DEMOLITION PHASE I

The first phase of demolition is limited to only the equipment and infrastructure that must be removed to facilitate the installation of the concrete walls of the expanded cave. The section labeled *"Demolition Phase 1 Impacted Areas"* provides images of the affected area from different vantage points with a description of the components that will be impacted by the work.

A description of the specific demolition requirements and sequence will be listed in the following section labeled *"Demolition Phase 1 Requirements"*.

Demolition Phase I Impacted Areas

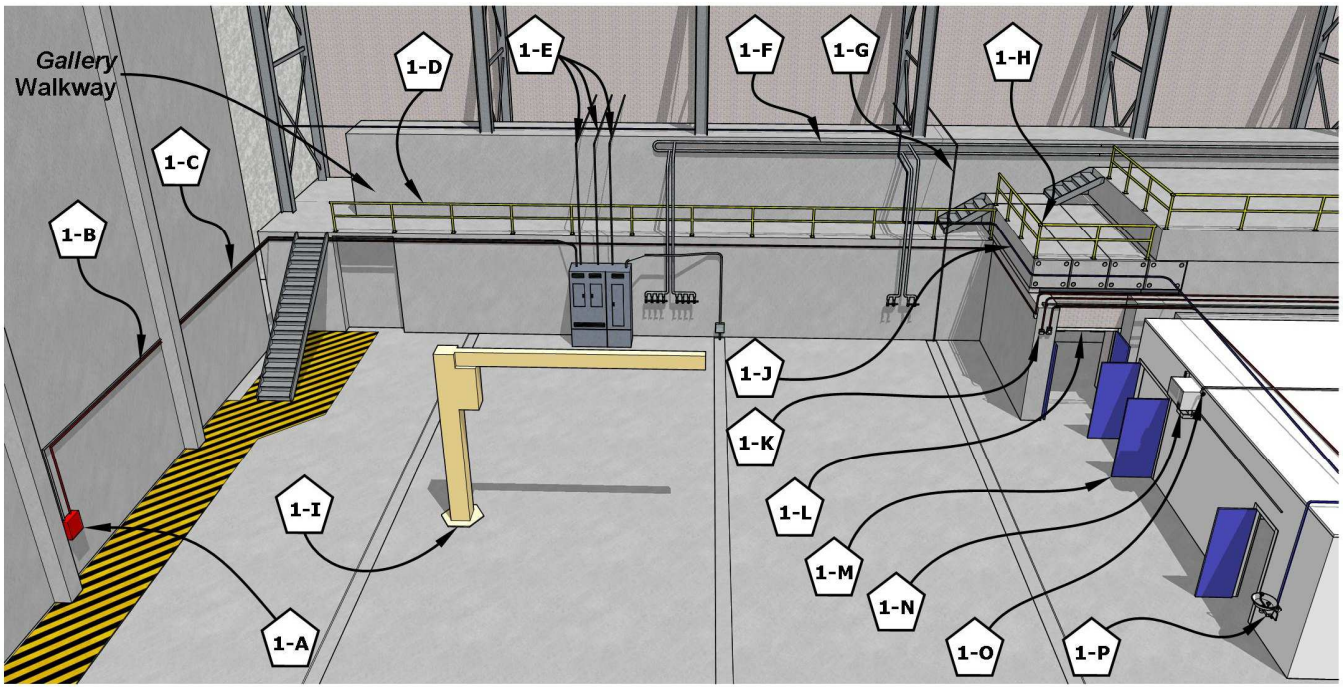


Figure 1. Test Lab High Bay – Looking East

Components Shown in Figure 1: Test Lab High Bay – Looking East

- Item 1-A: Fire protection system control panel
- Item 1-B: Signal conduit from fire protection system control panel *(1-A)*
- Item 1-C: Electrical conduit servicing the fire protection system control panel *(1-A)*
- Item 1-D: Handrails along first level above affected area *(Gallery)*
- Item 1-E: Electrical conduit to network equipment behind shielding
- Item 1-F: Low conductivity water (LCW) service lines to high bay area
- Item 1-G: Electrical conduit from behind shielding to trench
- Item 1-H: Handrails and stairs to second level above affected area
- Item 1-I: Boom crane in affected area
- Item 1-J: Water supply line for emergency eye wash *(1-P)*
- Item 1-K: Fire alarm strobe and annunciator system
- Item 1-L: Personnel Safety System interlock for existing injector test cave
- Item 1-M: Double door entry to the existing injector test cave control room
- Item 1-N: Air conditioning unit with supporting condensate pump and electrical receptacle.
- Item 1-O: Terminating drain spigot for fire suppression system servicing portable structures
- Item 1-P: Emergency eye wash

