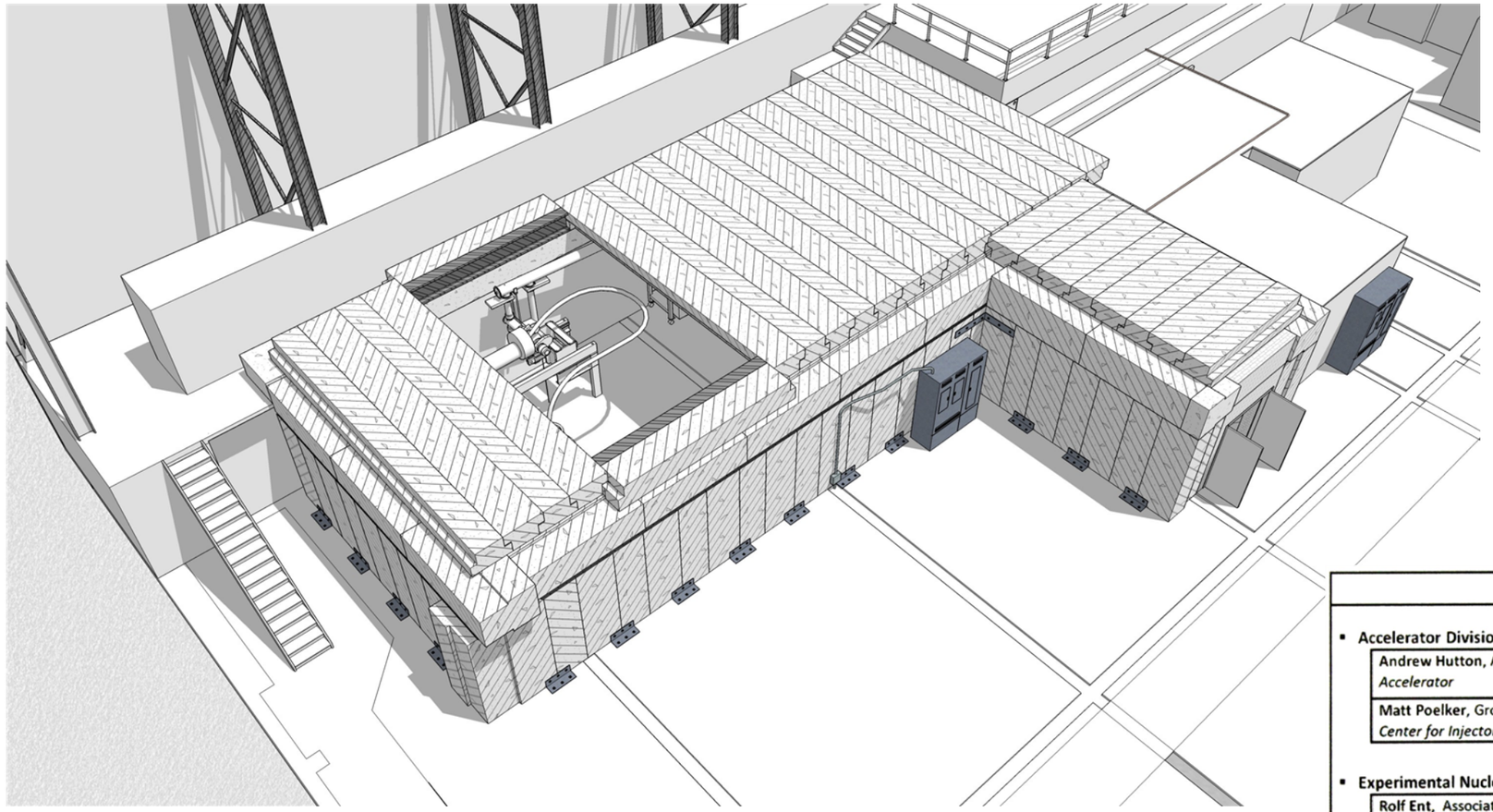
Injector Test Facility
Shield House Specifications



Approved by:

- **Accelerator Division**

Andrew Hutton, Associate Director *Accelerator*	Andrew Hutton	1/30/2015
Matt Poelker, Group Leader *Center for Injector Studies*	by Matt Poelker	1/30/2015

- **Experimental Nuclear Physics Division**

Rolf Ent, Associate Director *Experimental Nuclear Physics*		1/30/15
Andy Sandorfi, Group Leader *HD-Ice Experimental Program*	Andrew Sandorfi	1/30/15

