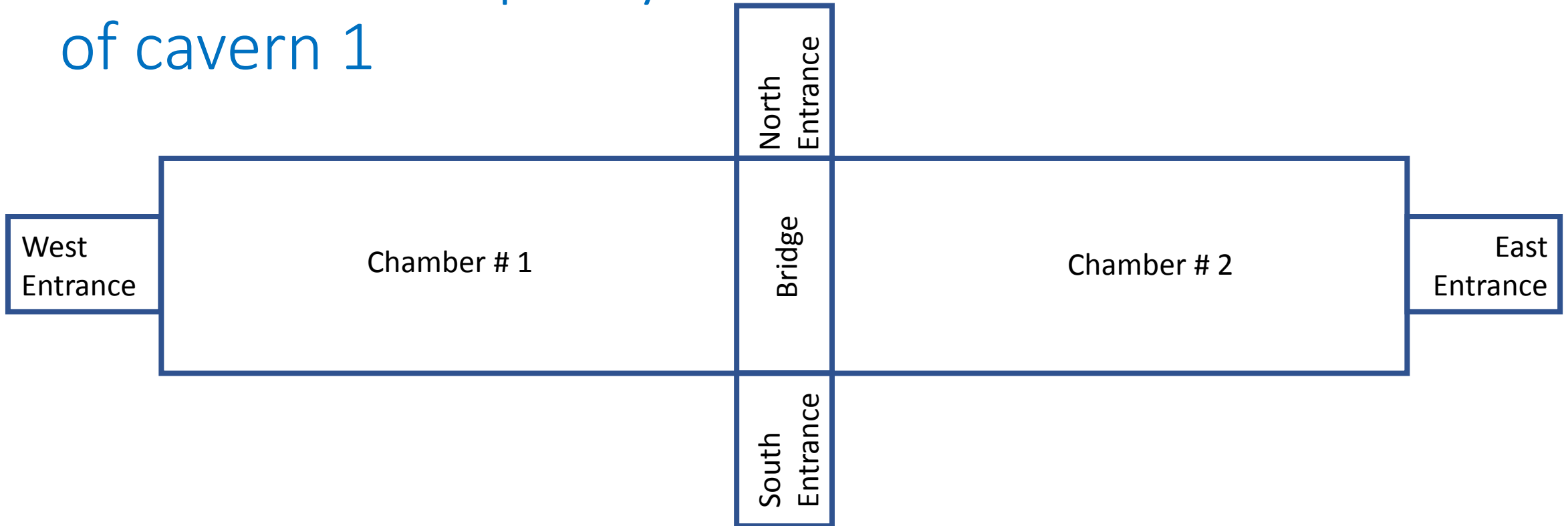
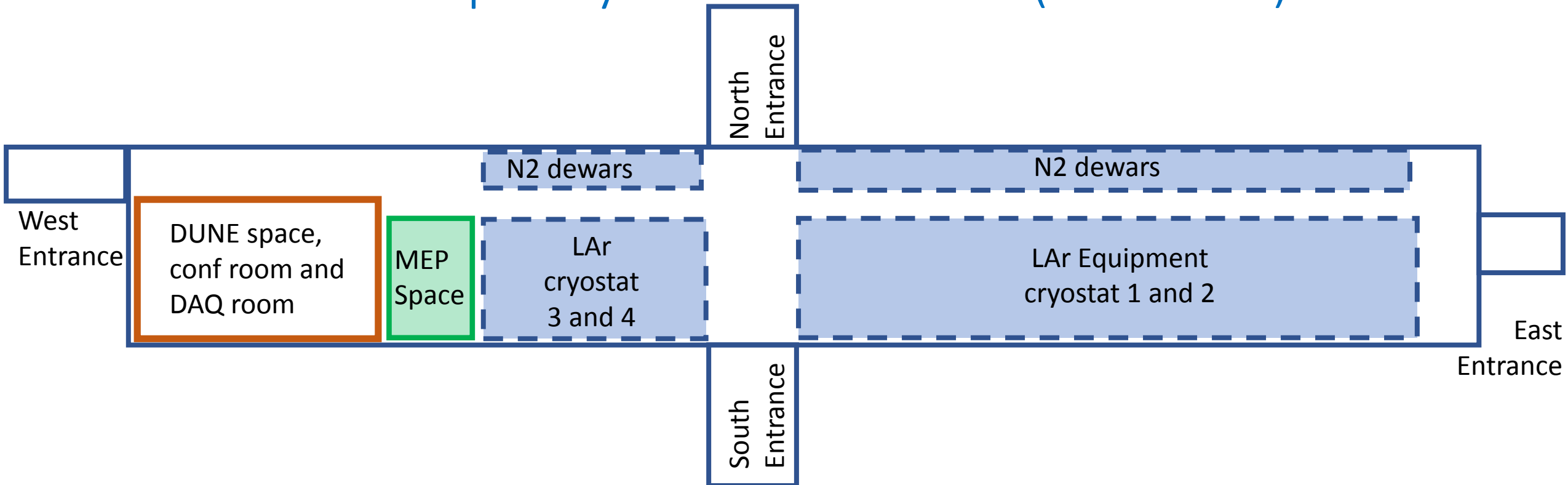