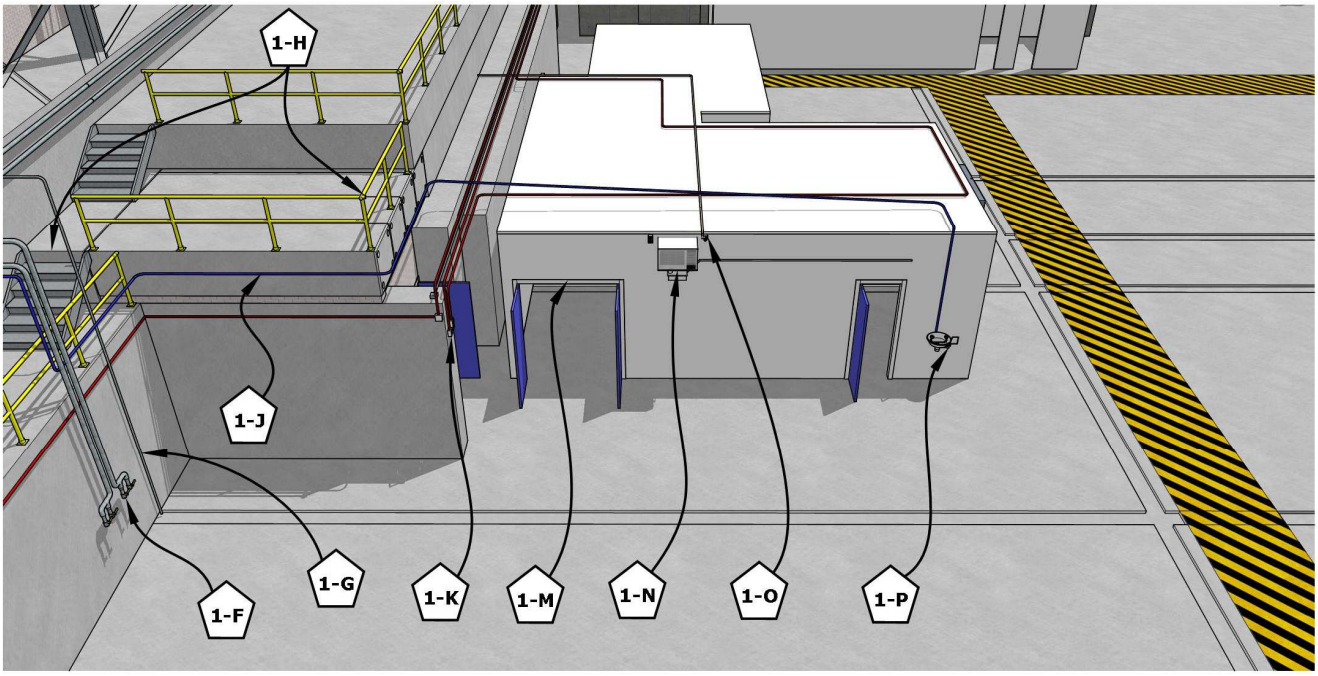


Figure 2. Test Lab High Bay – Looking South

Components Shown in Figure 2: Test Lab High Bay – Looking South

- Item 1-F: Low conductivity water (LCW) service lines to high bay area
- Item 1-G: Electrical conduit from behind shielding to trench
- Item 1-J: Water supply line for emergency eye wash *(1-P)*
- Item 1-K: Fire alarm strobe and annunciator system
- Item 1-M: Double door entry to the existing injector test cave control room
- Item 1-N: Air conditioning unit with supporting condensate pump and electrical receptacle.
- Item 1-O: Terminating drain spigot for fire suppression system servicing portable structures
- Item 1-P: Emergency eye wash

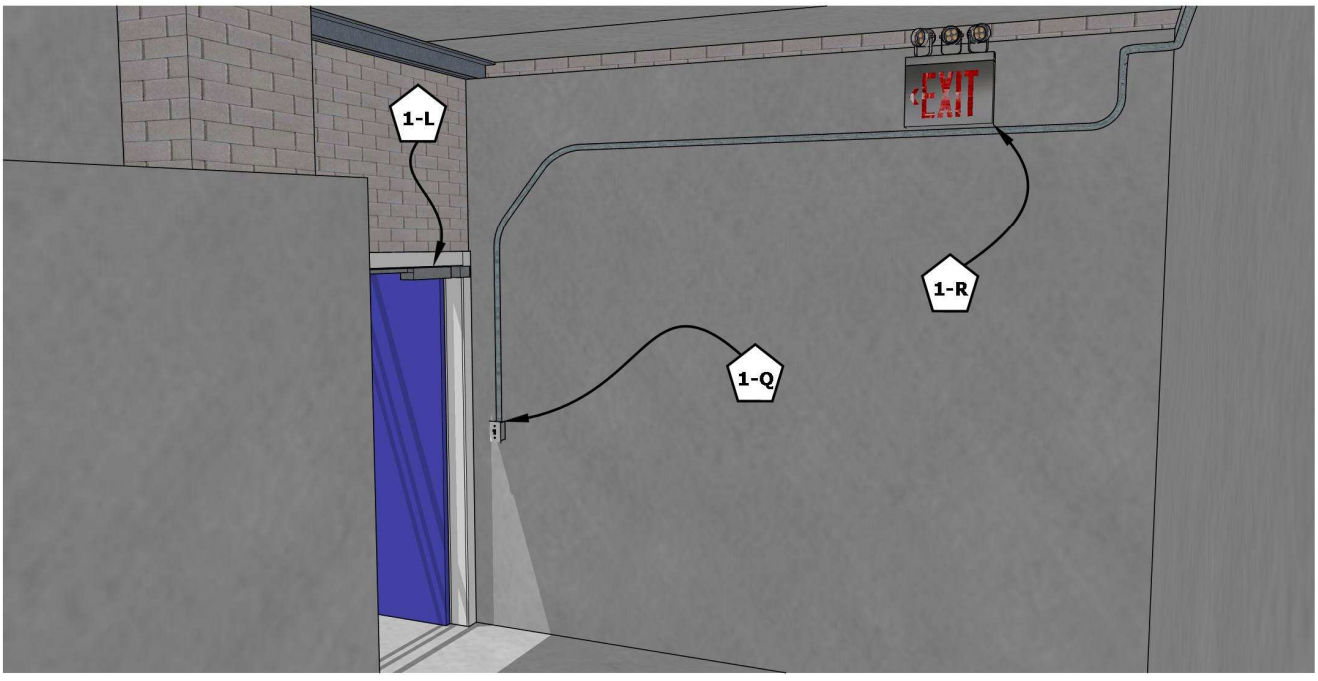


Figure 3. Existing Injector Test Cave – Looking North

Components Shown in Figure 4: Existing Injector Test Cave – Looking North

- Item 1-L: Personnel Safety System interlock for existing cave
- Item 1-Q: Surface mounted switch for injector cave interior lighting
- Item 1-R: Lighted exit sign and emergency egress lighting for injector cave interior

Demolition Phase I Requirements

Electrical Systems

The following electrical systems will need to be removed or modified to support the installation of the walls of the injector test cave expansion.

- **Electrical Service to the Fire Protection System Control Panel**

  Issue: The fire protection system control panel *(item 1-A in figure 1)* is powered by Circuit 01 in Panel AP-LAB-16, located within the bounds of the new injector test cave. The conduit connecting the fire protection system to the electrical panel runs along the east wall at 9' 6" above the finished floor. The location of this conduit will interfere with the new shielding wall.