Jefferson Lab
Thomas Jefferson National Accelerator Facility

Walt Akers/Experimental Nuclear Physics

Phone: 757/269-7669
Cellular: 757/846-4810
E-Mail: akers@jlab.org

Injector Test Facility Shield House

Installation of PreCast Shield Blocks

Blocks and Placement

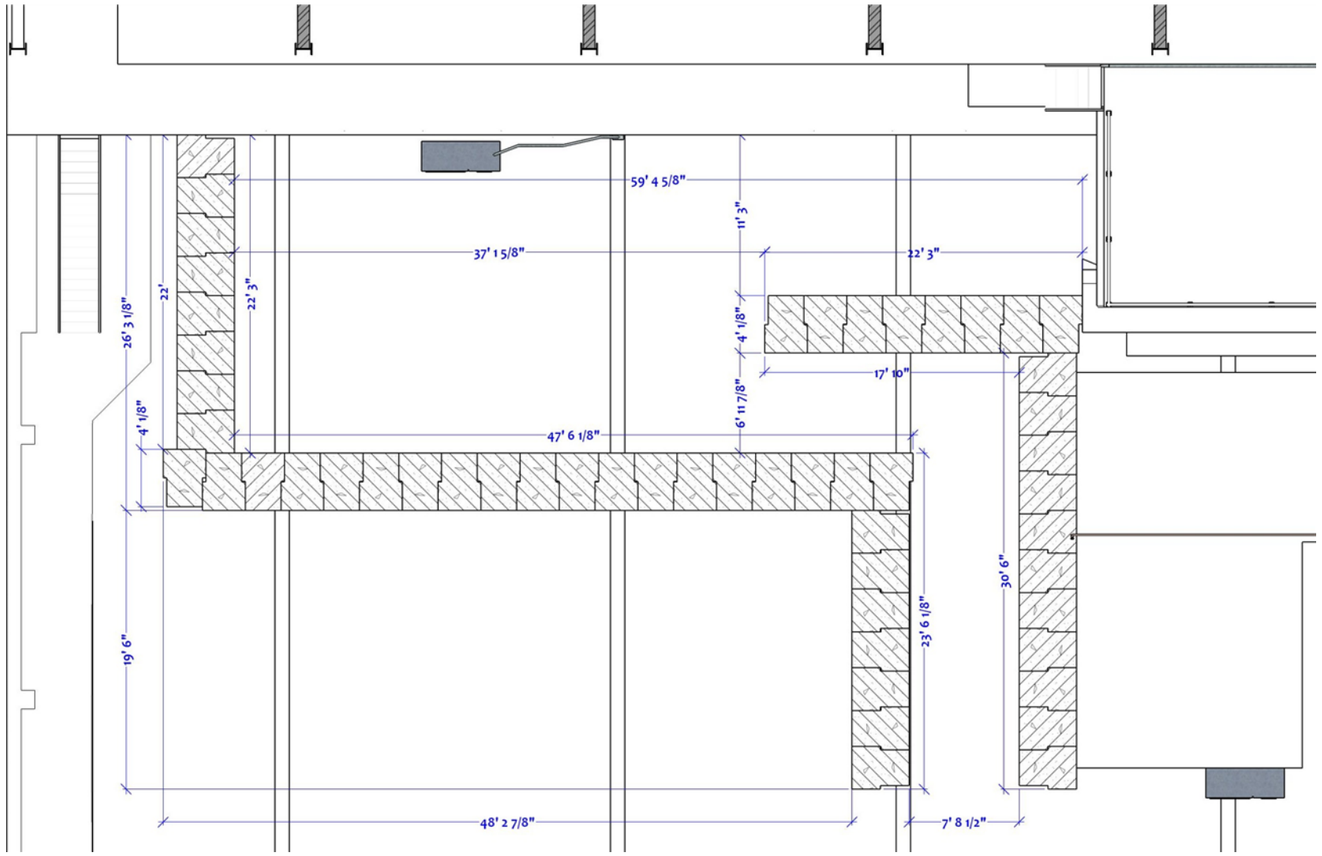
1) Blocks are from existing stock and measure 48"x 36"x 108".
2) Blocks will be installed in the configuration shown by Physics staff.
3) Position of northern most row of blocks is dictated by crane access.

Radiation Control Assessment

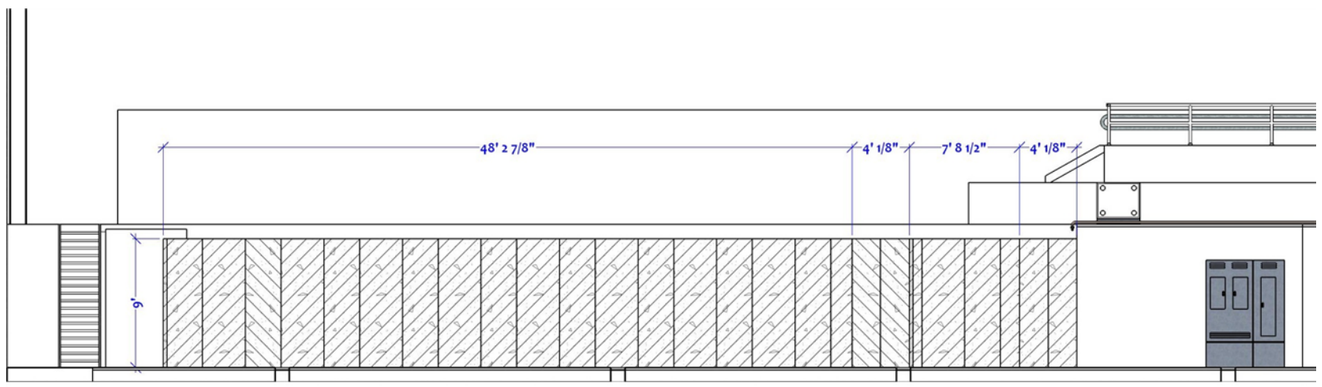
5) RadCon has evaluated each block during the delivery process.
6) Blocks located nearest to work areas will be non-irradiated.
7) RadCon has conducted a preliminary evaluation of the block layout.
8) Final RadCon approval is required before completion of the installation.

Facilities Assessment

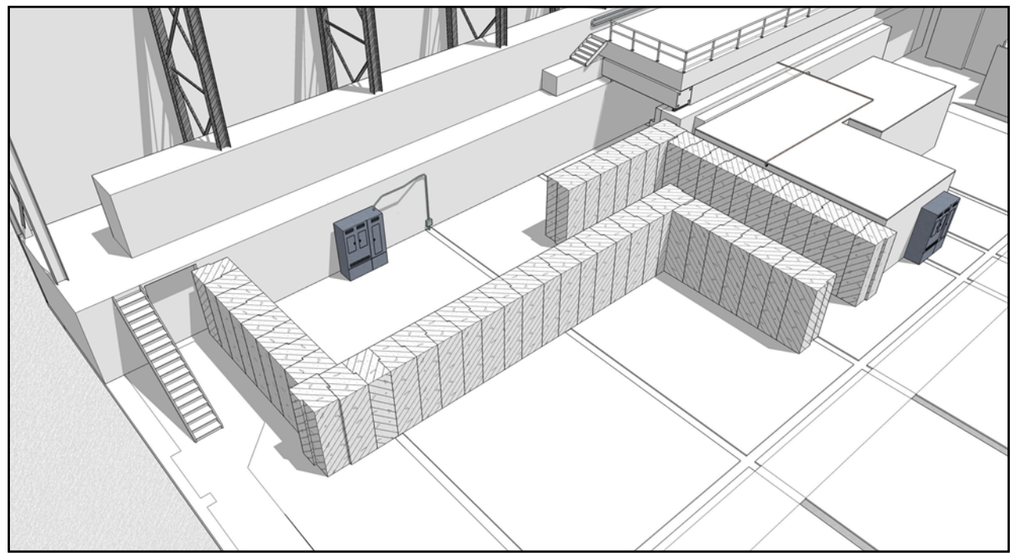
9) Facilities must specify any seismic bracing requirements.
10) Bracing will be manufactured by Physics/Accelerator staff.



