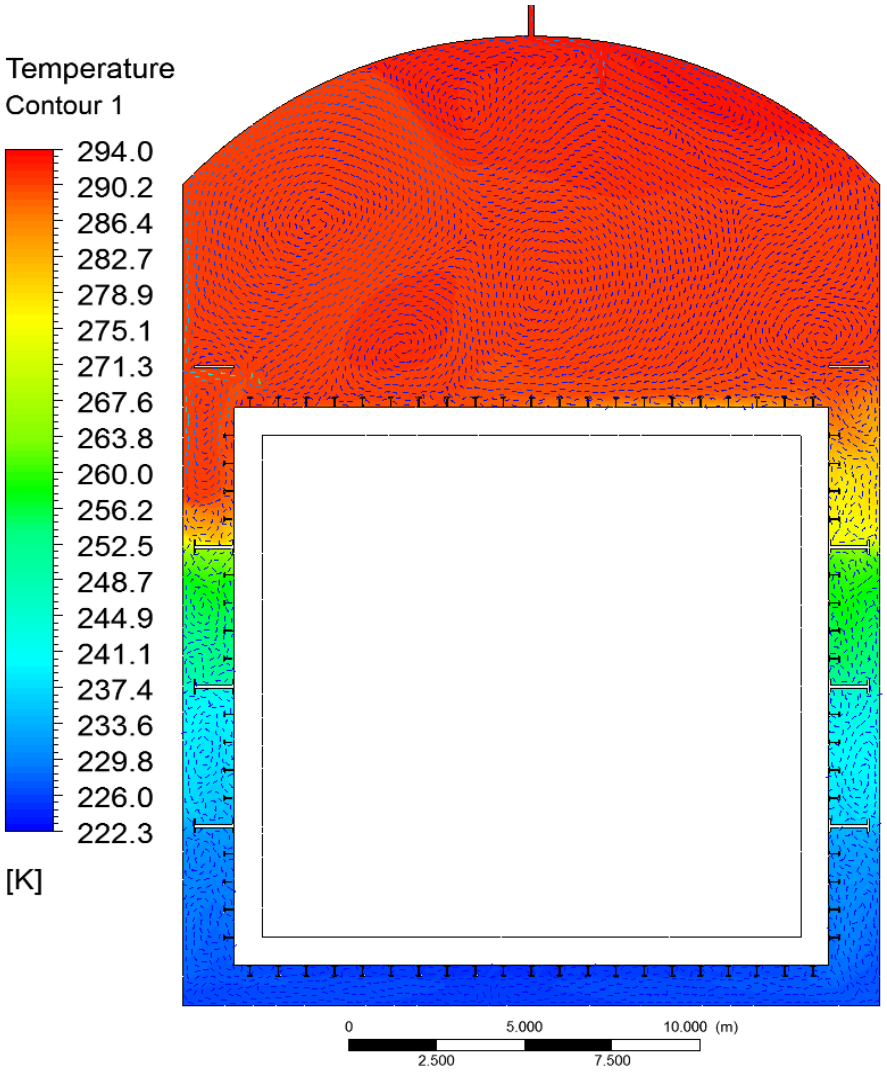
- Height of Unistrut to be from ground bar to as close to spring line as possible



BSI Scope Design Changes

Underground Mechanical – Cryostat Ventilation

- A condensation analysis has been performed which has determined that the current Preliminary design for Cryostat ventilation does not provide for adequate circulation to prevent condensation from occurring