  Resolution: The conduit will need to be removed and alternate power will need to be provided to the fire protection system. Two options should be considered:

  a. A fire protection junction box immediately adjacent to the control panel is connecting to a different power source. If there is sufficient power available in this junction box, then the control panel can be powered from there.
  b. A new conduit can be run from another electrical panel.

  Note that it is NOT RECOMMENDED for the existing conduit to be rerouted, because power panel AP-LAB-16 will be relocated during the second phase of demolition. When this happens, all existing connections will need to be redone – including this one.

- **Electrical Conduit to Network Equipment Behind Shielding Wall**

  Issue: Three electrical conduits *(items 1-E in figure 2)* provide service from panel AP-LAB-16 to the network/computing racks located behind the existing shielding wall above the affected area. These conduits will interfere with the installation of the concrete ledge and the placement of the roof beams.

  Resolution: Demolish the existing electrical conduits and run new lines from an alternate source. This allows the electrical cabinet to be relocated later without disconnecting the electrical systems again.

- **Electrical Conduit from Behind Shielding to Trench**

  Issue: This is an electrical conduit *(item 1-G in figures 1 & 2)* that provides service from behind the existing shielding wall to the trench in the Test Lab. This conduit will interfere with the installation of the concrete ledge and the placement of the roof beams.

  Resolution: Demolish the existing conduit and re-run the connection along a different path.

- **Abandoned Electrical Service at Injector Cave Entry**

  Issue: A covered electrical junction box with connecting conduit is located immediately above the existing entry to the injector test cave *(above item 1-L in figure 1)*. This box will interfere with the removal of the shielding blocks and the door casing during demolition.

  Resolution: Disconnect and remove the electrical junction box and conduit.

- **Electrical Receptacle for Injector Test Cave Control Room Air Conditioner**

  Issue: A small, window air conditioning unit *(item 1-N in figures 1&2)* was installed to provide cooling for the injector test cave control room. During its use, an electrical receptacle was installed to power a condensate

pump that supported the unit. Neither the air conditioner, nor the condensate pump are still in use. This receptacle will be covered up by the new shield wall and should be removed

Resolution: Disconnect and remove the electrical receptacle, box and conduit.

- **Electrical Light Switch, Exit Sign and Emergency Egress Lighting**

  Issue: A conduit providing power to a light switch *(item 1-Q in figure 3)* and an exit sign with emergency egress lighting *(item 1-R in figure 3)* is installed on the north wall of the existing injector test cave. The conduit and these components will interfere with the shielding wall being removed during the demolition process.

  Resolution: Disconnect and relocate the switch, lights and sign to the east wall - immediately adjacent to the shielding wall and directly across from the entry to the injector test cave.

Mechanical Systems

The following mechanical systems will need to be removed or modified to support the installation of the walls of the Injector Test Cave Expansion.

- **Low Conductivity Water (LCW) Service Lines**

  Issue: Several LCW lines extend from the gallery level down into the affected area. LCW is currently available within the existing injector test cave and these lines will not be needed in their current location. Additionally, these lines will interfere with the installation of the shielding walls and the installation of the roof beams.

  Resolution: Demolish the lines and install a *return stub* outside of the affected area.

- **Water Service to the Emergency Eye Wash**

  Issue: The water line *(item 1-J in figures 1 & 2)* that services the emergency eye wash *(item 1-P in figures 1 & 2),* runs along the perimeter of the existing test cave. The service line is wrapped in a secondary plastic conduit that is anchored to the roof blocks that are scheduled for demolition. This water line will interfere with the removal of the roof shielding blocks.

  Resolution: It will be necessary to either demolish or relocate the existing water line, at the discretion of the Safety Division. The following options should be considered.

  a. Removal of the eye wash station

     If the existing eye wash *(item 1-P in figures 1 & 2)* is no longer required, then it should be removed and the water line demolished.

  b. Installation of a portable eye wash station

     If a portable eye wash station can be installed to meet safety requirements, then the existing station should be replaced and the water line demolished.

  c. Relocation of the water service line

     In the event that an eye wash station attached to a permanent water source is required at that location, then the existing water line will need to be relocated along a path that does not interfere with the *(potentially repeating)* removal and installation of the shielding block roof.

- **Room Air Conditioning Unit and Supporting Mechanical Infrastructure**

  Issue: A 'window' air conditioning unit *(item 1-N in figures 1 & 2)* was installed to provide cooling to the injector test cave control room. A small condensate pump and a condensate drain line were later installed to remove water from the unit. Neither the air conditioner, nor the condensate system is still in use. In their current location, these components will interfere with the installation of the south shielding wall.

  Resolution: Accelerator staff will demolish and dispose of the air conditioning unit, condensate pump and condensate line.

Structural/Architectural Systems

- **Handrails Along First Level Above Affected Area *(Gallery)***

  Issue: The handrails currently installed along the gallery level of the shielding blocks *(item 1-D in figure 1)* will interfere with the placement of a cast-in-place concrete sill along the walk way.

  Resolution: Remove the handrails and place a cordon at the top of the stairs to prevent personnel from accessing the walkway.

- **Handrails and Stairs to Second Level Above Affected Area**

  Issue: The handrails and stairs located immediately above the entrance to the existing injector test cave *(item 1-H in figures 1 & 2)* will interfere with the removal of portions of the existing shield wall.

  Resolution: Remove the handrails and stairs after the walkway on the gallery level has been blocked off.

- **Boom Crane in Affected Area**

  Issue: An existing boom crane *(item 1-I in figure 1)* is located on the Test Lab high bay floor immediately adjacent to the affected area. This crane is no longer connected to power and is inoperable. The presence of the crane at this location will hamper the installation and use of the new injector test cave.

  Resolution: Disassemble the crane and provide it to Facilities Management for resale or disposal.

- **Shielding Blocks and Roof Beams**

  Issue: A shielding wall and three roof beams are used to create the entry to the existing injector test facility *(item 1-L in figure 2)*. This entry will no longer be used in the new design and these shielding components are not part of the revised design of the injector test cave expansion.

  Resolution: Once all electrical, mechanical, fire protection and safety systems have been removed from the shielding, the shield blocks will be removed with the Test Lab crane and moved to storage for future use.