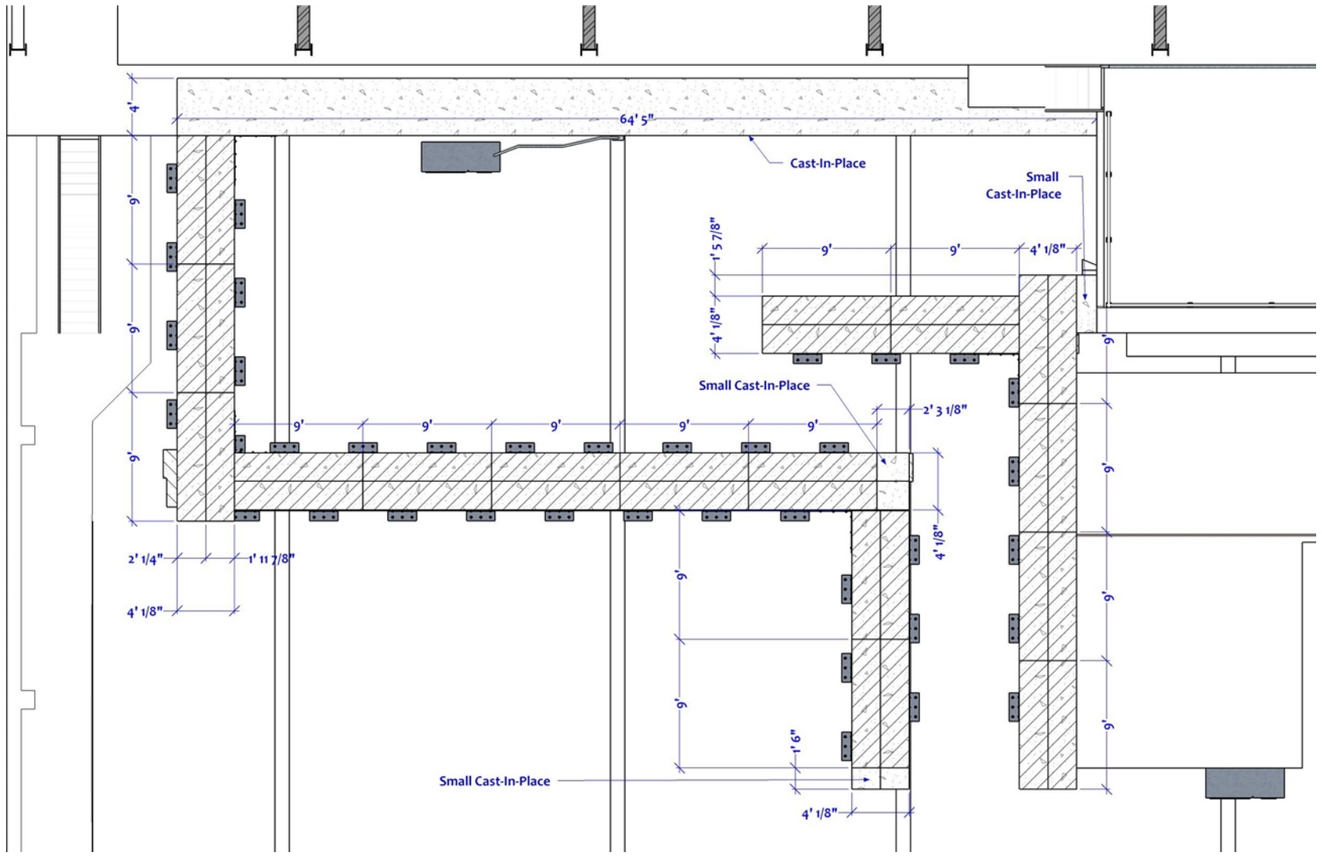
Plan View: PreCast Shielding Block Installation



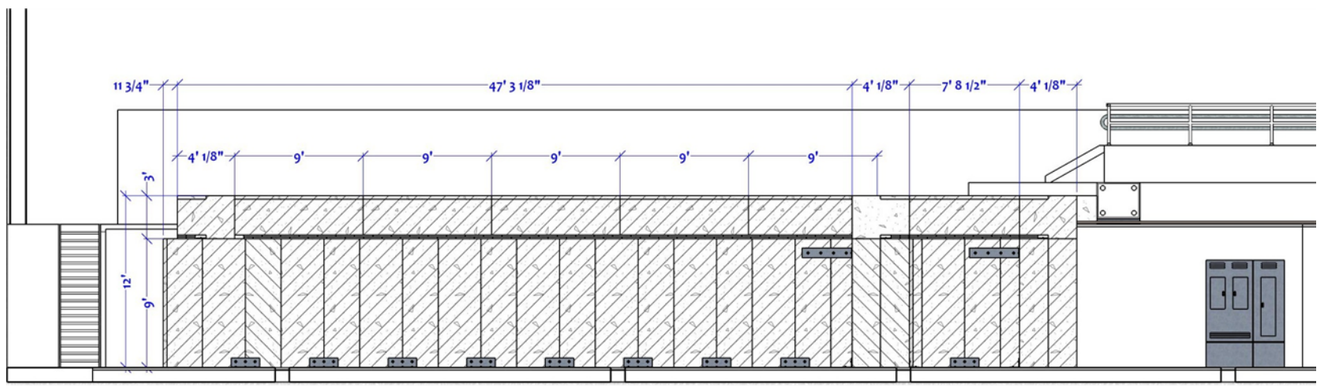
Elevation: PreCast Shielding Block Installation



Perspective From Northwest



Plan View: PreCast Upper Shielding Block Installation



Elevation: PreCast Upper Shielding Block Installation

Installation of PreCast Upper Shield Blocks

Blocks and Placement

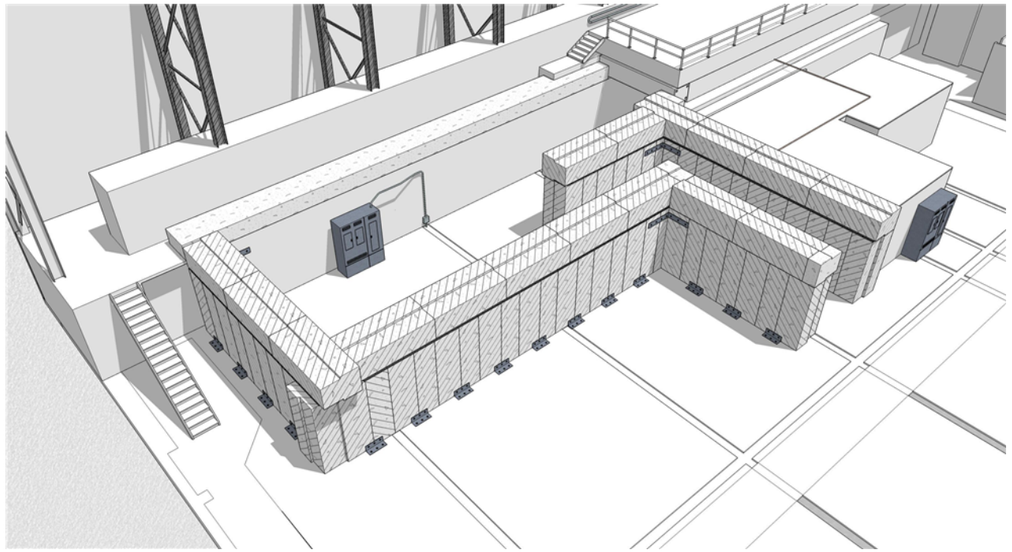
1) Blocks are from existing stock and measure 48"x 36"x 108".
2) Blocks will be installed in the configuration shown by Physics staff.
3) Blocks have 3" rebate along half of the 48" side to allow interlocking fit.
4) The 3" rebate will be filled with two courses of 1-1/2" thick concrete blocks.
5) These blocks provide support, as well as increased radiation protection.

