

Task Hazard Analysis (THA) Worksheet

(See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

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Complete all information. Use as many sheets as necessary

Task Title:	UITF Cave2 ceiling roof tile removal	Task Location:	UITF, Cave2 rooftop, High Bay Area of Test Lab
Division:	Accelerator	Department:	Center for Injectors and Sources
Frequency of use:	6 times per year		
Lead Worker:	M. Poelker		

Ionizing Radiation Engineered Controls

- Below 7' height inside Cave 1, the walls provide concrete shielding of at least 55". Above 7', the East wall thickness is 27"
- The ceiling in the keV section of UITF is made of concrete at least 30" thick. Iron plate 3.5" thick is placed below cable penetrations.
- The Cave 2 ceiling of MeV section of UITF is made of 22" concrete.
- The main entrance to UITF is a labyrinth with walls 36" concrete and ceiling 22" concrete.
- In the keV regions, the beam termination points (dumps and Faraday Cups) are shielded to handle up to 30 mA beam current.
- The gun HV Power Supply can only be turned ON when UITF is swept and armed with Personnel Safety System (all doors are locked)
- The RF system can only be turned ON when UITF is swept and armed with Personnel Safety System (all doors are locked)

In this Task Hazard Analysis, the focus is on temporary removal of the Cave2 ceiling roof tiles. The roof tiles represent important radiation shielding. Sources of ionizing radiation must be de-energized and locked out when Cave2 roof tiles are removed.

Mitigation already in place:
[Standard Protecting Measures](#)
[Work Control Documents](#)

Exposure to Laser non-ionizing Radiation

Drive Laser hazards are mitigated through use of Class 1 laser enclosures (hutch and laser beam line transport) and via redundant laser shutters interlocked to the Laser Personnel Safety System (LPSS). The laser hutch can be OPENED for mirror alignment purposes: when the hutch is OPENED, laser shutters close inside the laser clean room, blocking the delivery of high power laser light to the laser hutch enclosure. Alignment is performed using an independent low-power "eye-safe" laser that can be temporarily connected to the fiber optic beam delivery system. Laser hazards and procedures are fully covered under a separate document ACC-17-64784-LOSP.

Oxygen Deficiency Hazard

An ODH assessment was performed that considers cryogenic nitrogen and helium, and gaseous nitrogen for the entire UITF enclosure and considering MeV beam production using the SRF Quarter Cryomodule (QCM), and installation of the HDIce target. In this assessment, the UITF enclosure was assigned a rating of ODH0 for areas below 9'. Above 9' the enclosure is considered ODH1. Signage will clearly indicate these conditions. Fixed oxygen and nitrogen monitoring systems will be used to detect and alert for ODH conditions. Sensors are located in appropriate areas. This assessment can be found at: https://misportal.jlab.org/railsForms/oxygen_deficiency_reviews/74180/edit

The quantity of SF6 gas stored inside the gun high voltage power supply pressure vessel is relatively small and does not pose an ODH hazard.

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SF6 Exposure

A complete release of the SF6 from the gun high voltage power supply pressure vessel would create a layer of SF6 gas less than 1” thick on the bottom of the Cave1 floor. However, if the gas were to mix with air in the Cave, it would take approximately 45 minutes to remove the SF6 from the UITF enclosure, when considering the 4400 cfm exhaust fan that vents to the outside of Building 58. This time interval does not allow enough time for personnel to exceed the 8-hour exposure limit of 1000ppm. The estimated 8-hour average exposure concentration would be ~ 572ppm.

Fall Protection

Under normal conditions, there are railings that surround the Cave2 roof top that mitigate the need for fall protection. But for ceiling tile removal, some of these railings are removed, and then fall protection is required.

This Task Hazard Analysis addresses fall protection measures when ceiling tile are removed.