- **Double Door Entry to Injector Control Room**

  Issue: A double door entry *(item 1-M in figures 1 & 2)* was installed on the portable structure outside of the injector test cave to allow access to the control room. A secondary entrance exists through an adjacent wall that also provides access to the room. The double door will be blocked by the new shielding wall and should be removed.

  Resolution: Remove the doors and install gypsum wallboard over the opening.

Fire Protection Systems

- **Signal Conduit from Fire Protection System Control Panel**

  Issue: This conduit *(item 1-B in figure 1)* runs from the fire protection control panel to the east side of the building along the area where the injector test cave expansion will be installed. This conduit provides service to several elements on the east wall. The current location of the conduit interferes with the installation of the shielding walls and the removal of the shielding blocks around the injector test cave entry.

  Resolution: Reroute the fire protection conduit to run along the back wall of the gallery above the injector test cave expansion.

- **Fire Alarm Strobe and Annunciator System**

  Issue: A fire strobe and annunciator *(item 1-K in figures 1 & 2)* are installed on the shielding blocks that are located at the entry of the injector test cave. These components will interfere with the removal of the shielding blocks and the installation of new shielding.

  Resolution: Remove the annunciator and strobe and demolish the existing conduit.

- **Terminating Drain Spigot for Fire Suppression System Servicing Portable Structures**

  Issue: A drain spigot *(item 1-O in figures 1 & 2)* is installed at the end of the fire suppression system above the portable structures outside of the injector test cave entry. This spigot will interfere with the installation of the new shielding walls.

  Resolution: Remove the existing spigot and, if necessary, install a new drain spigot at a different location on the portable structure.

Personnel Safety Systems

- **Personnel Safety System Interlock for Existing Injector Test Cave**

  Issue: A personnel safety system interlock is installed at the entry to the injector test cave. This unit is not currently operational and will interfere with the removal of the shielding blocks and the installation of the new shielding wall.

  Resolution: Remove the components and disconnect any remaining connections to the personnel safety system.

- **Emergency Eye Wash**

  Issue: An emergency eye wash *(item 1-P in figures 1 & 2)* is located on the wall of the portable structure outside the injector test facility. The water service to this unit will be disturbed by previous work.

  Resolution: Refer to the related entry in the Mechanical Systems section for proposed resolutions.

Affected Area Following Demolition Phase I

Figure 4 shows the layout of the area following the removal of the existing infrastructure and prior to the installation of the new shielding.

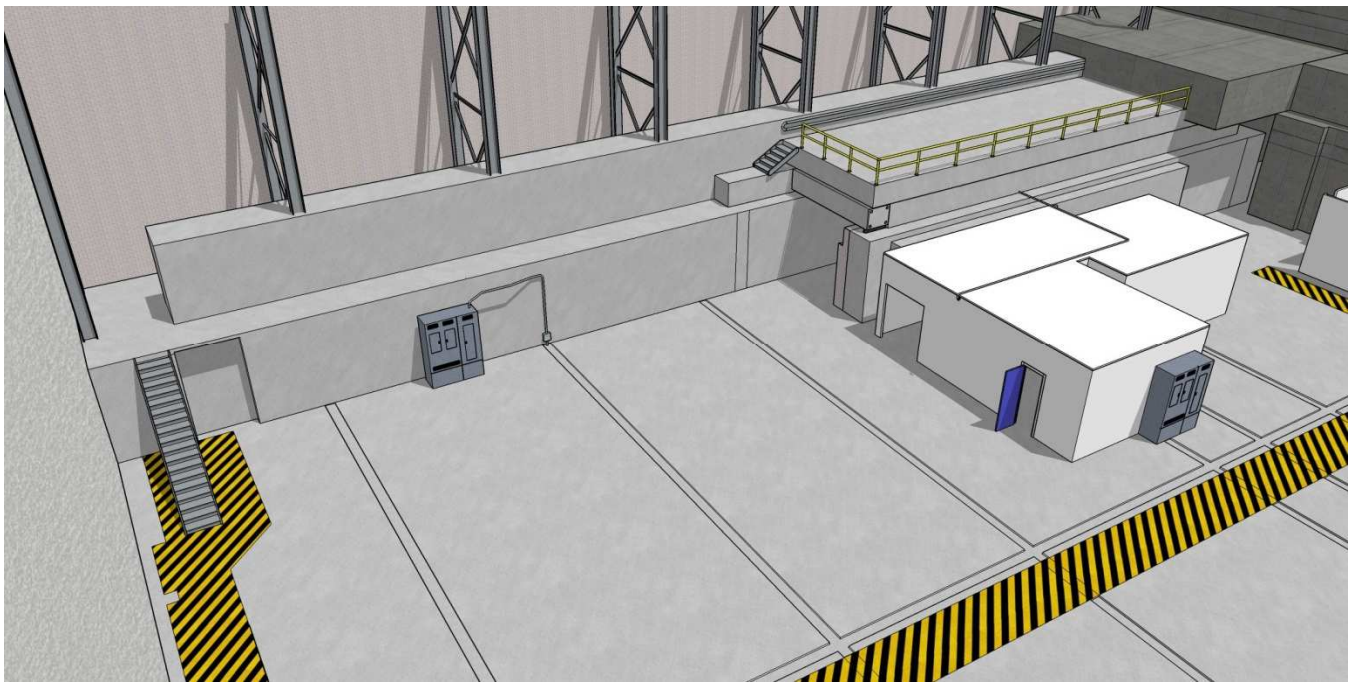


Figure 4. Test Lab High Bay Affected Area Following Demolition

INJECTOR CAVE EXPANSION

There are currently several options for constructing the injector test cave expansion. This section will illustrate the general dimensions and provide a brief description of the different approaches to assist in decision making.

General Footprint of Injector Cave Expansion

Figure 5 shows the layout and dimensions of the injector test cave expansion for all of the proposed configurations.