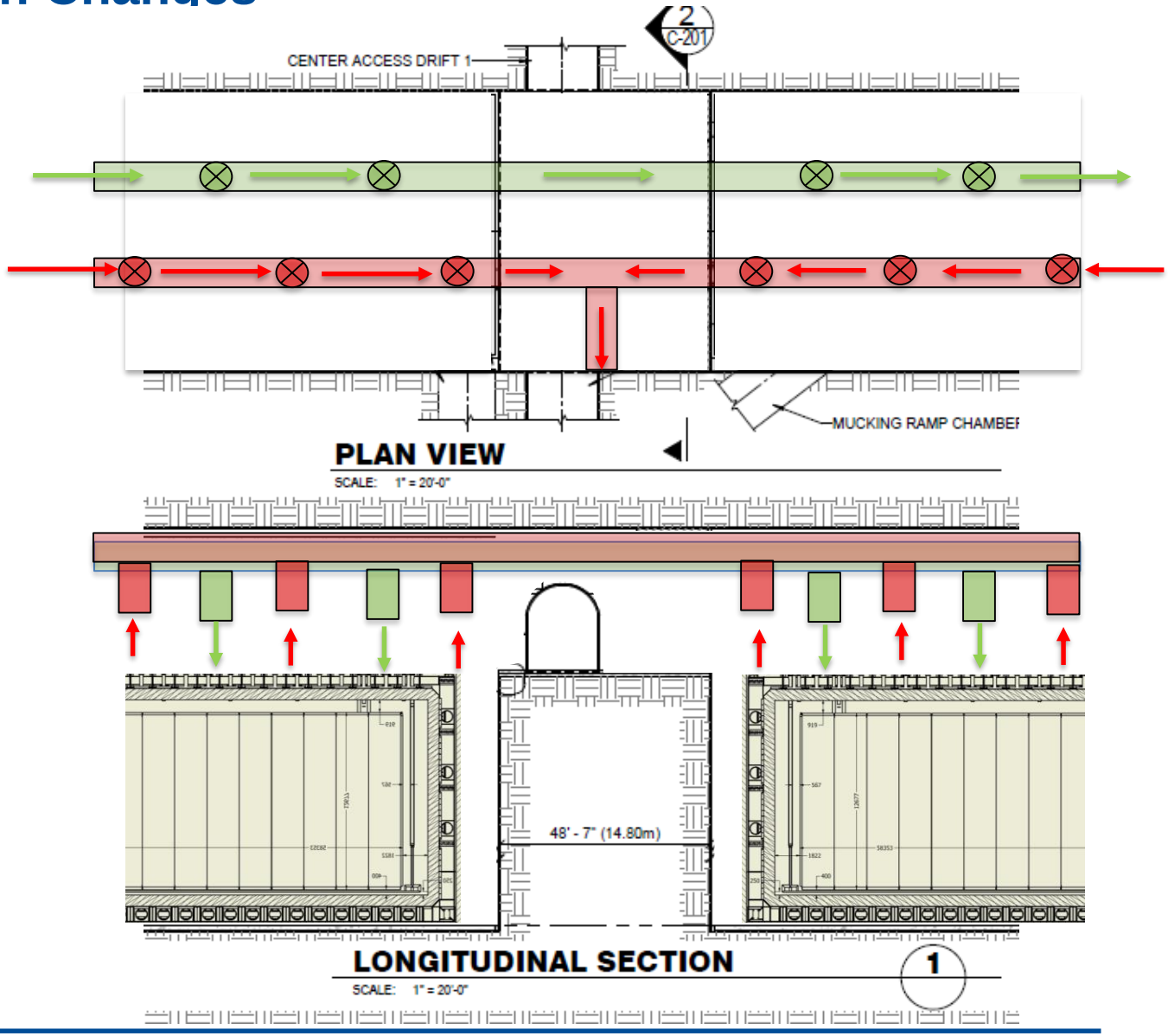
BSI Scope Design Changes

Underground Mechanical – Cryostat Ventilation

- Current Preliminary Design

Intake Air

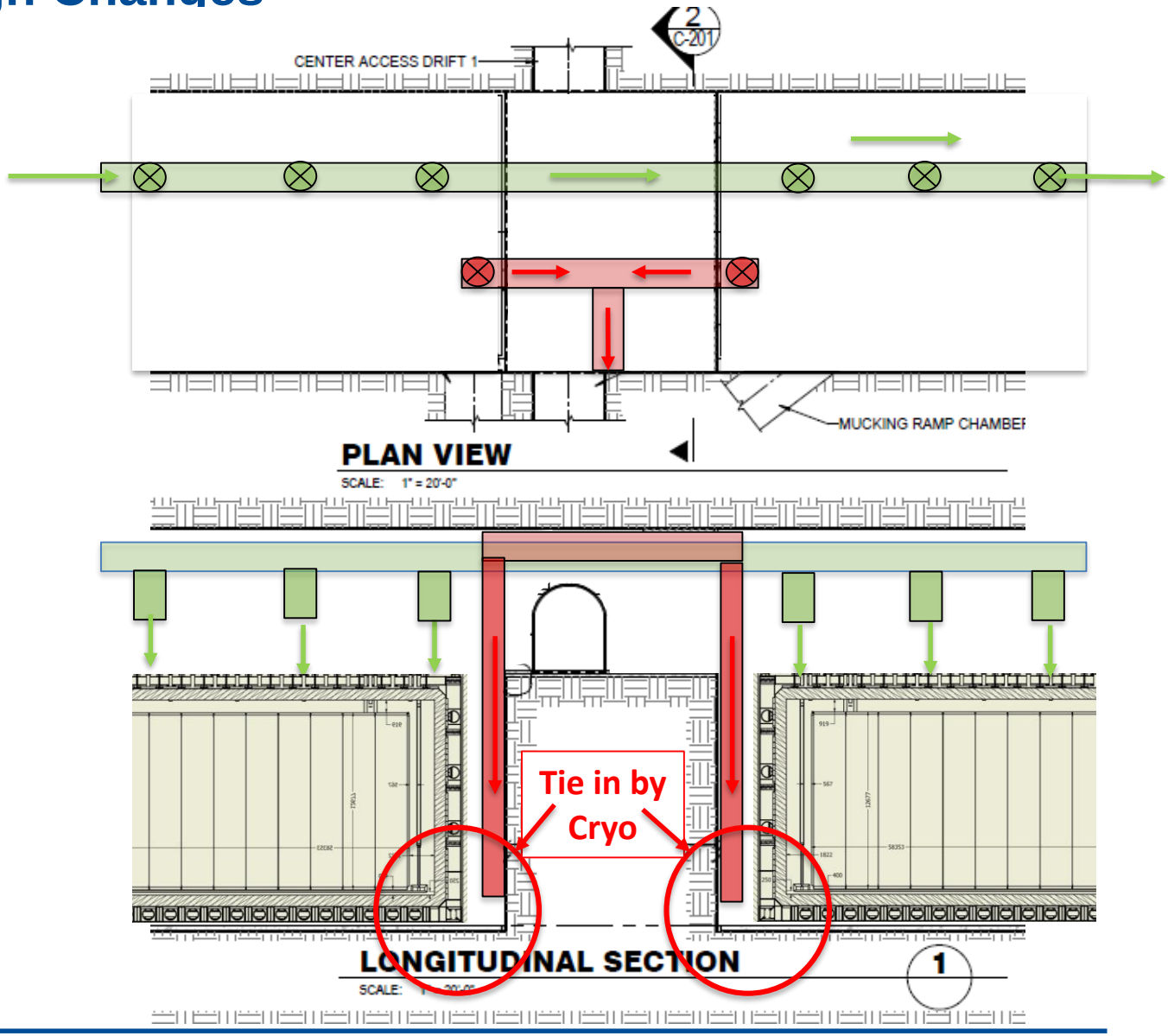
Exhaust Air