Beneficial Occupancy of cavern 1



- When the cavern is turned over from CF, there will be:
 - 4 entrances at the 4850 level.
 - A N/S bridge connection the N and S entrances.
 - Chambers 1 and 2 excavated down to the 4910 level. (6 stories deep)
 - Lighting, sprinkler system, HVAC, WiFi, conveyances and some electrical infrastructure will be available.

Beneficial Occupancy or AUP of CUC (cavern 2)



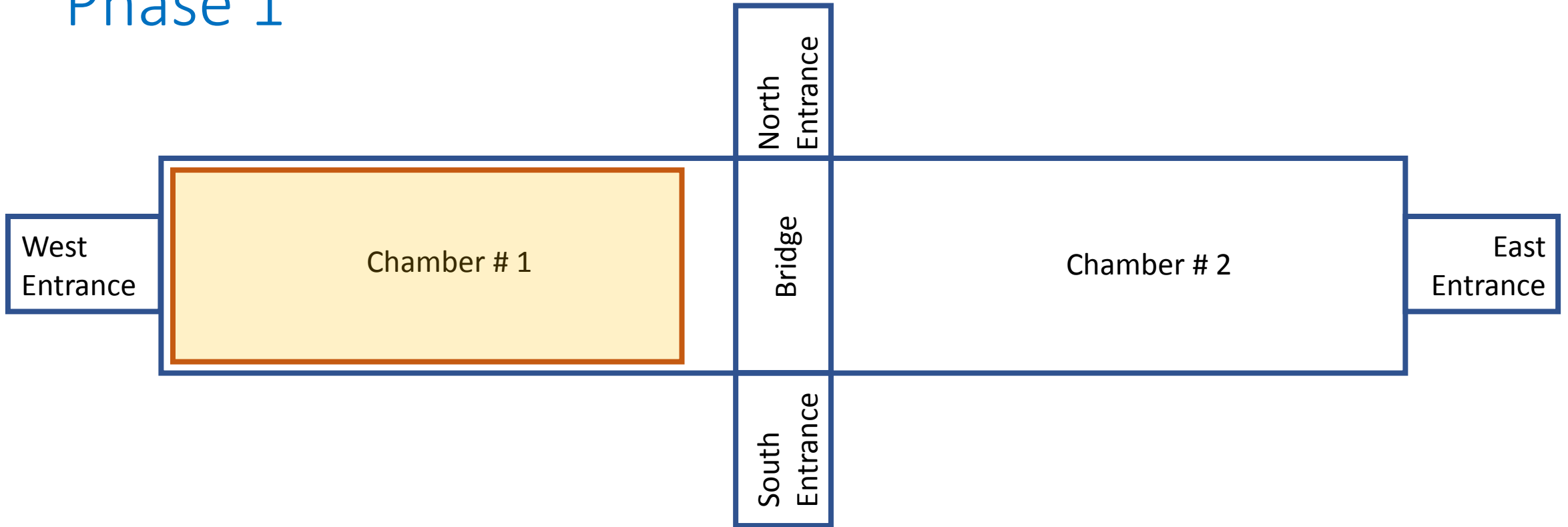
- When the CUC cavern is turned over from CF, there will be:
 - 4 entrances at the 4850 level.
 - A **CMU walled space for DUNE** that will contain the DAQ room and other ancillary space.
 - **MEP** equipment installed for the facility in the space shown above.
 - There are **4 spaces reserved for cryogenic equipment** shown above.
 - Lighting, sprinkler system, HVAC, WiFi, and some electrical, cooling water and compressed air infrastructure will be available. Final distribution to the usage points is still required.