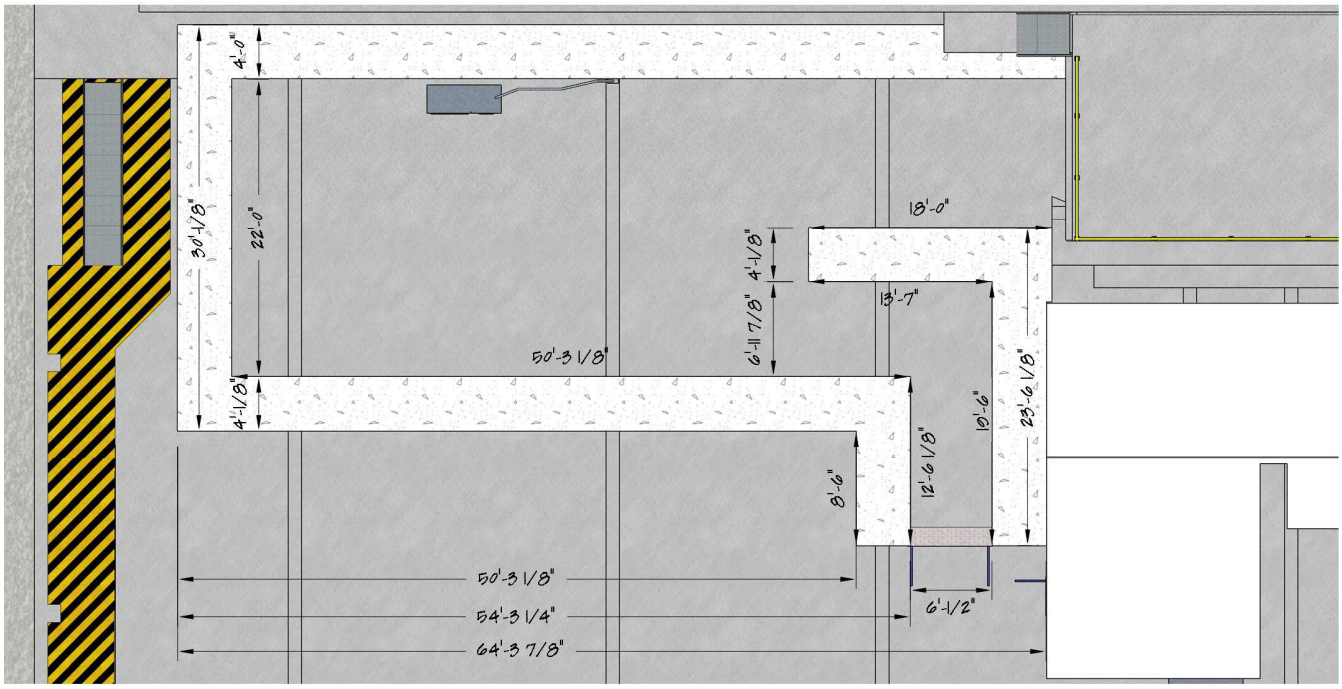


Figure 5. General Footprint of Injector Cave Expansion

Injector Cave Expansion Using Existing Blocks

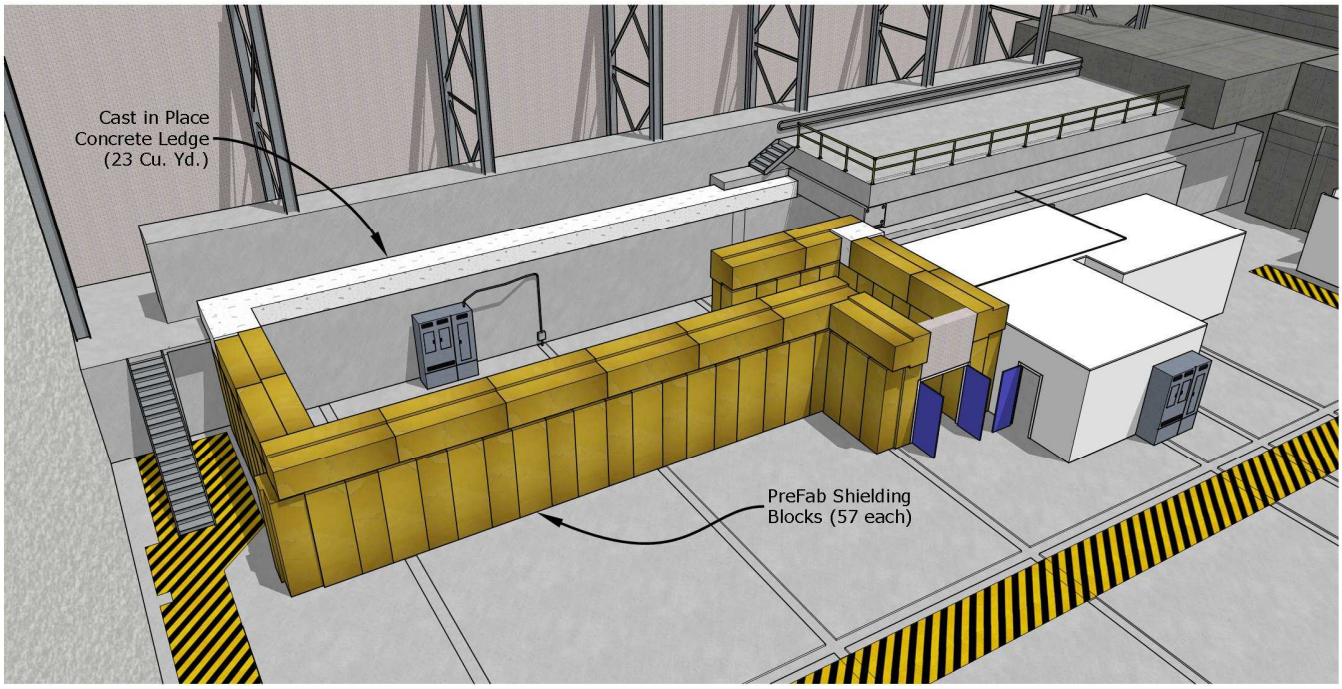
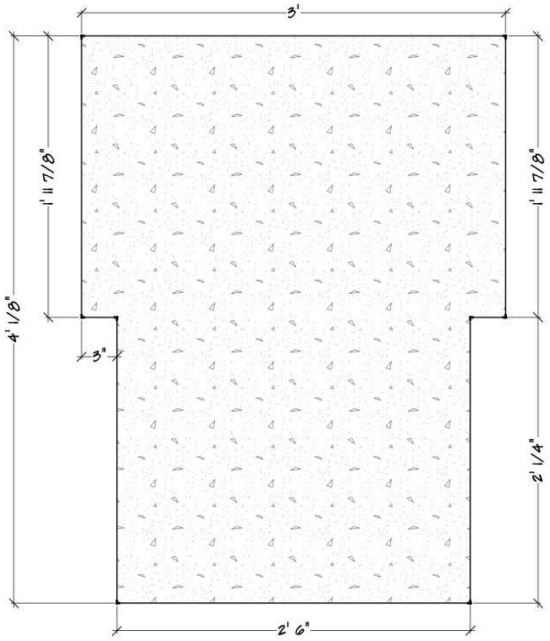