Sequence of Task Steps	Task Steps/Potential Hazards	<u>Consequence Level</u>	<u>Probability Level</u>	<u>Risk Code</u> (before mitigation)	Proposed Mitigation (Required for <u>Risk Code</u> >2)	Safety Procedures/ Practices/Controls/Training	<u>Risk Code</u> (after mitigation)
1	Gun operation / Exposure to Ionizing Radiation	M	M	3	The photogun high voltage power supply, the QCM cathode power supply and the buncher cavity solid state amplifier must be de-energized and locked out before Cave2 roof tiles can be removed	Lock Tag and Try Before UITF operations can resume, the cave 2 roof tiles and the grating barrier at the Cave2 helium vent must be verified in place	1

For questions or comments regarding this form contact the Technical Point-of-Contact [Harry Fanning](#)

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2	Laser operation / Exposure to non-ionizing laser radiation	M	L	2	Laser alignment inside UITF can be performed with the Laser Hutch Enclosure OPEN using a low-power “eye-safe” alignment laser.	The UITF drive laser resides inside a laser clean room outside the UITF enclosure, with laser light delivered to the photogun via a shielded optical fiber. This laser system is interlocked to the LPSS, with the high power diver laser light shuttered OFF when the laser hutch is OPENED. If laser alignment needs to occur when the Cave2 roof tiles are removed, the hutch can be OPENED and a low-power eye-safe laser can be connected to the optical fiber, per ACC-17-64784-LOSP	1
3	RF non-ionizing radiation	L	L	1	The QCM cathode power supply and the buncher cavity solid state amplifier must be de-energized and locked out before Cave2 roof tiles can be removed	Lock Tag and Try Before UITF operations can resume, the cave 2 roof tiles and the grating barrier at the Cave2 helium vent must be verified in place	1

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4	Fall Protection	M	M	3	<p>A permanent guard railing was installed on the west side of the Cave2 rooftop, at the location of the elevated portion of the ceiling. The fixed guard rail plus moveable guard rail surround the northern and western perimeter of the cave2 rooftop and prevent falling from the north and west sides.</p> <p>Posts were added to the rooftop for a horizontal lifeline, designed for one person. The North Side Worker is secured to this lifeline using an approved lanyard, to prevent falling into the opening formed by removal of ceiling tiles.</p> <p>Moveable guard railings protect the Crane Operator and South Side Worker from falling into the opening. Moveable guard rails are placed along the north side opening after all six ceiling tiles have been removed.</p>	<p>Under normal conditions, when the Cave2 ceiling roof tiles are in place, moveable guard rails surround the exposed perimeter of the Cave2 rooftop.</p> <p>Approved fall protection harnesses, lanyards and lifeline.</p> <p>Approved posts for securing the horizontal lifeline.</p> <p>Fall protection gear inspected regularly.</p> <p>KEEP OUT signs placed near fall hazards</p>	1
5	Crane and Rigging	M	L	3	<p>Use of properly rated lifting hardware: bridle and hoist rings</p>	<p>Safe rigging practice as described in Material Handling Equipment Program: Rigging, Cranes, and Hoists, Chapter 6141 of the EH&S Manual</p>	1

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6	ODH (GN2)	M	L	3	Restricted flow orifices and automatic valve closure at power outage	Personnel will exit UITF when ODH alarms sound. All personnel entering the area must have ODH1 training and follow procedures based on EH&S signage.	1
7	Electrical and High Voltage	M	M	3	Terminals insulated or guarded to prevent inadvertent contact. Approved LTT procedure followed when attaching the electron gun to the HV power supply.	Lock Tag and Try training for connecting the high voltage cable to the photogun by workers during maintenance. Nearby voltage verification unit informs workers of gun high voltage power supply status.	1
8	SF6	L	EL	1	Contents of gun HV power supply SF6 tank does not constitute ODH hazard. Pressure gauge on SF6 tank provides visible alarm when pressure falls to specified level Commercial SF6 transfer/recovery system	Equipment specific training when transferring SF6 from the High Voltage tank to the Dilo recovery system Access to the floor is restricted when ventilation fan inoperative, or when there is a known leak on the SF6 tank	1

Highest Risk Code before Mitigation:

3

Highest Risk Code after Mitigation:

1

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When completed, if the analysis indicates that the [Risk Code](#) before mitigation for any steps is “medium” or higher ($RC \geq 3$), then a formal [Work Control Document](#) (WCD) is developed for the task. Attach this completed Task Hazard Analysis Worksheet. Have the package reviewed and approved prior to beginning work. (See [ES&H Manual Chapter 3310 Operational Safety Procedure Program](#).)

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