Phasing Summary

*activity drives milestone start / finish

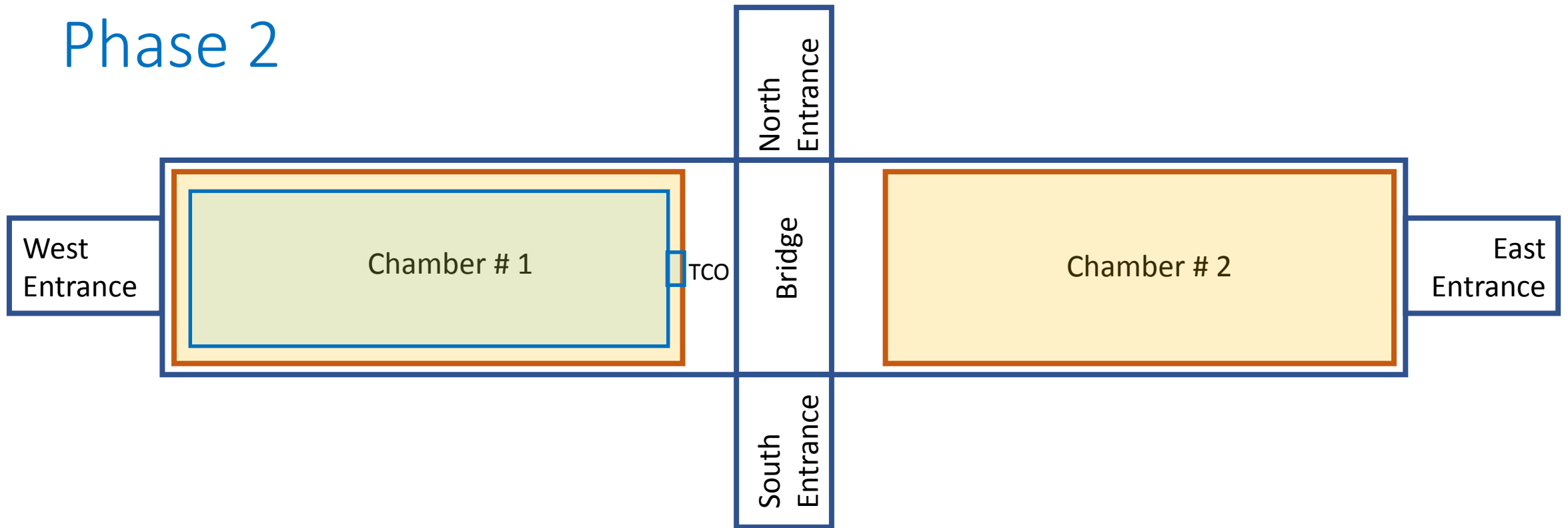
Phase	Chamber					Miles tone Start	Miles tone Finish	Projected Occupancy (# personnel)				Notes
	1	2	3	4	CUC			CF	Cryost at	Det ect or	cryo geni cs	
1	Warm structure install*	Storage	Excavation		Avail for storage	Sep-22	Mar-23	80	30-50	0	0	Bridge #1 Installation will happen with CF, what effect with the installation of the cryo piping in the shaft have on moving items down.
2	Cold structure install*	Warm structure install		Excavation	Avail for storage	Mar-23	Mar-24	80	50	0		Mezzanine #1, #2 install
3	Detector installation* - Cryo equip installation	Cold structure install			Cryo equipment installation	Mar-24	Feb-25	0	50	50	10	Cryo equip installation on mezzanine
4	TCO close - LAr filling	Detector installation* - Cryo equip Installation				Feb-25	Apr-26	0		50	10	occupancy during filling?
5	Commissioning	TCO close - LAr filling*				Feb-27	Jan-28	0				
6		Commission*				Jan-28	Jun-28					3