Cast Concrete

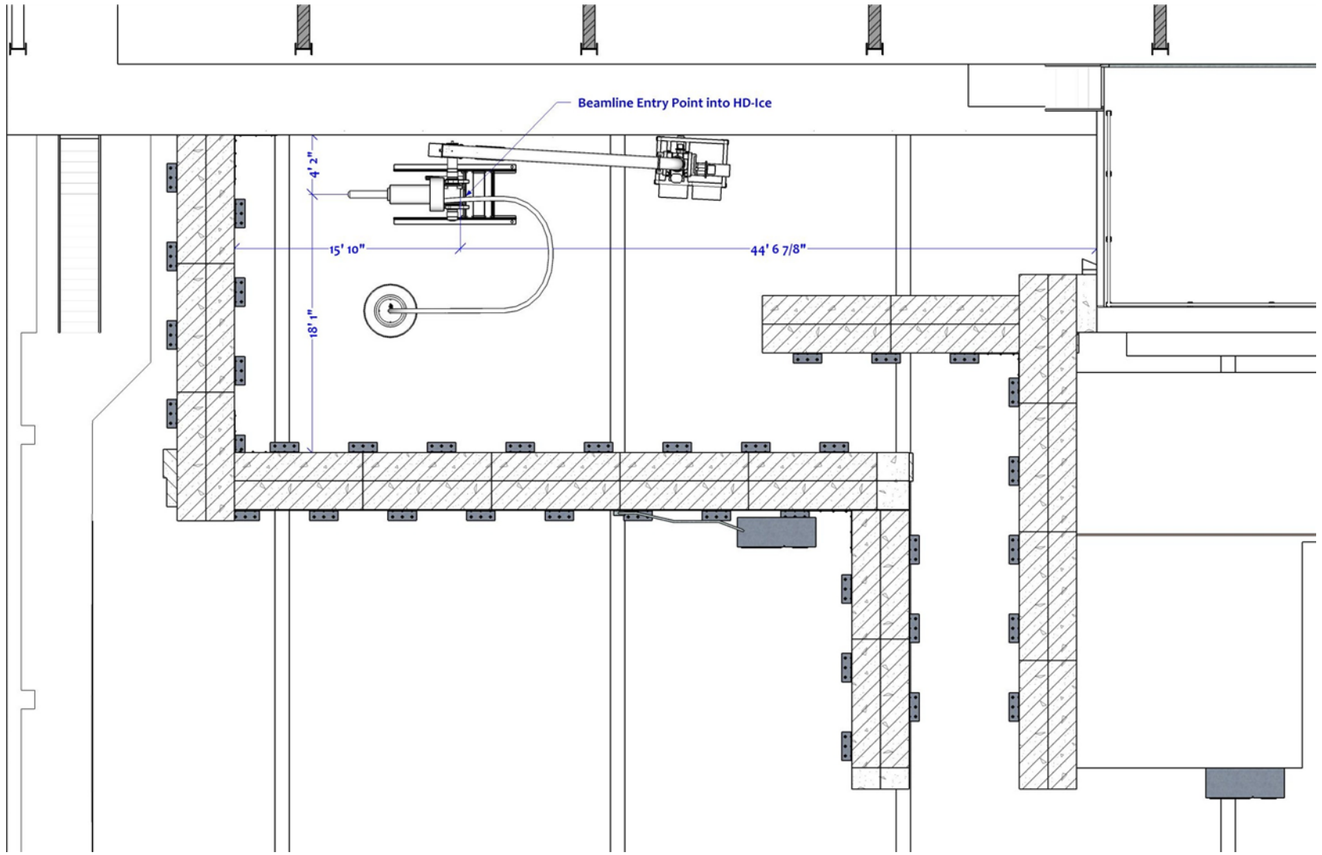
6) The rear wall will be brought level with the shield blocks by adding a 24" x 48" x 64' 5" cast-in-place concrete slab.
7) Small cast-in-place sections will be used to close gaps in upper blocks.
8) Electrical service and infrastructure may conduits may be integrated into the cast-in-place concrete.

Facilities Assessment

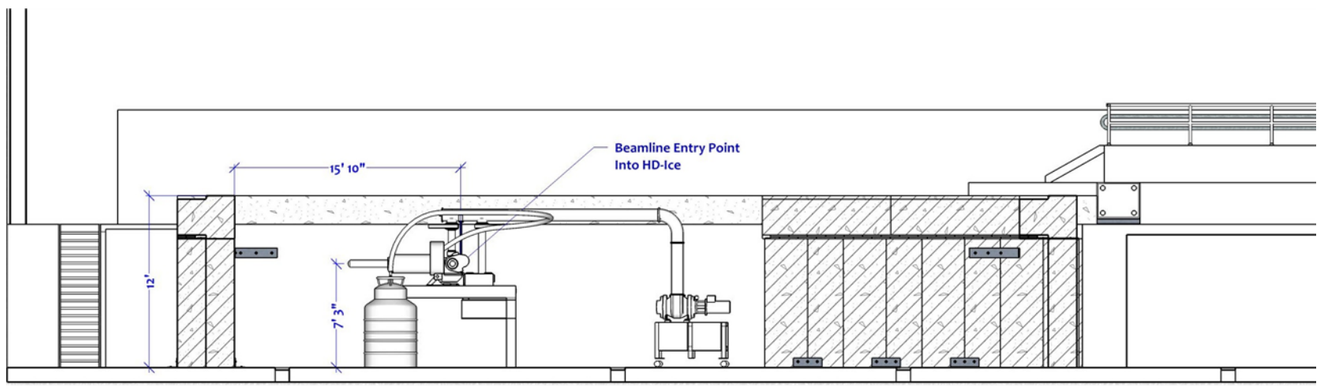
9) Seismic bracing shown in these images is for illustration only.
10) Facilities must specify any seismic bracing requirements.
11) Bracing will be manufactured by Physics/Accelerator staff.