Figure 6. Injector Cave Expansion Using Existing Blocks

Figure 6 shows the construction of the injector test cave expansion using concrete shielding blocks that are already available on site. The design consists of 44 blocks installed upright along the perimeter with 13 blocks stacked along the top to achieve a height of 12 feet. Because of the configuration, a small amount of cast-in-place concrete must be used to complete the corner where the shielding adjoins the existing cave and to create a ledge for receiving the roof beams along the gallery walkway.

Each of the existing blocks is nine ft. tall and is cast in a manner that allows them to interlock with the adjacent block. The figure to the right shows the dimensions of each block.



- **Benefits of this Approach**

  Cost

  The use of the existing blocks saves money on the cost of cast-in-place concrete.

  Schedule

  Because the blocks are available and onsite now, installation technicians can begin work immediately on the installation of blocks on the north side of the cave.

  Reconfigurability

  Because the blocks are stacked and interlocked, their placement can be adjusted to reconfigure the cave for specific applications.

- **Drawbacks**

  Internal Labor

  Since the work will be performed largely by Jefferson Lab staff, the price and availability of our technical staff may be a concern.

  Seismic Stability

  Because of seismic concerns, Facilities Management will need to recommend a design for anchor points and reinforcing plates that can be used to ensure that the structure remains stable in the event of a seismic event.

  Cost of Cast-In-Place Concrete

  Using a base price of $700.00 per cubic yard *(installed),* the cost of the concrete installation should not exceed $16,000.

Injector Cave Expansions Using Cast-In-Place Shielding

10-Foot Cast-In-Place Shielding Wall

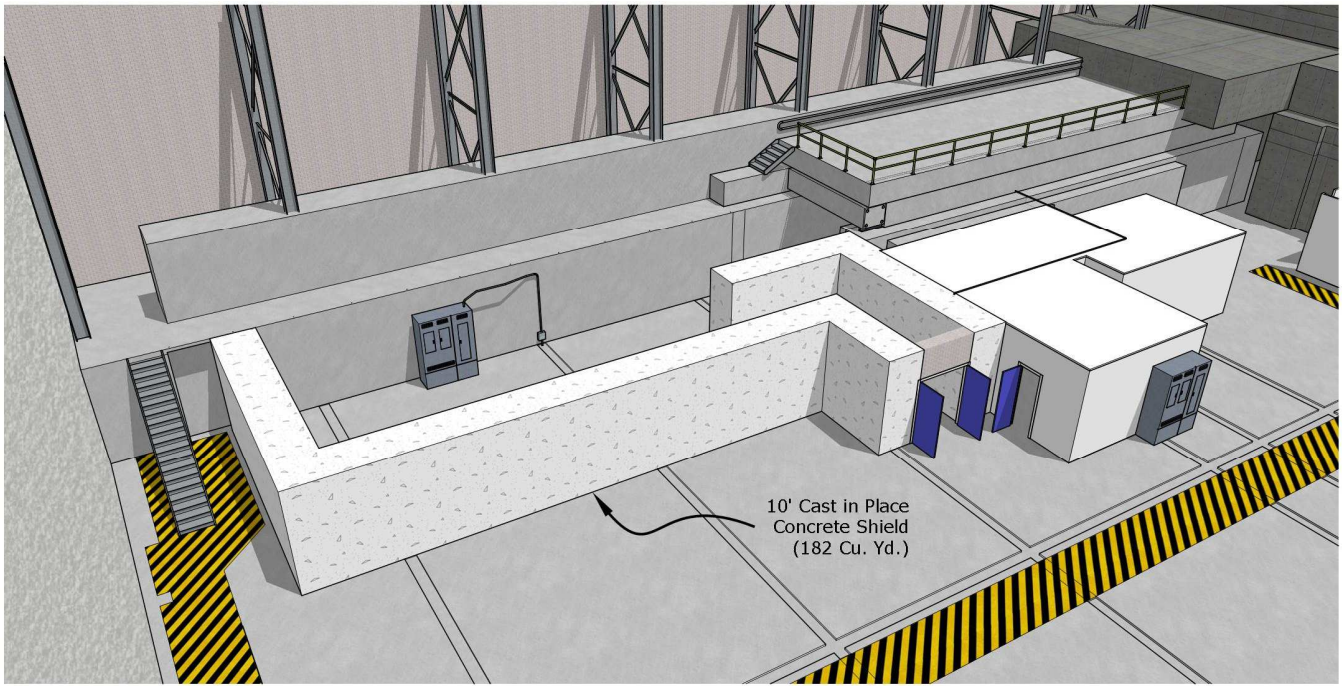


Figure 7. 10-Foot Cast-In-Place Injector Cave Expansion

Figure 7 shows the construction of the injector test cave expansion using cast-in-place concrete. In this design, the wall is limited to 10 ft. which allows the roof beams to rest on the existing gallery walkway without modifications.

- **Benefits of this Approach**

  Contracted Labor

  The entirety of the work necessary to install the cast-in-place cave expansion would be performed by contracted labor. Under a properly written contract, they would be liable for meeting cost, schedule and quality objectives.