Phase 1



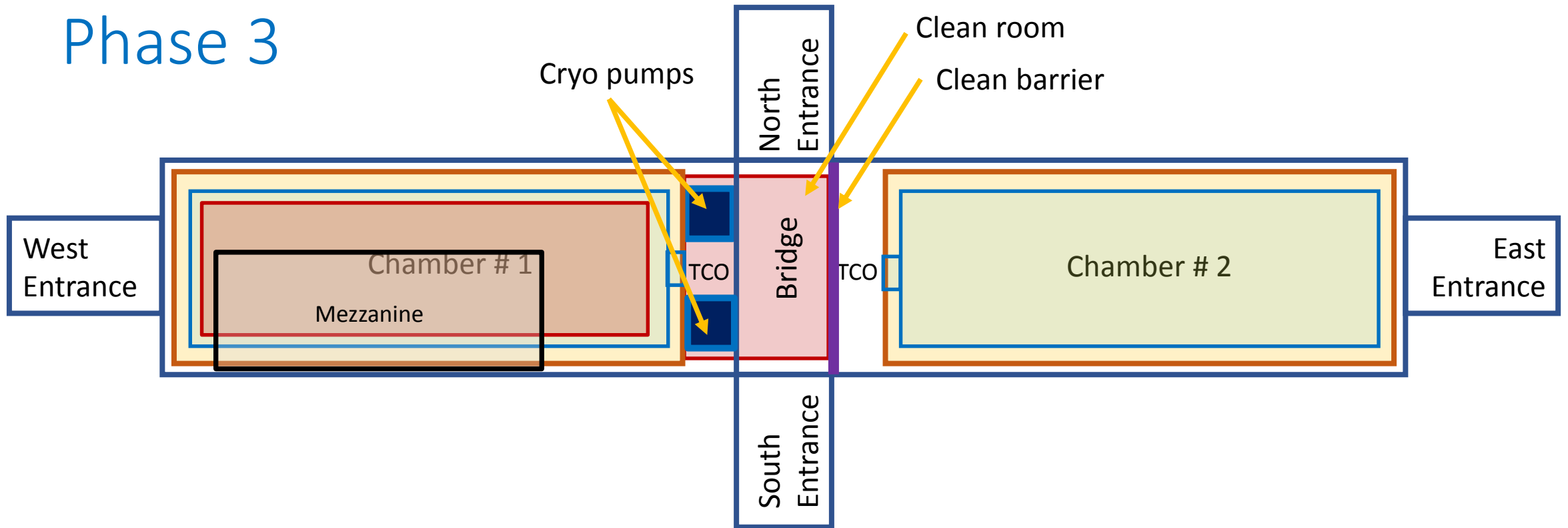
- Phase 1 will be the construction of the warm steel structure for cryostat 1 in chamber 1.
- Construction will occur from W to E with the steel members delivered thru the west entrance.
- This will be heavy steel work with welding, grinding, painting (touch up of welds, etc).
- Estimated occupancy at the 4910 will be $> 30 < 50$.
- Expect the space in chamber 2 to be used for storage and laydown space.