Perspective From Northwest



Plan View: Placement of HD-Ice Apparatus



Elevation: Placement of HD-Ice Apparatus

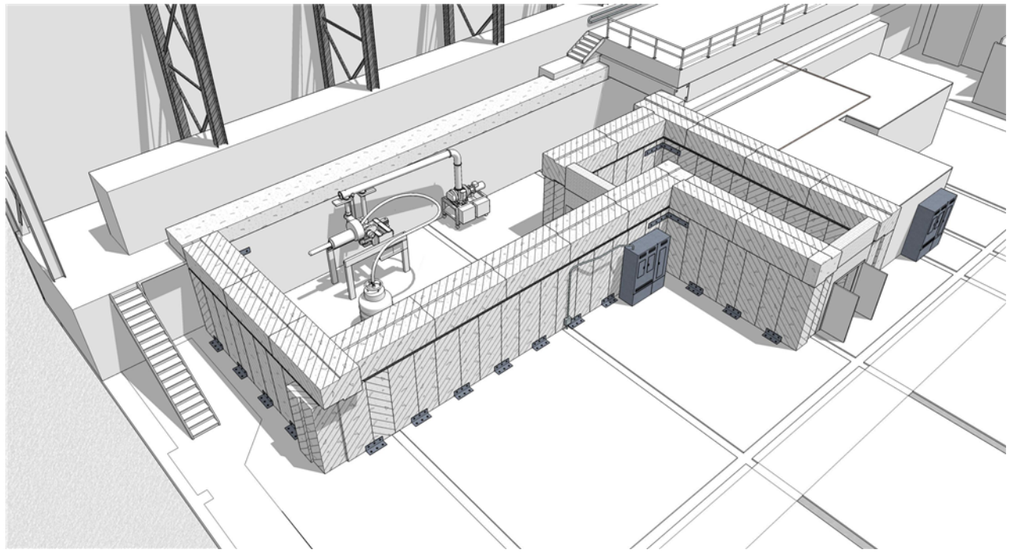
Placement of HD-Ice Apparatus

Experimental Installation

1) The beamline entry point into HD-Ice will be as shown.
2) The beamline elevation will eliminate the need for any pit or trench.
3) Experimental apparatus will be installed through the removable roof.

Infrastructure Requirements

4) The electrical power distribution switchboard must be relocated outside of the experimental enclosure.
5) To maintan frozen target during power outages, HD-Ice will require electrical service connected to their existing deisel generator.
6) Lighting and convenience receptacles do not require generator power.
7) Specific HD-Ice electrical requirements will be provided in a separate document.
8) HD-Ice will require minimal (1 gpm) low conductivity water (LCW), which can be provided from the existing feed in the primary test cave.
9) Any LCW required for magnets or beam dumps will be provided through the existing feed in the primary cave.
10) Cryogens (LHe) will be provided using a helium dewar supplied by the Engineering Department.
11) A warm gas recovery line and vaporizer will be installed by the Engineering Department to capture helium boil-off.