  Seismic Stability

  This unit would be engineered to be anchored to the floor and have embedded reinforcement that would provide stability against seismic events, both for itself and the existing cave.

- **Drawbacks**

  Cost

  Using a base price of $700.00 per cubic yard *(installed),* the cost of the concrete installation would be $127,000.

  Additional Penetrations Required

  Because the roof is lower than 12 feet, it would be necessary to install a large hole *(48" radius x 60" depth)* into the existing concrete floor to hold the helium dewar required for the HD-Ice installation. This cost has not been fully estimated, but is likely to exceed $10,000.

Schedule

The time required to develop requirements, solicit proposals, select a vendor, receive submittals and begin installation is likely to be measured in months. The contracting process could significantly delay the construction of the facility.

Fixed Configuration

Once the monolithic structure has been cast, it will be unmovable and impossible to reconfigure.

12-Foot Cast-In-Place Shielding Wall

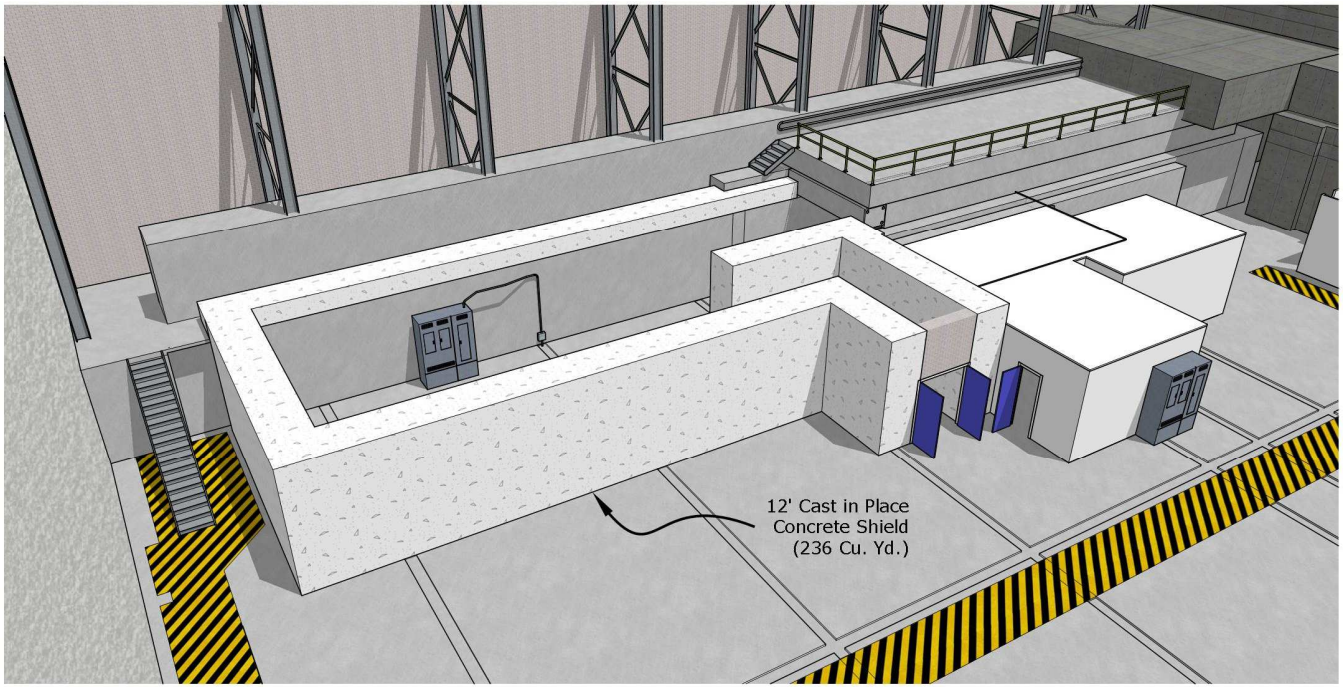


Figure 8. 12-Foot Cast-In-Place Injector Cave Expansion

Figure 8 shows the construction of the injector test cave expansion using cast-in-place concrete. In this design, the wall is limited to 12 ft. tall and a 2 ft. ledge of concrete is installed along the gallery walkway to bring it to full height.

- **Benefits of this Approach**

  Same as 10-foot cast-in-place installation.

- **Drawbacks**

  Cost

  Using a base price of $700.00 per cubic yard *(installed),* the cost of the concrete installation would be $165,000.

  Schedule

  The time required to develop requirements, solicit proposals, select a vendor, receive submittals and begin installation is likely to be measured in months. The contracting process could significantly delay the construction of the facility.

  Fixed Configuration

  Once the monolithic structure has been cast, it will be unmovable and impossible to reconfigure.