BSI Scope Design Changes

Underground Mechanical – Cryostat Ventilation

- Required Final Design Arrangement
- Required for all 4 Cryostat Chambers



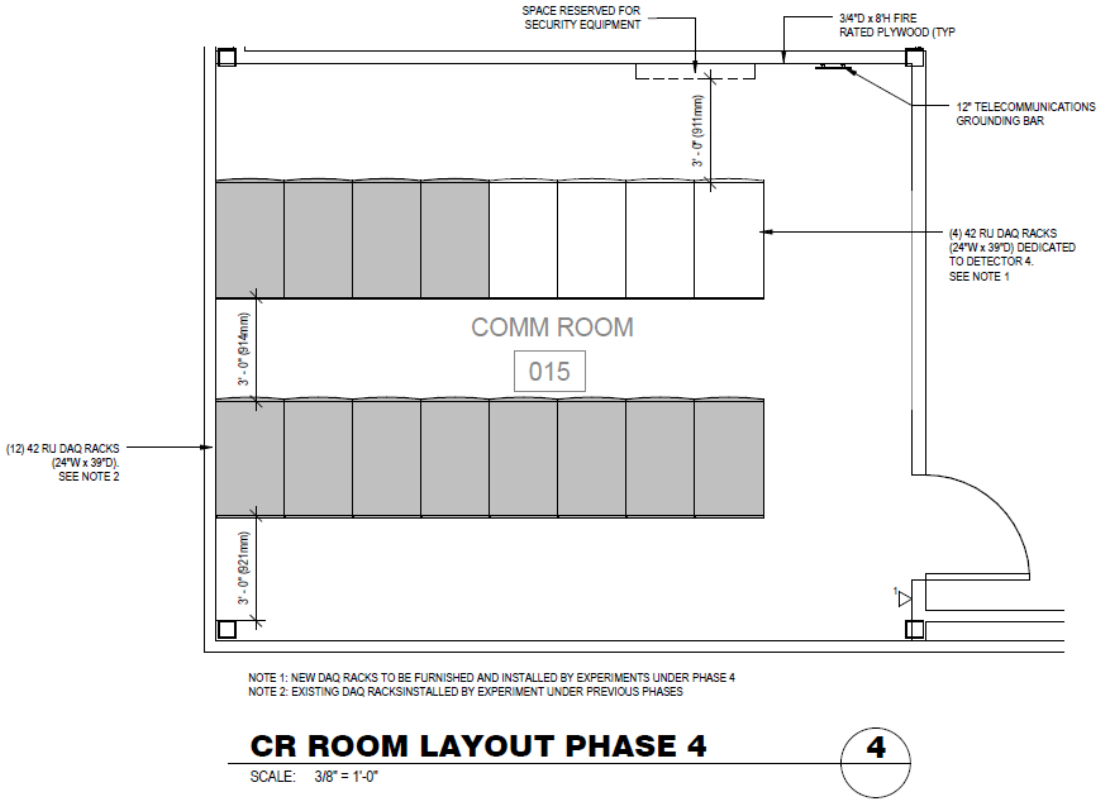
Intake Air

