

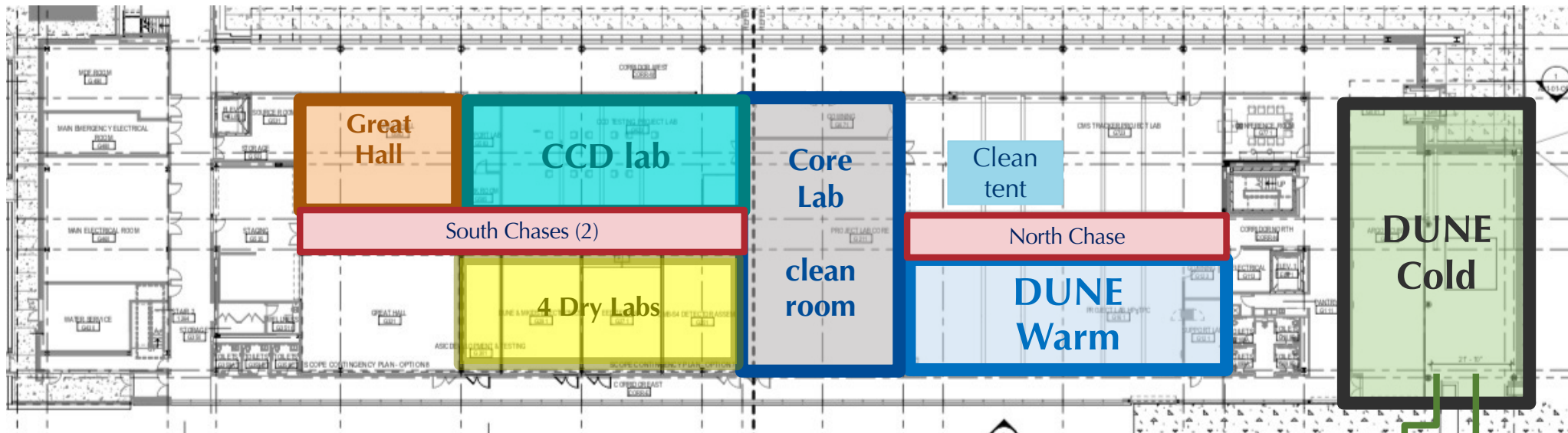


IERC Update for Neutrino Division

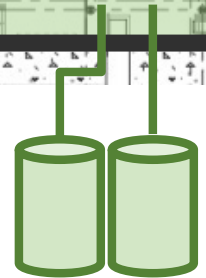
- What's in the ND labs & the plans for them
- Status

Leo Bellantoni
ND Biweekly
November 29, 2022

Ground floor map



External
Dewars

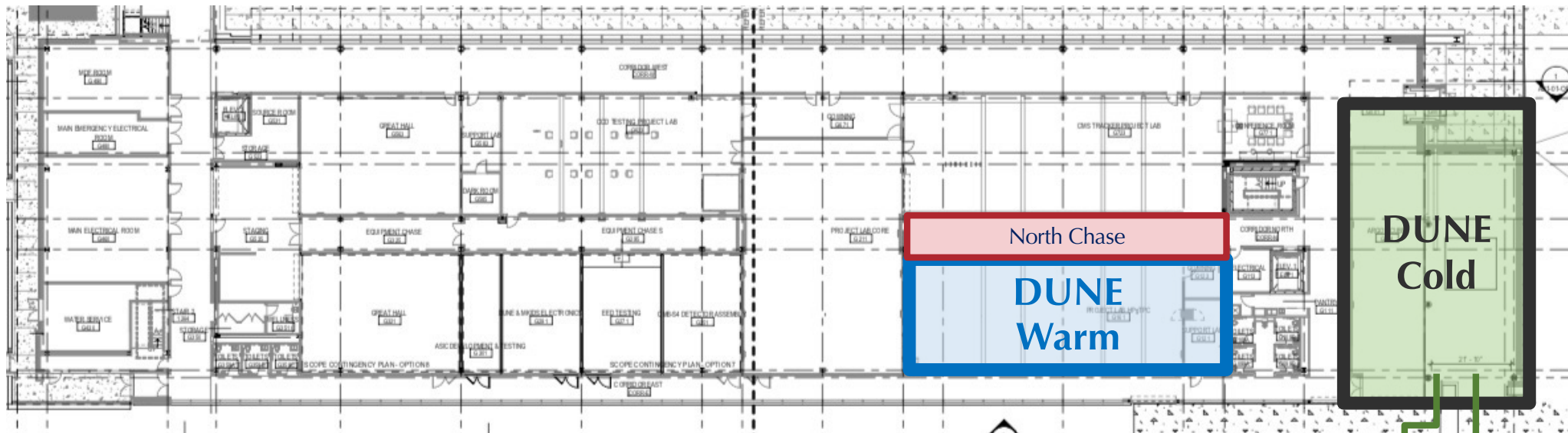


~400 ft end-to-end

Build-for-expansion: many spaces not outfitted initially

Offices are upstairs

Ground floor map



The areas of particular interest to Neutrino Division are the 2 labs which begin with DUNE related work.