Perspective From Northwest

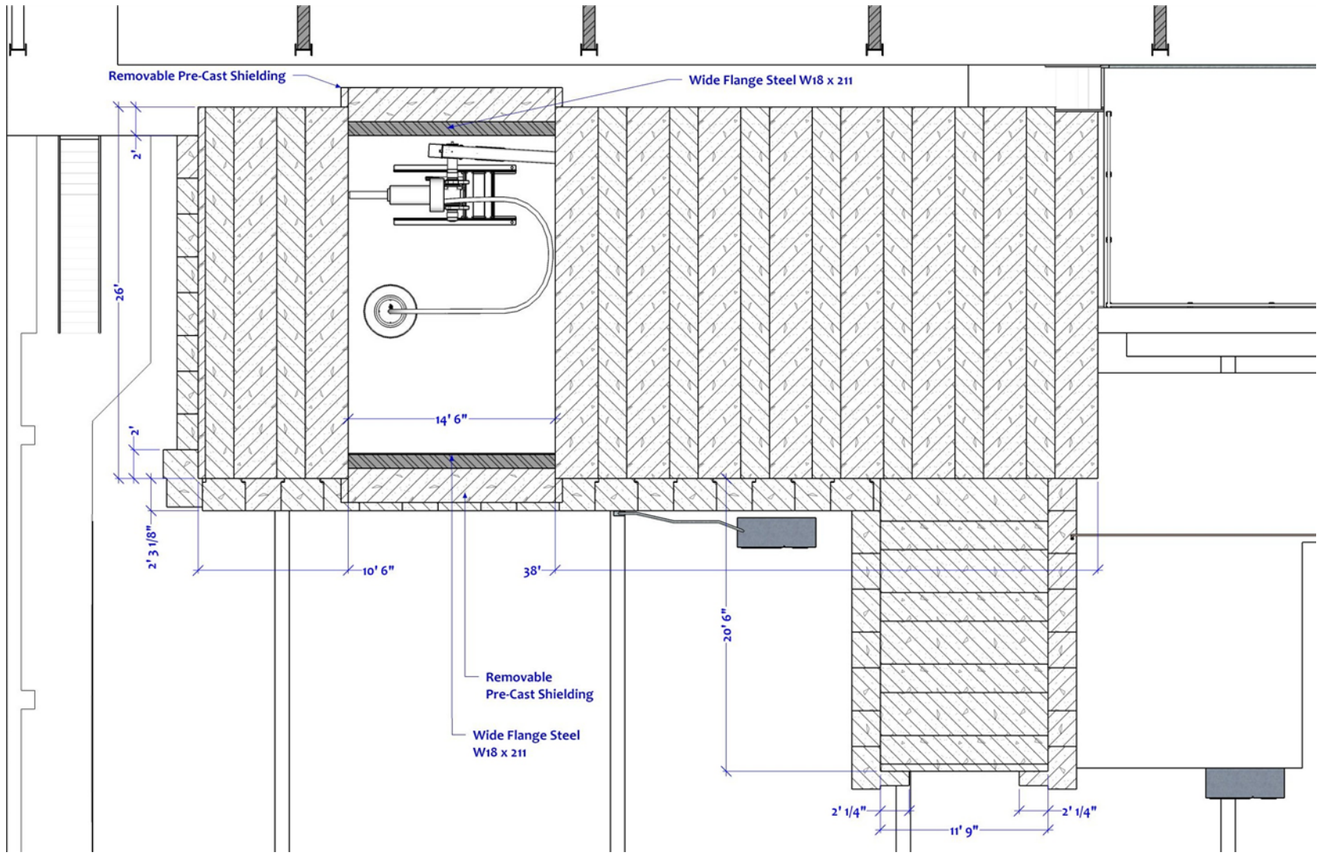
Placement of Lower Roof Beams

PreCast Roof Beams

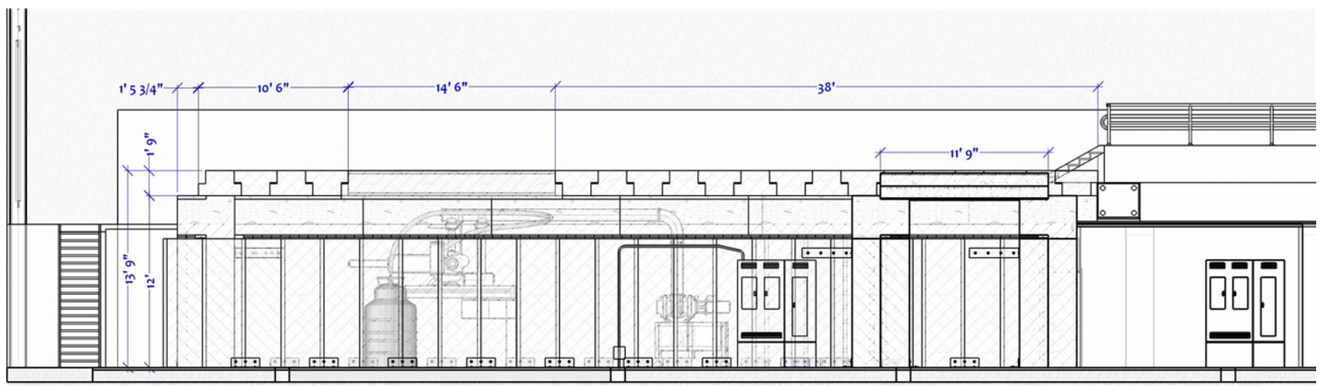
1) Long roof beams are from existing stock measuring 21" high x 36" wide by 21' long.
2) Each roof beam is in a T configuration with a face that is rebated to 24" on center on the obverse side of the 36" wide face.
3) Shorter roof beams, used over the labyrinth, are cut from long beams.
4) A 14' 6" opening is positioned immediately above the HD-Ice experimental apparatus as shown in the figures.

Structural Steel and Cast Shielding

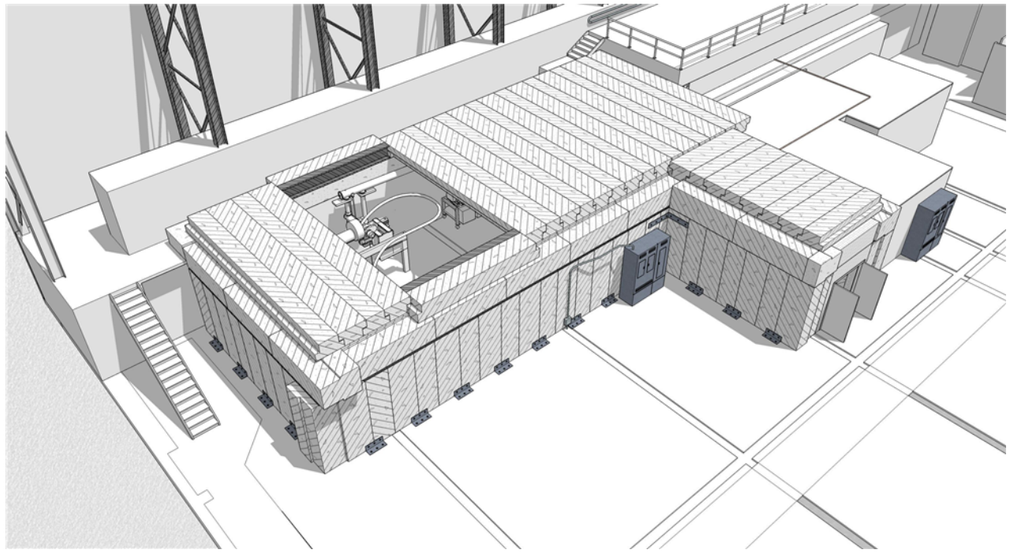
5) A W18 x 211 steel girder is installed on each side of the 14' 6" roof opening.
6) Removable cast concrete shielding is fitted (perhaps integrated) with the W18 x 211 structural steel to provide shielding.
7) RadCon must evaluate the shielding design to ensure adequate protection.
8) Facilities must specify how they want this removable girder/shielding system to be fastened to the upper shielding blocks.
9) Physics/Accelerator will fabricate the support and shielding.