Exhaust Air

BSI Scope Design Changes

Underground Communications

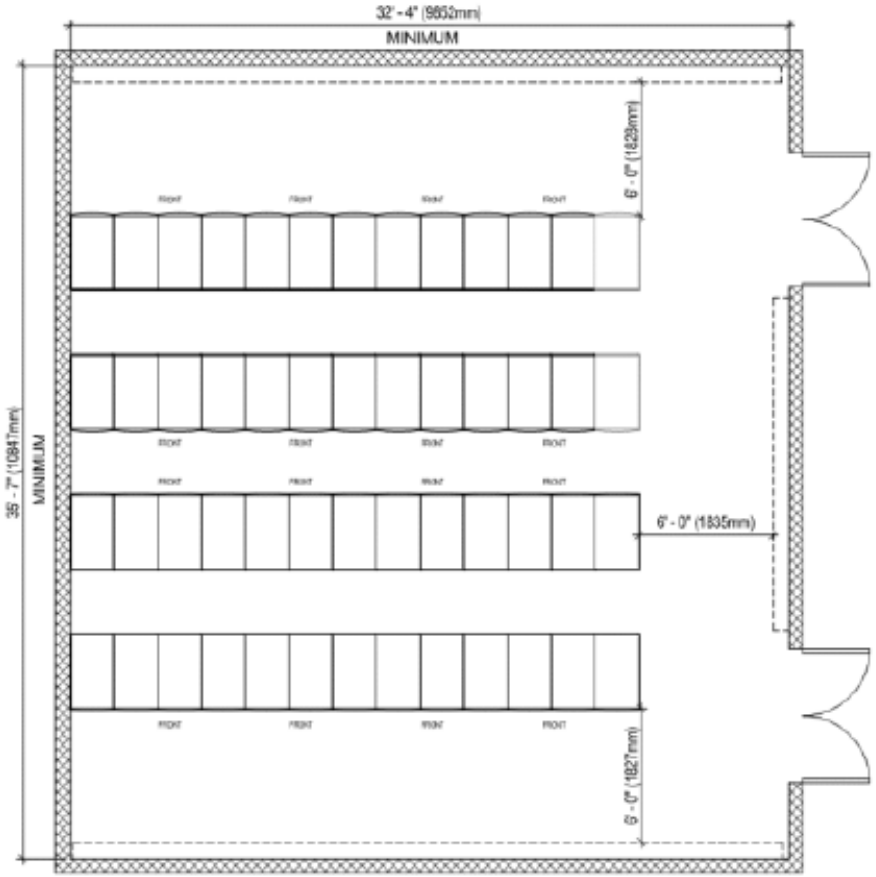
- The Current Preliminary Design calls for a total of 16 racks in the CUC Communication room



