Jefferson Lab
Thomas Jefferson National Accelerator Facility

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:	Cool and Operate the HDice In-Beam Cryostat and its super-conducting magnets			**Task Location:**	Cave-2 of the UITF in Bldg 58
Division:	Physics	**Department:**	Hall B	**Frequency of use:**	4 times per year
Lead Worker:					

Mitigation already in place:
Standard Protecting Measures
Work Control Documents

- UITF ODH: https://wiki.jlab.org/ciswiki/index.php/File:UITF_ODH_Assessment.pdf ;
  https://misportal.jlab.org/railsForms/oxygen_deficiency_reviews/74180/edit ;
- PSS-ODH system operational: https://jlabdoc.jlab.org/docushare/dsweb/View/Collection-10790 ;
- HDice IBC OPS: https://www.jlab.org/Hall-B/HDIce/manuals/InBeam01a.pdf ;
- HDice IBC Pressure Systems Safety review documents: https://jlabdoc.jlab.org/docushare/dsweb/View/Collection-9218

Sequence of Task Steps	Task Steps/Potential Hazards	Consequence Level	Probability Level	Risk Code (before mitigation)	Proposed Mitigation (Required for Risk Code >2)	Safety Procedures/ Practices/Controls/Training	Risk Code (after mitigation
1	Understand IBC OPS procedures, as detailed in https://www.jlab.org/Hall-B/HDIce/manuals/InBeam01a.pdf. (Could result in damage to equipment.)	M	EL	1			1
2	Verify 4-layer transfer line connection from 500 L buffer dewar to IBC. (Jets of cold gas can emerge if not properly seated.) Verify He vent connections to direct exhaust gas out of cave-2. (To avoid water condensation on equipment.)	L	L	1			1

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3	Verify 110/220 IBC power feeds from *Big Bertha* transformer to IBC gas cart. Verify power source as HDH1 in HDice, backed by diesel generator. (Provides power backup and reduces NMR noise.)	L	EL	N			N
4	Wheel in commercial 500 L dewar of LHe , ODH 1. (Possible damage to dewar and He release on collision with walls or equipment when moving dewar.)	L	EL	N	ODH 1 (see ODH Assessment link above)	ODH signs posted at the cave entrance. Two person rule to watch for interferences when moving dewars. Training: ODH (SAF-103)	N
5	Connect commercial LHe dewar supply to 500 L buffer dewar. Using He gas bottle with regulator set to deliver about 2 psi, begin transfer from commercial dewar to cool buffer dewar, 4-layer transfer line and IBC simultaneously - ODH 0. (Possible hazard from pressurized gas. Possible cryo-Hazard from release of cold gas.)	L	L	1	ODH 0 (see ODH Assessment link above)	ODH signs posted at the cave entrance. PPE required when making dewar connections: cryo (or welding) gloves, safety goggles (face shield), long pants, closed-toed shoes. Follow procedures in IBC OPS manual at link above. Training: ODH (SAF-103); Compressed gas (ES&H 6150)	1
6	Wheel in 110 L LN2 dewar and begin auto-cool of trap on gas cart -ODH 0. (Possible Cryo-Hazard from release of cold gas.)	L	EL	N	ODH 0 (see ODH Assessment link above)	ODH signs posted at the cave entrance. PPE required when making dewar connections – as in step 5. Training: ODH (SAF-103)	N

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7	When commercial dewar is empty, IBC 4K reservoir will be full (50 L) and buffer dewar will have about 150 L left. Exchange empty LHe commercial dewar for a full one and continue to fill buffer to 400 L. Repeat as needed, once every 2 to 3 days, ODH 1. Exchange LN2 dewar with full tank about 1/week. (Possible damage to dewar and cryogen release on collision with walls or equipment when moving dewars. Possible Cryo-Hazard from release of cold gas.)	L	EL	N	ODH 1 (see ODH Assessment link above)	ODH signs posted at the cave entrance. Two person rule to watch for interferences when moving dewars. PPE required when making dewar connections – as in step 5. Training: ODH (SAF-103)	N
8	With the IBC at 4K, start the flow of 3He/4He mixture to lower the IBC to 0.05 K. (Possible loss of 3He if not carried out correctly.)	L	L	1	ODH 0 (see ODH Assessment link above)	ODH signs posted at the cave entrance. Follow procedures in IBC OPS manual at link above.	1
9	With magnet power supplies off, ensure that the connections to the current leads and the connections from the leads to the IBC are tight, and that the connections are covered/not accessible. (Possible spark if leads are loose; hazard of electric shock if leads are exposed.)	M	L	2	Covers over power supply connections.	Check that the insulation on the cable connectors to the IBC in intact.	1

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10	Energize the superconducting magnets within the IBC. (Medical concern from magnetic field hazard. Possible danger to equipment is not carried out correctly.)	M	L	2	Survey and mark floor at 5 gauss safe distance. Monitor voltage drop in coils and exhaust He gas flow to magnet leads. ODH 0 (see ODH Assessment link above)	Beacon, barriers and signage to warn of potentially high magnetic fields near cryostat. Follow procedures in IBC OPS manual at link above.	1
11	De-energize magnets when studies are complete. (Possible danger to equipment is not carried out correctly.)	L	L	1	Monitor voltage drop in coils and exhaust He gas flow to magnet leads. ODH 0 (see ODH Assessment link above)	Follow procedures in IBC OPS manual at link above.	1
12	Warm IBC by stopping flow of LHe from Buffer dewar.	L	L	1	ODH 0 (see ODH Assessment link above)	Follow procedures in IBC OPS manual at link above. Training: ODH (SAF-103)	1

Highest Risk Code before Mitigation:	2	Highest Risk Code after Mitigation:	1

When completed, if the analysis indicates that the Risk Code before mitigation for any steps is "medium" or higher (RC≥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.)

Form Revision Summary

Periodic Review – 08/29/18 – No changes per TPOC
Periodic Review – 08/13/15 – No changes per TPOC
Revision 0.1 – 06/19/12 - Triennial Review. Update to format.
Revision 0.0 – 10/05/09 – Written to document current laboratory operational procedure.

ISSUING AUTHORITY	TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning	08/29/18	08/29/21	0.1

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