Plan View: Placement of Lower Roof Beams



Elevation: Placement of Lower Roof Beams



Perspective From Northwest

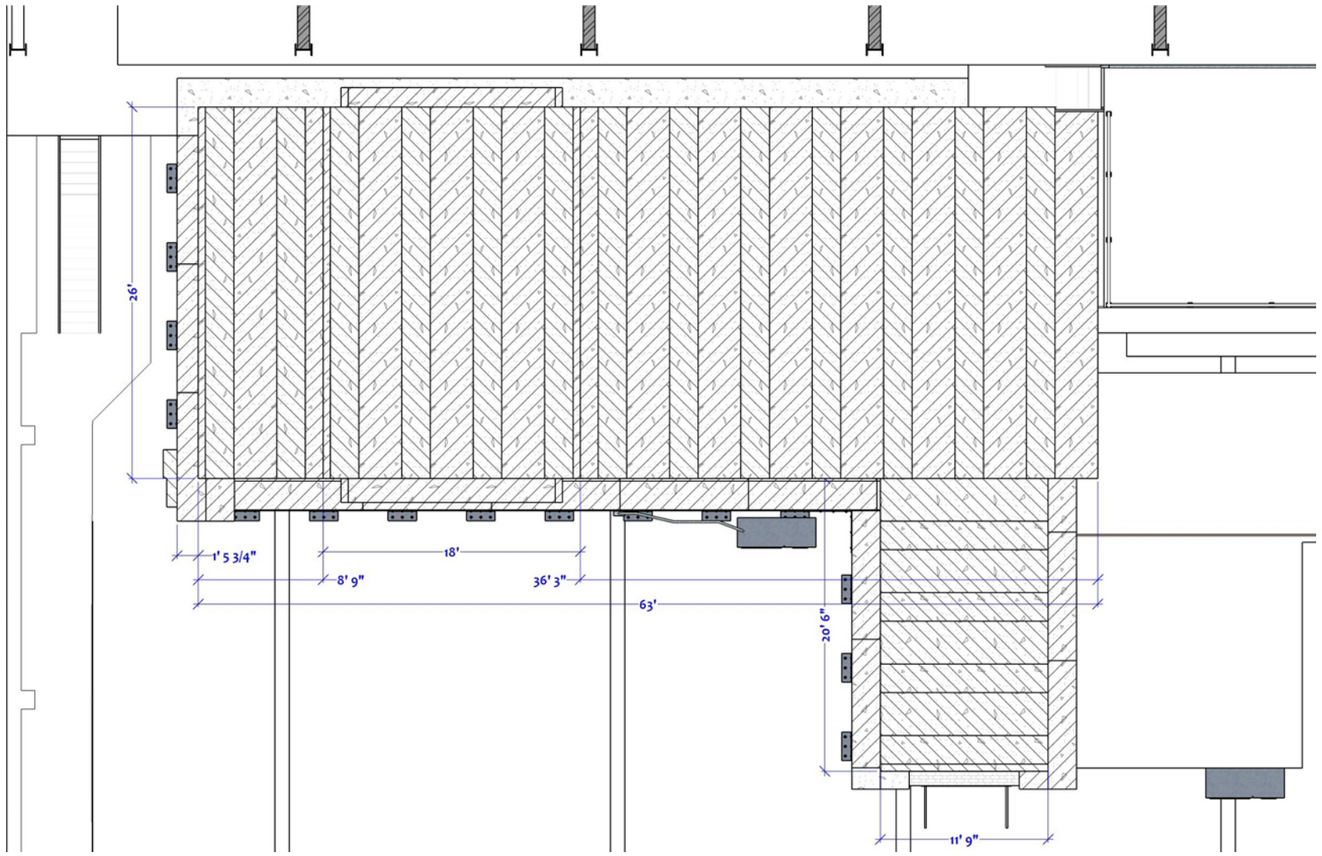
Placement of Upper Roof Beams

PreCast Roof Beams

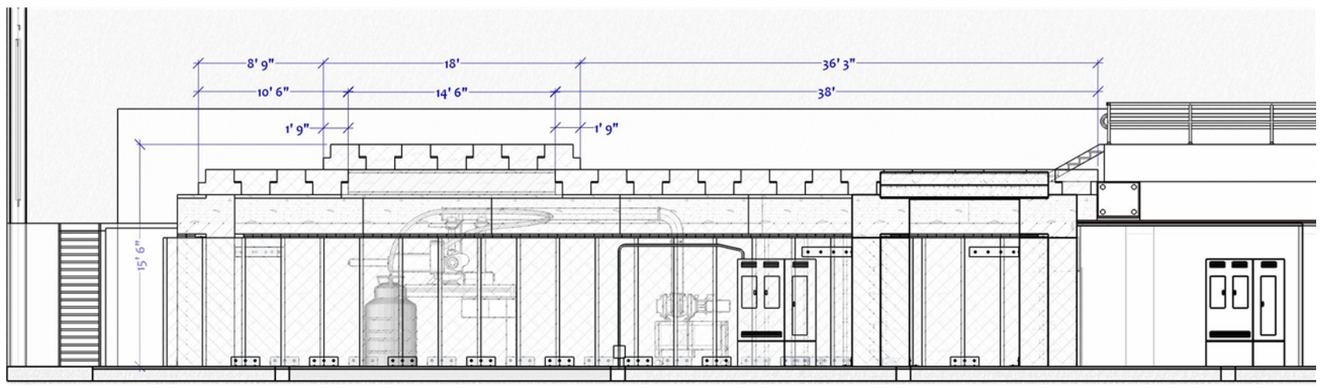
1) Upper roof beams are from existing stock measuring 21" high x 36" wide by 21' long.
2) Each roof beam is in a T configuration with a face that is rebated to 24" on center on the obverse side of the 36" wide face.
3) The roof beams overlap the 14' 6" opening by 1' 9" on each side.
4) The installed upper roof beams provide a total of 14' clearance over the HD-Ice experimental area.
5) During HD-Ice operations these roof beams will be removed routinely to service the frozen target.
6) For removal, the beams will be lifted 1.5" or less and moved to the lower roof area on the south.
7) Stacking plates may be installed on the outer ends of the lower roof beams if Facilities has concerns about weight loading on the center of the beams.

Facilities and Safety Infrastructure

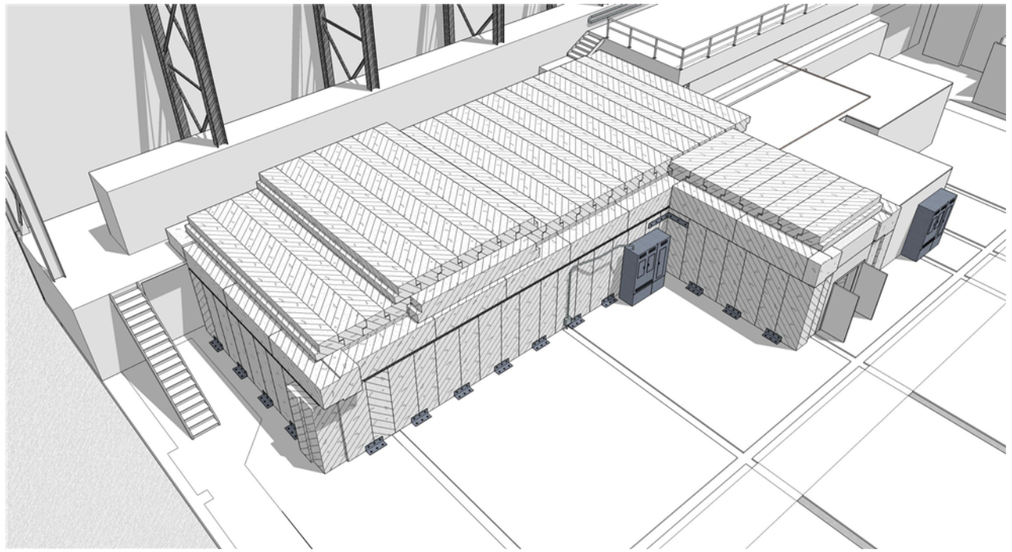
8) Routine personnel access on the lower or upper roof beams is not expected.
9) Non-routine personnel access may be facilitated using fall protection.