14-Foot Cast-In-Place Shielding Wall

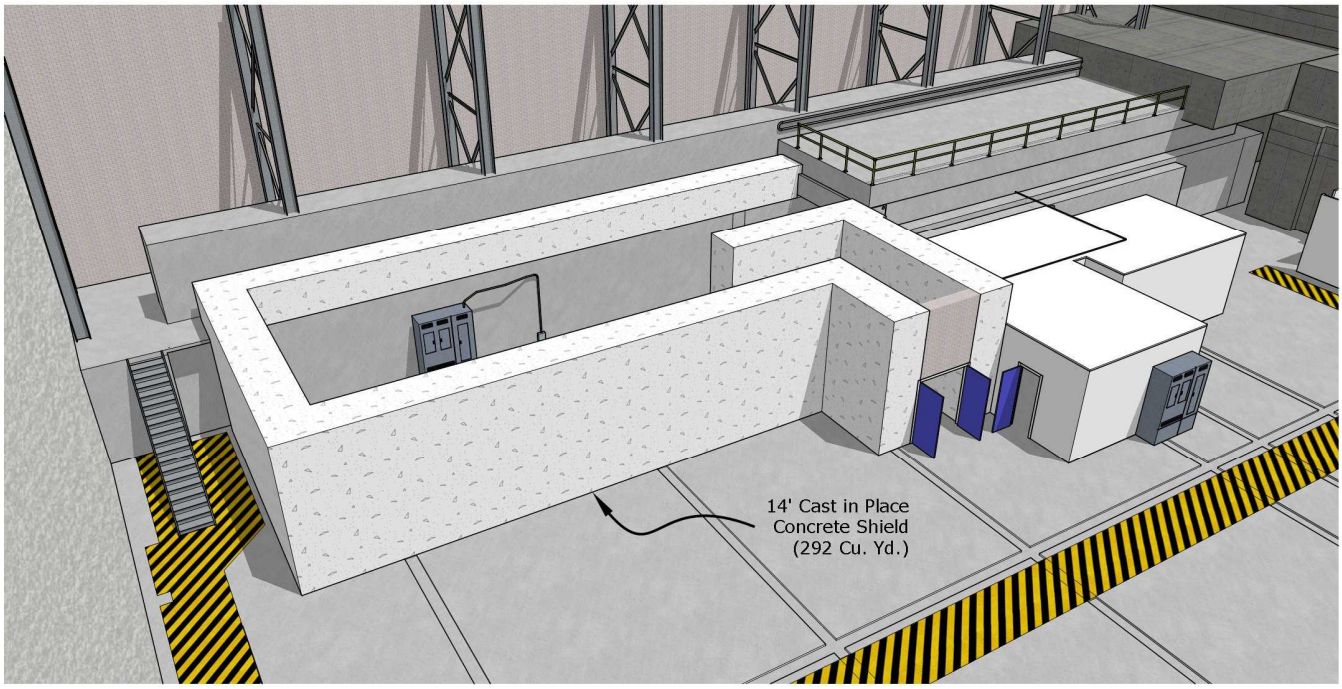


Figure 9. 14-Foot Cast-In-Place Injector Cave Expansion

Figure 9 shows the construction of the injector test cave expansion using cast-in-place concrete. In this design, the wall is limited to 14 ft. tall and a 4 ft. ledge of concrete is installed along the gallery walkway to bring it to full height.

- **Benefits of this Approach**

  Same as 10-foot cast-in-place installation.

- **Drawbacks**

  Cost

  Using a base price of $700.00 per cubic yard *(installed),* the cost of the concrete installation would be $204,400.

  Schedule

  The time required to develop requirements, solicit proposals, select a vendor, receive submittals and begin installation is likely to be measured in months. The contracting process could significantly delay the construction of the facility.

  Fixed Configuration

  Once the monolithic structure has been cast, it will be unmovable and impossible to reconfigure.

Installation of Injector Cave Expansion Roof Beams

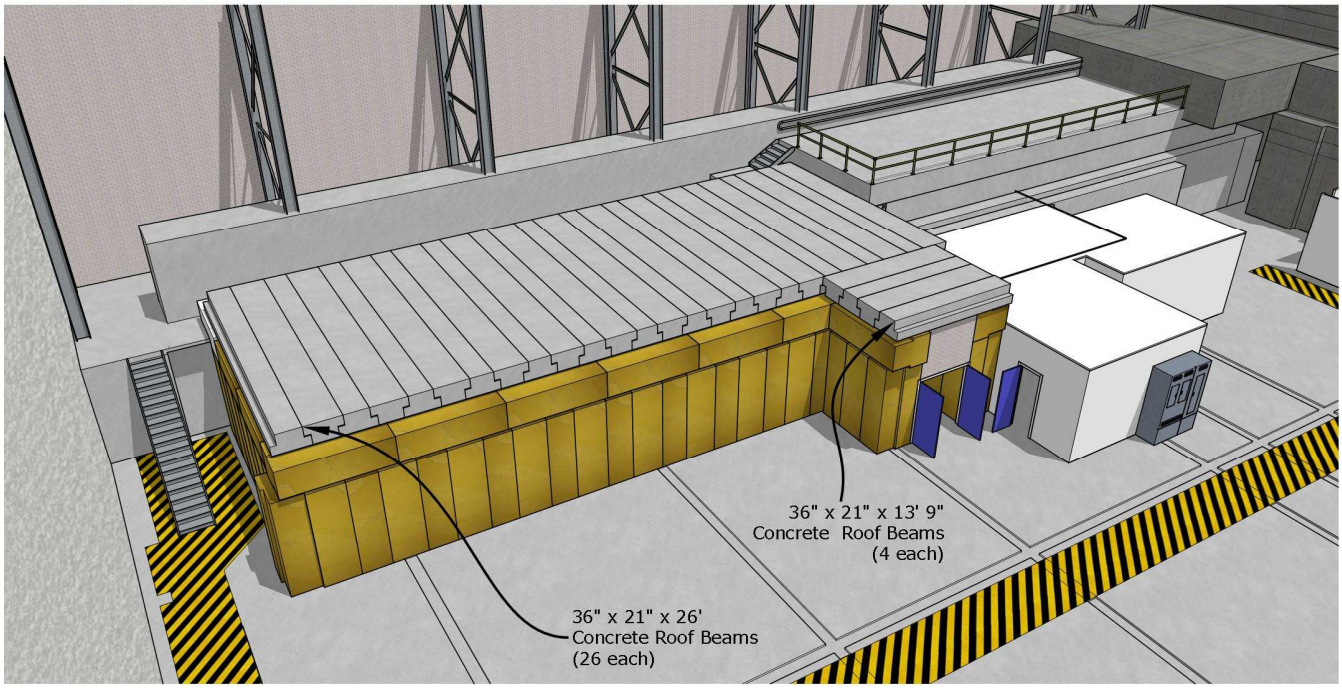


Figure 10. Installation of Injector Cave Expansion Roof Beams

Figure 10 shows the new injector test cave with roof beams installed. The bulk of the roof is covered with twenty-six 26-foot roof beams. Three shorter beams are used to cover the entry to the labyrinth.

During design discussions with Facilities Management, it may be necessary to identify the total number of beams that will need to be removed during the normal installation of either base or experimental equipment. Supporting girders may be installed under roof beams that are not expected to be moved, allowing greater stability and support. Further, all installations of infrastructure *(power, lights, HVAC, LCW, cryogens)* must be attached to either the walls or fixed regions of the roof beams. Otherwise disassembly of the roof and installation of equipment may be hampered.