External
Dewars

One is designed for work with cryogenic liquids (DUNE Cold) and the other not (DUNE Warm).

DUNE Cold Lab



- 3100 sq ft
- Cryogen resistant epoxy floor
- Cryogenics enter on east side through trench
- 15000 SCFM venting for ODH
- 25 ton gantry crane
- 35 ft high bay
- Vibrationally isolated 17' x 17' pit, 5' deep
- Trenches for cable runs in floor
- 4 service panels

View from east side facing west; glass is on north side

Shows upper floor (1st) workspace area through glass to left

This architect's rendering is a little dated re the specific equipment we will put into this lab

Lab Service Modules



- Compressed air (100 psig)
- Lab vacuum (21 torr, runs through long thin pipes to S end of building)
- Boil-off N₂
- Electrical ground
- Cat6 connections
- Standby power (10 sec back or better)
- Fiber optic data connection for future upgrade

Above the service panels, trays run AC power and Cat6 lines around the lab perimeter

Cat6 lines go to chases for connection to external internet

DUNE Cold Lab Program

- The 1st project is prototype testing of the photon detection for the Vertical Drift Far Detector modules; it should be finished in 2024. Initial deployment uses 160 liter Dewars to feed small open vessels, as is now being done in PAB. This should not, given the size of the room, require an ODH system.
- The 2nd project is the installation and use of a cold box (~2m × 2m × 2m) for the testing of cryogenic robotics. Initial need is for LN₂; at this point we expect to need an ODH system and the external Dewars in place.
- The 3rd project in DUNE Cold is the cryogenic testing of modules for the liquid Argon detector of the DUNE Near Detector. This should start in 2026 and run through 2028. It will incorporate 2 Dewars of ~1.5m dia, 4.5m height. The current DUNE project plan calls for testing in LN₂.
- After 2028, this room will act as an R&D facility similar to what we are now doing in PAB – which will need also LAr.

External Dewars

- Until recently we had planned to take the 3000 liter N_2 Dewar in the Meson Area and move it to replace the 5000 liter Dewar that provides boil-off N_2 for SiDet; then we were planning to move that 5000 liter Dewar to IERC.
- The LAr Dewar would have been purchased new (~150k\$) in this scenario.
- It is becoming clear that there isn't another scientific program on the horizon for the Dewars now at LArTF; these have much more capacity (11,000 gal LN_2 , 6500 gal LAr)
- Located across the berm inside the TeVatron ring – transfer lines then run to DUNE Cold Lab.



DUNE Warm lab



- 2000 sq ft
- Upgradeable to clean room
- 10 ton gantry crane
- 8 service panels
- Adjacent support lab
- Vents for high pressure gas systems to exterior
- Vibration isolated cement floor
- Trenches for cable runs in the floor

The DUNE Warm lab will provide assembly area support for the DUNE Cold lab. It will also initially host prototypes for the DUNE Near Detector gas phase R&D.

DUNE Warm lab



Service panels on walls facing the chase have feedthrough ports – can put noisy or other supporting equipment in chase, albeit with some space limitations, & feed cables through these ports

Status and Plans

- Although we have Authorization for Use and Possession, the contractor (Mortenson) will still be finishing up in the building.
- Josh Kenney (IDS) & I will coordinate access to prevent conflict with the contractors.
- Could last through December (punchlist items)
- Access for personnel is easy but access to set up equipment is problematic

- When Mortenson is finished, access will be by card reader. Most of the building needs the same level of security as Wilson Hall, but lab areas will need restrictions.
- A lab safety training, akin to what we have in FTBF and PAB is to be introduced by the time Mortenson is finished. People working in the labs will get training notices in their emails.

Status and Plans

No office furniture.

Very very limited WiFi possible before January

No conference room furniture.

Not enough A/V equipment in the conference rooms to have a meeting with.

Lab benches are there in the DUNE Labs, but...

No lab stools next to those benches.

No dry nitrogen from the service panels.

Because of this initial state and access, we will first concentrate on getting started with cryo & ODH systems, chilled water distribution and other infrastructure into the building.