BSI Scope Design Changes

Underground Communications

- The Final Design requires a total of 52 racks in the CUC Communication room

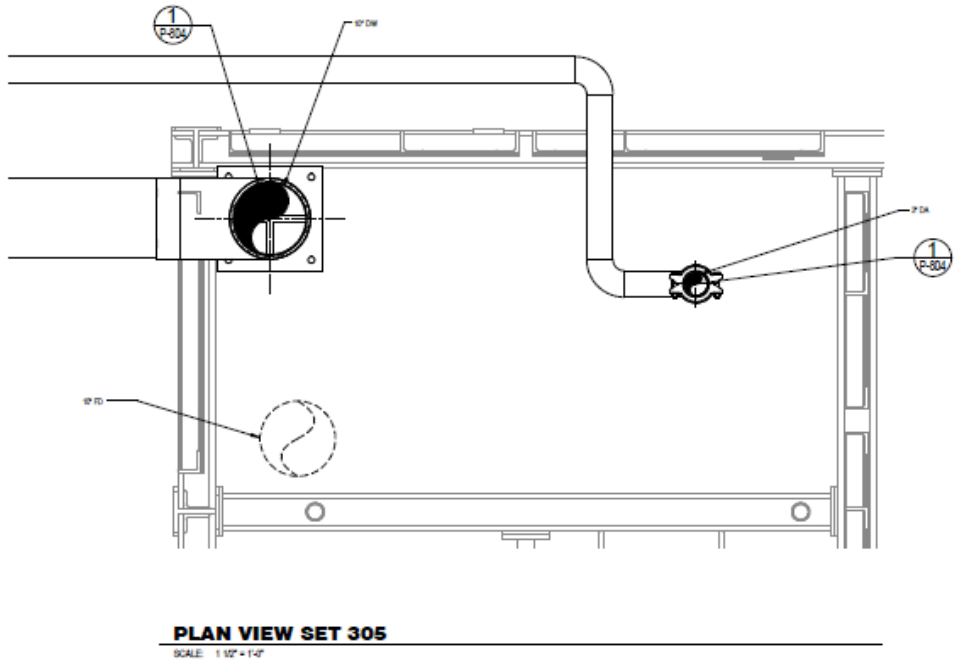


BSI Scope Design Changes

Underground Plumbing

- Modifications to the Shaft Set Steel design have been completed for sets 291 – 308. All Plumbing drawings need to be updated to incorporate the final design