Phase 2



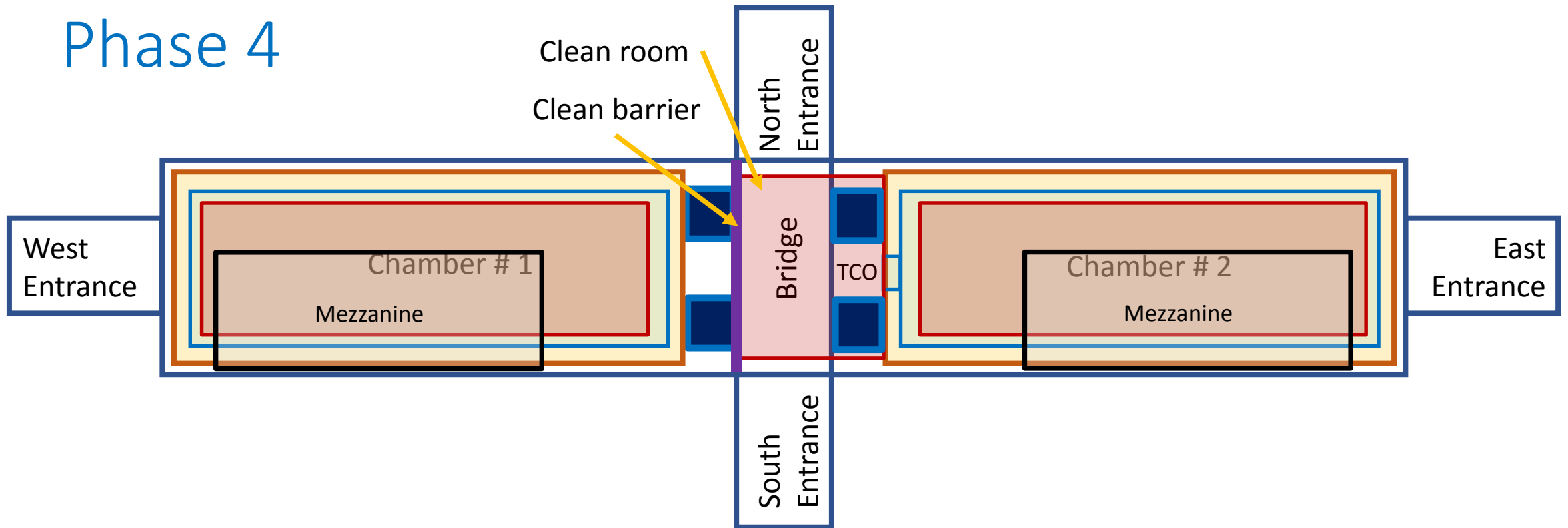
- Phase 2 will be the construction of the warm steel structure for cryostat 2 in chamber 2.
- Construction will occur from E to W with most of the steel members delivered thru the east entrance.
- The inner membrane and insulation will be installed inside of cryostat 1. Materials will come from both the W and N entrances and lowered down to the 4910 level. Materials will enter the cryostat through the TCO at the E end.
- This will include the use of scaffolding, rigging and overhead hoists, application of mastic, welding of the thin membrane, grinding and polishing.
- Once complete, there will be leak testing of the membrane, cleaning of the membrane (pressure washing) and the installation of the internal cryogenic distribution piping.
- Estimated occupancy at the 4910 will be > 50.