I anticipate that few people will want an office with neither furniture nor WiFi, so filling in offices will happen later – spring or more likely summer 2023

Status and Plans

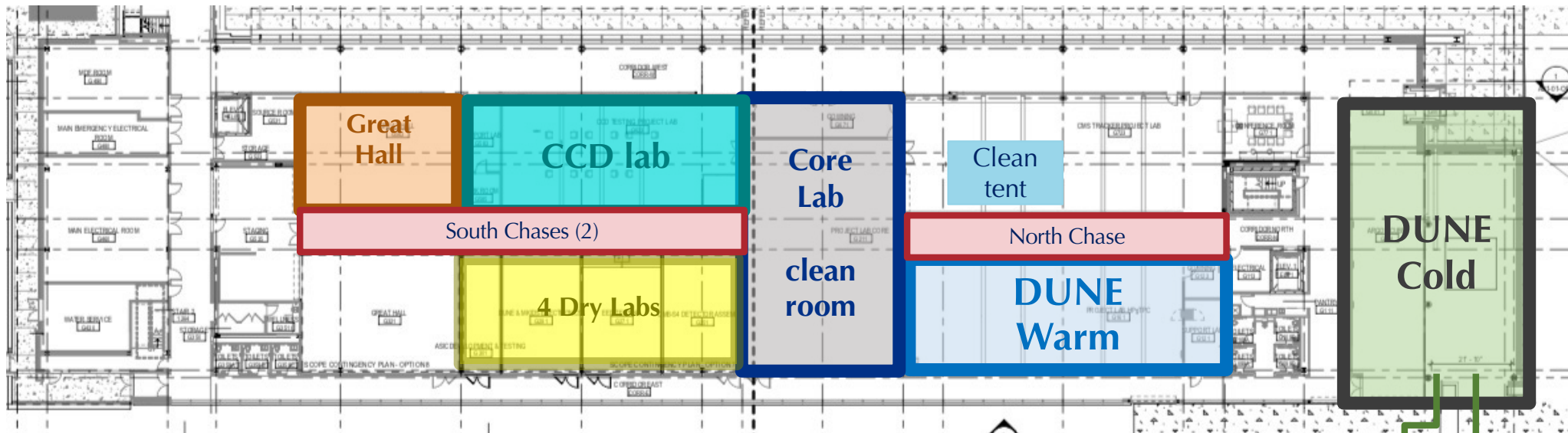
- By January we should be able to start moving in (ND only here):
 - Vertical Drift Photon Detector tests using 160 liter Dewars in Cold Lab.
 - First “Turn the crank” on our ORC process with ODH (& Class 4 laser, at some point) considerations
 - Do need a little IT connectivity
 - Gonna have to take something to sit on with them when they move!
 - Move ALICE readout modules out of environmentally uncontrolled storage into DUNE Warm Lab
 - At an appropriate break in their experimental program, move GOAT test stand from PAB to Warm Lab
 - ORC process will need a minimal ODH analysis and radioactive source considerations
 - Do need a little IT connectivity
 - Again, lab stools needed
 - Readout / control system similar to what is in PAB - not in 1st 6 months

Status and Plans

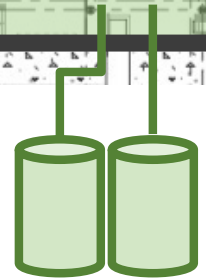
- Design, install, review ODH systems – through 2023
- Move install & refurbish Dewar system – through 2023, as funding permits.
 - Some funding (about 60%) has already been identified
 - No task codes yet
- Office Furniture (on-project for IERC) – early 2023
- Wired Networking – limited capacity by Jan 2022, full capacity mid-2023
- Wireless Networking – mid-2023 based on lead times from vendor (~400 days)
 - This will allow occupancy of office space
- Fit-out of future expansion areas to allow the lab to grow into the new facility – aim is to be finished with that by end of FY23

Additional material

Ground floor map



External
Dewars



~400 ft end-to-end

Build-for-expansion: many spaces not outfitted initially

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Core Lab

- Day-1 cleanroom will contain precision metrology and equipment used for detectors requiring high precision construction techniques – wirebonders, an optical gauging station, coordinate measuring machines, microscopes etc.
- Initial needs are driven by CCD based dark matter searches (OSCURA, etc) and cosmic microwave background measurements (CMB-S4).
- Ultimately, this lab will support a wide range of IERC programs in the way that Lab D supports a wide range of SiDet work.
- This work is now being done in SiDet, and HL-LHC needs to expand as they move into production phases for their different subsystems; they will occupy Lab C in the SiDet complex completely.

Great Halls

- Designed to hold a grove of dilution refrigerators
 - A 2nd grove in a 2nd hall is part of the expansion
- Potential future projects include
- Qbits as particle detectors
 - Novel single-photon calibration source R&D

Dry Labs

- 4000 ft² of general lab space in 4 rooms
- CMB-S4 will use one room, along with the Core lab and the Great Hall
- Tech benches in the second room. After expansion provides space for them upstairs in the building, this room is probably detector electronics engineering/test
- Detector electronics engineering/test in the third room
- ASIC testing in the fourth room
- CMB-S4 work now being done in SiDet, and the rest on WH14.

CCD lab

- For testing and assembling Skipper readout CCDs for dark matter searches. An adiabatic demagnetization refrigerator now in Lab C will be moved into IERC.
- We also plan to move a stand-alone cleanroom now in Lab C in support of this activity into the (unfinished) G-West area.
- CCD work now being done in SiDet's Lab C.