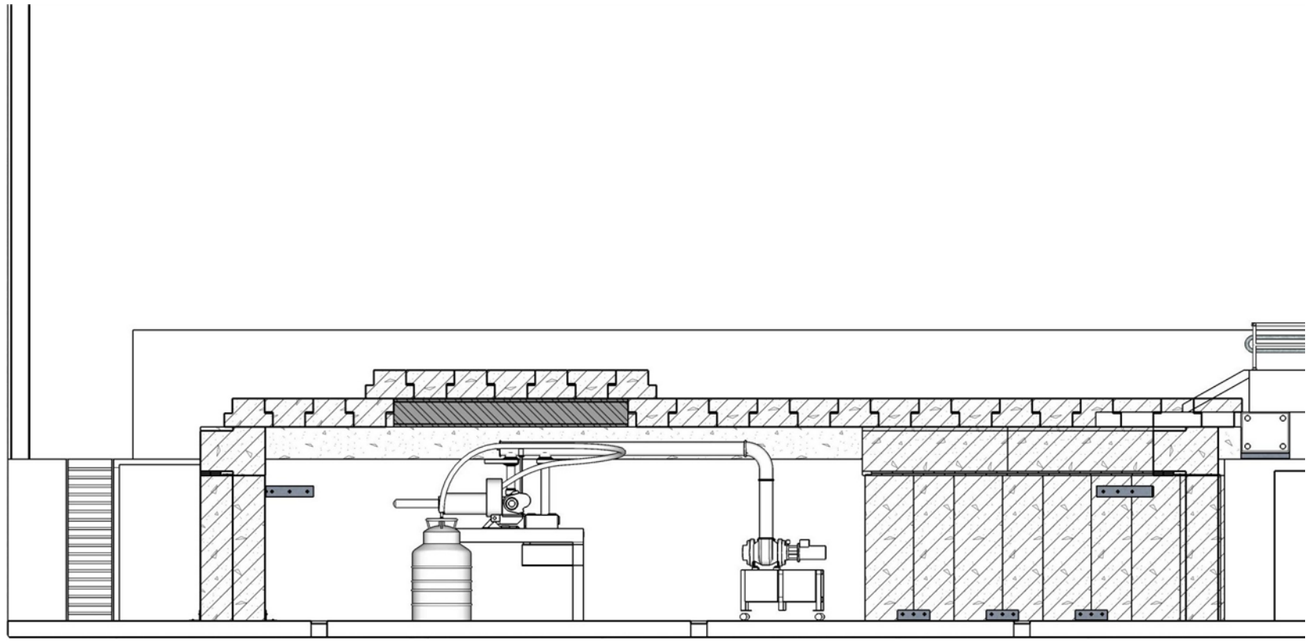
Plan View: Placement of Upper Roof Beams



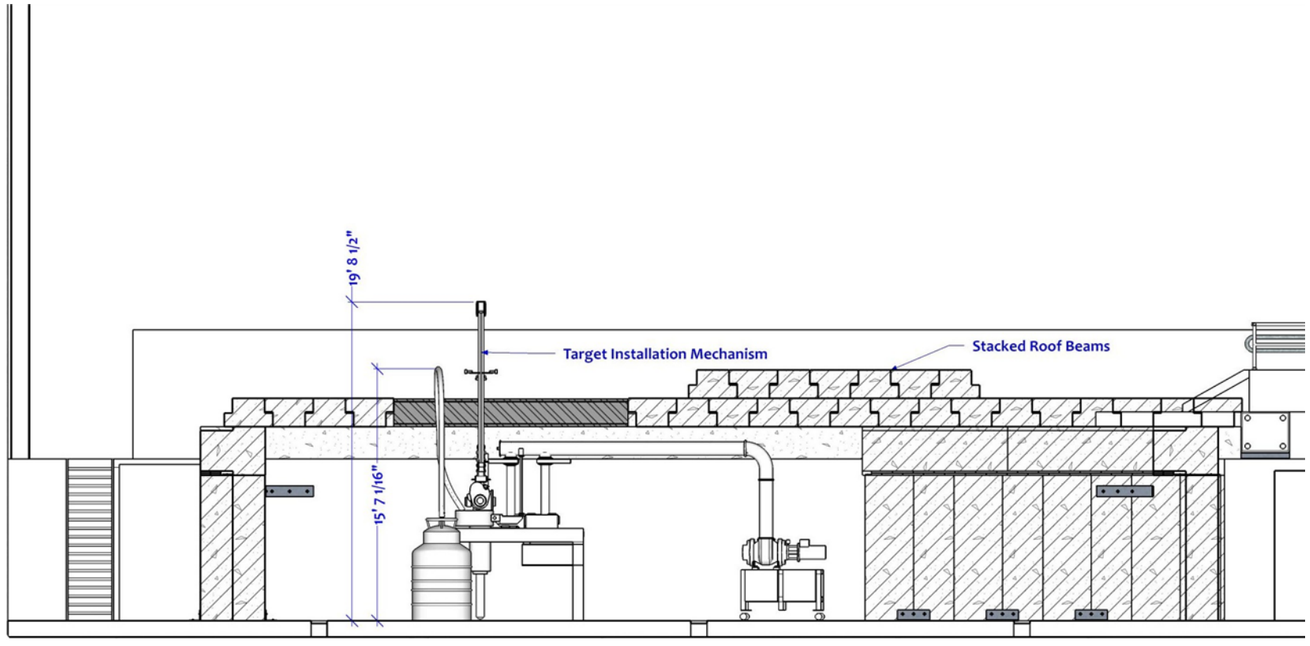
Elevation: Placement of Upper Roof Beams



Perspective From Northwest



Elevation: HD-Ice in Operating Configuration (Roof On)



Elevation: HD-Ice in Service Configuration (Roof Removed)

Service Configuration for HD-Ice Apparatus

Operating Conditions

1) During normal operation, the HD-Ice IBC is parallel to the beamline.
2) Total height of HD-Ice is 11' with 3' of overhead clearance to the upper roof.

Service Configuration

3) In the service configuration, the HD-Ice IBC is rotated perpendicular to the beamline and the finished floor.
4) The HD-Ice cryoline rotates upward, through the roof opening, to a height of nearly 16'.
5) A mechanism is attached to HD-Ice that is used to install the target.
6) The overall height of the installed mechanism is nearly 20'.

Frequency of Reconfiguration

7) The HD-Ice experiment is expected to be operated for 3 six-week periods each year.
8) Studies of the effects of the UITF beams on HD polarization are expected to last 1 to 2 weeks, after which the target will be replaced.
9) Replacement of the target will require the removable section of the roof to be relocated - per this design.
10) A standard operating procedure will be developed to establish the safety factors and technique required for removal and installation of the roof section.