Pre Excavation design for Piping in Shaft Services compartment at 305

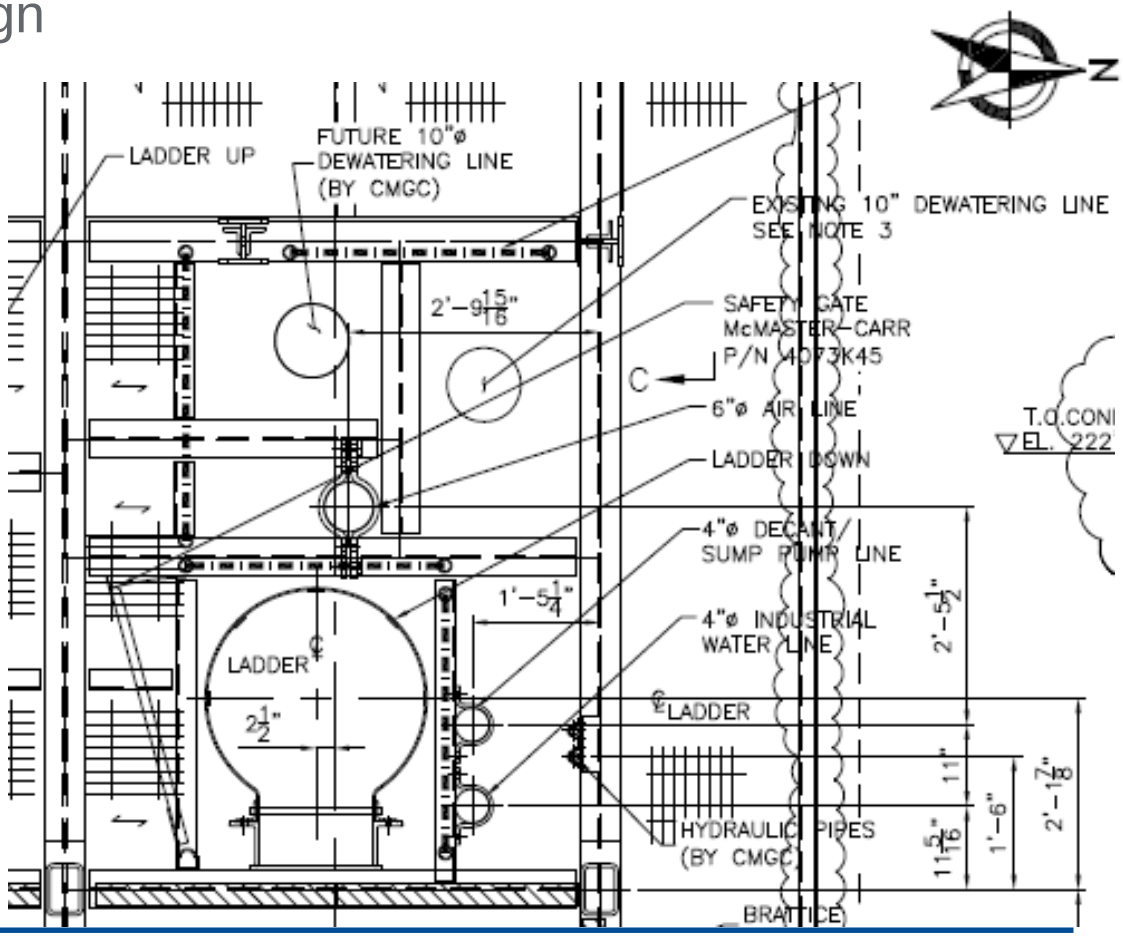


BSI Scope Design Changes

Underground Plumbing

- Modifications to the Shaft Set Steel design have been completed for sets 291 – 308. All Plumbing drawings need to be updated to incorporate the final design

Updated Shaft Set steel design for Pipe Services compartment at set 305



BSI Scope Design Changes

Underground Plumbing

- Incorporate all outstanding comments from 100% Preliminary Design not completed

Drawings				
SD033		PER-B-P-710	We need to show the 3" Shaft Drain line coming out of the shaft here	unresolved
SD034		PER-B-P-717	We need to show the 3" Shaft Drain line coming out of the shaft here	unresolved
SD035		PER-B-P-720	Why does pipe ND move to the north slightly?	unresolved
SD039		PER-B-P-724	For this layout, PS-3 has been removed and the pipe clamps are anchored to B09	unresolved
SD040		PER-B-P-725	We need to show the 3" Shaft Drain line coming out of the shaft here	unresolved
SD043		PER-B-P-732	Consistent with my comment SD026, the FW and IW pipes should go to the west rather than the east	unresolved
SD008	BSI	PER-B-P-801	Detail 1 - DW 10 01 Pipe Clamps - there are no detailed dimensions shown in this design.	unresolved
SD009	BSI	PER-B-P-801	Detail 1 - DW 10 01 Pipe Clamps - not sure about the clamp thickness but it sure looks thicker than necessary for a 10" pipe	unresolved
SD013	BSI	PER-B-P-720	Between sets 207 and 208, the 8" ND line moves slightly to the west. This should be shown in the Revit view with an elbow along this pipe somewhere between the 2 sets	unresolved
SD022	BSI	PER-B-P-800 series	All the pipe clamp drawings say that the fasteners are FRA supplied. This comment should be removed. We want the cost of the fasteners included in the estimate	unresolved

BSI Scope Design Changes

Potential Changes

Potential Change Description	Status
1. Electrical/Data Support for Infrared Cameras to Monitor Cryostat Performance	Waiting for Clarification from Cryostat Group
2. Emergency Shut off Switches for Power Distribution. Could be for CF as well as EXP	Waiting for further clarification
3. Connections for Lighting and Fire Protection below the Mezzanine Level	Requirement Definition Required
4. Piping and Electrical run through a trench in the Septum	Requires Trade Study
5. Integration of Access Control System	Under Investigation
6. Industrial Water, Compressed Air and Emergency Communications at the Chamber bottom	Requirement Definition Required
7. Addition of temporary grounding network to the bottom of each Detector Pit	Requirement Definition Required

BSI Scope Design Changes

Potential Changes Cont'd

Potential Change Description	Status
8. Infirmary and Recreation Room in CUC	Special Committee set up to determine if required
9. Machine Shop for Cryostat Construction	Further Clarification Required

BSI Scope Design Changes

Questions?