Phase 3



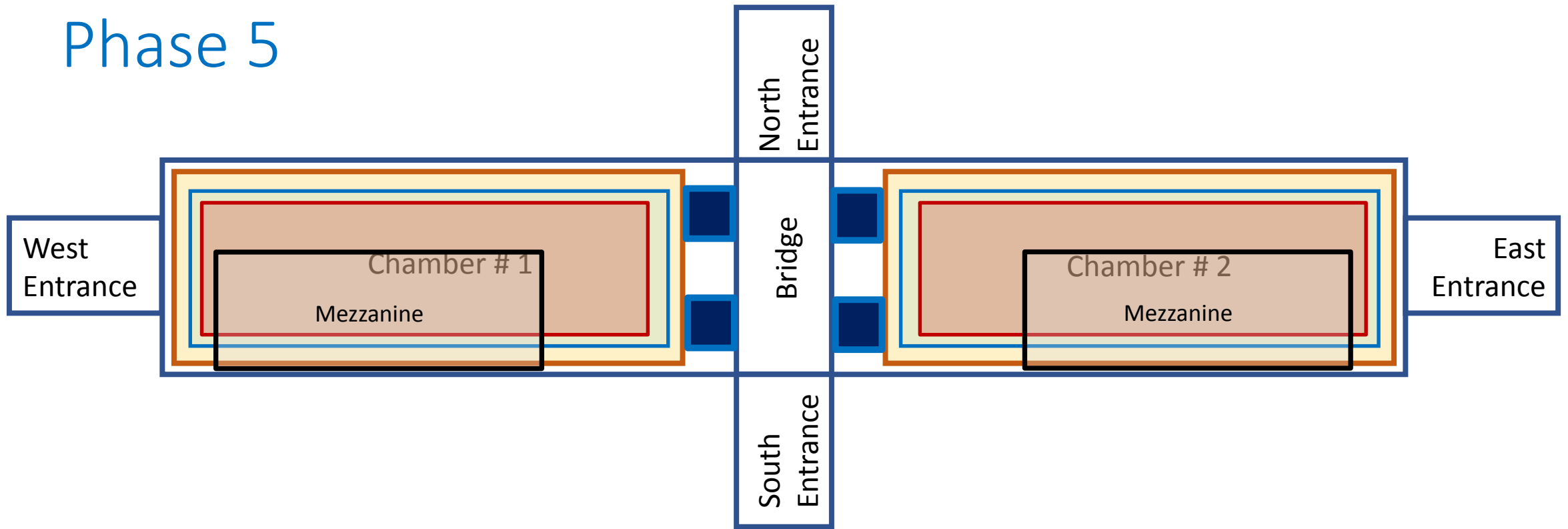
- Phase 3 will be the installation of the inner membrane and insulation in cryostat 2. Materials will enter from the East entrance.
- DUNE will construct a clean room at the 4910 level. Approximate cross section shown in the figure below the bridge.
- DUNE will install the detector inside cryostat 1 thru the clean room at 4910 and TCO. Materials will be delivered thru the N entrance.
- The mezzanine will be installed over cryostat 1 along with the installation of the proximity cryogenics. – happens in phase 2 according to the current schedule
- This will be steel work with welding, grinding, rigging and lifting. The cryogenics will add cabling, cryogenic piping and mounting of components on the mezzanine and in the CUC and in chamber 1.
- Nearing the end of the detector installation, the 4 cryo pumps and valves will be installed at 4910. This will need to be coordinated between DUNE and cryogenics.
- Once the detector is complete, the TCO will be sealed. This happens in phase 4 (according to the schedule)
- Estimated occupancy at the 4910 will be > 50.

Phase 4



- Phase 4 will require the clean room to be reconfigured over to be used for the installation of the detector in cryostat 2.
- DUNE will install the detector inside cryostat 2 thru the clean room at 4910 and TCO. Materials will be delivered thru the N entrance.
- The mezzanine will be installed over cryostat 2 along with the installation of the proximity cryogenics.
- Cryostat 1 will begin cryogenic operations. This includes the purge, cooldown and LAr fill. Need to confirm operations at 4910 after the introduction of cryogens in cryostat 1.
- Near the end of detector installation, the cryogenic pumps and valves for cryostat 2 will be installed at 4910 L.
- The TCO will be closed for detector 2 when installation is complete and the clean room removed.
- Estimated occupancy at the 4910 will be $> 30 < 50$.

Phase 5



- Phase 5 will have the commissioning of the cryogenic and detector systems in cryostat 1.
- Cryostat 2 will begin cryogenic operations. This includes the purge, cooldown and LAr fill.
- Estimated occupancy at the 4910 will be < 10 at 4910 for cryogenic maintenance.

Considerations

- Crane can no longer be used after mezzanine installed
- Mezzanine is 2.1m, affixed to the rock wall with hangers and suspended from the top of the cavern. It is not attached to the warm structure of the cryostat