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Operational Safety Procedure Review and Approval Form # 80380
(See [ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure \(OSP\) and Temporary OSP Procedure](#) for Instructions)

Type:

OSP

[Click for OSP/TOSP Procedure Form](#)
[Click for LOSP Procedure Form](#)

Serial Number:

ENP-18-80380-OSP

Issue Date:

11/27/2018

Expiration Date:

10/27/2021

Title:

Cool and Operate HDice IBC and its super - conducting magnets in cave - 2 of UITF

Location:
(where work is being performed)

58 - Test Lab - 1127

Location Detail:
(specifics about where in the selected location(s) the work is being performed)

Risk Classification:

Without mitigation measures (3 or 4):

2

(See [ES&H Manual Chapter 3210 Appendix T3 Risk Code Assignment](#))

With mitigation measures in place (N, 1, or 2):

1

Reason:

This document is written to mitigate hazard issues that are :
Determined to have an unmitigated Risk code of 3 or 4

Owning Organization:

PHALLB

Document Owner(s):

Sandorfi, Andy (sandorfi@jlab.org) Primary

Supplemental Technical Validations ☒

Cryogenic Material - Gas or Liquid (Jonathan Creel, Kelly Dixon)

ODH 0 and 1 (Imani Burton, Jennifer Williams)

Static Magnetic Fields >5G: Fringe, High, & Quench Effect (Imani Burton, Jennifer Williams)

Document History ☒

Revision ☒

Reason for revision or update ☒

Serial number of superseded document ☒

Comments for reviewers/approvers: ☒

Attachments ☒

Procedure: **IBC_coolingOSP-3310T1Form.pdf**

THA: **THA IBC OPS-17166_v2.pdf** **THA IBC OPS-17166_v2.pdf**

Additional Files:

Review Signatures

Additional Authorization : Physics ES&H Liaison	Signed on 11/21/2018 11:17:37 AM by Bert Manzlak (manzlak@ilab.org)
Subject Matter Expert : Cryogenic Material - Gas or Liquid	Signed on 11/20/2018 2:40:42 PM by Kelly Dixon (kdixon@ilab.org)
Subject Matter Expert : Oxygen Deficiency Hazards (ODH)->ODH 0 and 1	Signed on 11/20/2018 3:31:32 PM by Jennifer Williams (jennifer@ilab.org)
Subject Matter Expert : Static Magnetic Fields >5G: Fringe-> High-> & Quench Effect	Signed on 11/20/2018 3:31:36 PM by Jennifer Williams (jennifer@ilab.org)

Approval Signatures

Division Safety Officer : PHALLB	Signed on 11/26/2018 7:27:02 AM by Ed Folts (folts@ilab.org)
Org Manager : PHALLB	Signed on 11/27/2018 5:20:09 PM by Volker Burkert (burkert@ilab.org)
Safety Warden : Test Lab - 1127	Signed on 11/26/2018 8:29:10 AM by John Hansknecht (hansknech@ilab.org)

Operational Safety Procedure Form

(See [ES&H Manual Chapter 3310 Appendix T1 Operational Safety Procedure \(OSP\) and Temporary OSP Procedure](#) for instructions.)

Click
For Word Doc

Title:	Cool and Operate HDice IBC and its super-conducting magnets in cave-2 of UTF		
Location:	UTF, cave-2 ⇔ East side of area 1128 in Bldg 58	Type:	<input checked="" type="checkbox"/> OSP <input type="checkbox"/> TOSP
Risk Classification (per Task Hazard Analysis attached) (See ESH&Q Manual Chapter 3210 Appendix T3 Risk Code Assignment.)		Highest Risk Code Before Mitigation	2
		Highest Risk Code after Mitigation (N, 1, or 2):	1
Owning Organization:	Physics	Date:	Nov 16/2018
Document Owner(s):	A.M. Sandorfi		

DEFINE THE SCOPE OF WORK

1. Purpose of the Procedure – Describe in detail the reason for the procedure (what is being done and why).

This procedure gives general guidance for the following activities:

- cooling and operating the HDice IBC, with its 500 L buffer dewar, in cave-2 of the UTF
- energizing the super-conducting solenoids within the IBC

2. Scope – include all operations, people, and/or areas that the procedure will affect.

Operations:

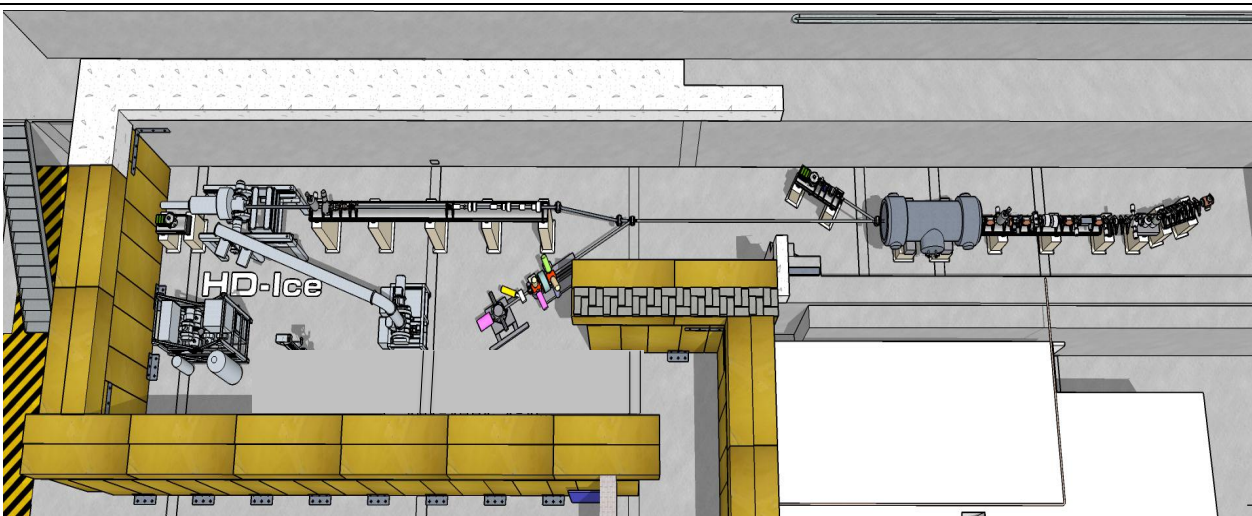
- bring in commercial 500 L dewars of LHe into cave-2 of the UTF
- transfer LHe from a commercial dewar to the HDice Buffer dewar to cool both Buffer and IBC to 4K
- bring in a 110 L LN2 dewar start an the auto-fill of the trap on the IBC gas-handling cart
- start 3He/4He circulation to lower the temperature of the IBC to 0.050K
- refill the Buffer dewar with LHe from a new commercial 500 L dewar as needed (every 2-3 days)
- ramp up the currents in the IBC super-conducting solenoids
- ramp down the currents in the IBC super-conducting solenoids
- stop cryogen flow to the IBC and warm up the cryostat

HDice Staff involved: M. Lowry, X. Wei, C. Hanretty, K. Wei, T. Kageya, A.M. Sandorfi

Affected Areas: UTF Labyrinth, cave-2 of the UTF

3. Description of the Facility – include building, floor plans and layout of the experiment or operation.

- UTF, cave-2
⇔ East side of area 1128 in Bldg 58
(far left in attached drawing)
- cave-2 shielding roof is assumed to be ON
(cave reverts to ODH-0 with roof off)



ANALYZE THE HAZARDS and IMPLEMENT CONTROLS

4. Hazards identified on written Task Hazard Analysis

- 4.1 Moving commercial dewars full of LHe and LN2 cryogenics into cave-2
- 4.2 Moving commercial compressed He gas cylinders
- 4.3 Cold He gas venting from dewars and In-Beam Cryostat
- 4.4 Electrical connections to super-conducting magnets
- 4.5 Magnetic fields from IBC super-conducting magnets

5. Authority and Responsibility:

5.1 Who has authority to implement/terminate

M. Lowry / X. Wei / A. Sandorfi

5.2 Who is responsible for key tasks

M. Lowry, X. Wei

5.3 Who analyzes the special or unusual hazards including elevated work, chemicals, gases, fire or sparks (See [ES&H Manual Chapter 3210 Appendix T1 Work Planning, Control, and Authorization Procedure](#))

- ODH Assessment: carried out by Will Oren & Hari Areti; approved by Chris Perry
https://wiki.jlab.org/ciswiki/index.php/File:UITF_ODH_Assessment.pdf ;
- OD Review 74180: signed by Jennifer Williams, John Hansknecht and Tim Michalski
https://misportal.jlab.org/railsForms/oxygen_deficiency_reviews/74180/edit ;
effective: 03/07/2018 – 02/12/2021

6. Personal and Environmental Hazard Controls Including:

6.1 Shielding

NA

6.2 Barriers (magnetic, hearing, elevated or crane work, etc.)

Magnetic: beacon when magnets energized; tape line marking 5 gauss limits

6.3 Interlocks

NA

6.4 Monitoring systems

PSS ODH system to monitor O2 levels; HDice IBC control monitoring of OPS

6.5 Ventilation

- 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>

6.6 Other (Electrical, ODH, Trip, Ladder) (Attach related Temporary Work Permits or Safety Reviews as appropriate.)

NA

7. List of Safety Equipment:

7.1 List of Safety Equipment:

Cryo (or Welding) gloves, safety glasses

7.2 Special Tools:

NA

8. Associated Administrative Controls

As posted, moving LHe dewars changes status from ODH-0 to ODH-1 and requires 2 people.

9. Training

9.1 What are the Training Requirements (See [List of Training Skills](#))

ODH/SAF-103 ; Compressed gas/ES&H 6150

DEVELOP THE PROCEDURE

10. Operating Guidelines

Read and understand the HDice IBC OPS manual: <https://www.jlab.org/Hall-B/HDice/manuals/InBeam01a.pdf>

11. Notification of Affected Personnel (who, how, and when include building manager, safety warden, and area coordinator)

Prior to the start and when the work has been fully completed, notify the following:

Building 58 manager: Phil Denny (x 7752);

UITF Safety Warden: John Hansknecht (x 7096)

HDice: A. Sandorfi (x 5457), X. Wei (x 5266), M. Poelker (x 7357)

12. List the Steps Required to Execute the Procedure: from start to finish.

12.1 Understand IBC OPS procedures, as detailed in <https://www.jlab.org/Hall-B/HDice/manuals/InBeam01a.pdf>.

12.2 Verify 4-layer transfer line connection from 500 L buffer dewar to IBC.

12.3 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.

12.4 Wheel in commercial 500 L dewar of LHe, ODH 1.

12.5 Connect LHe commercial 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.

12.6 Wheel in 110 L LN2 dewar and begin auto-cool of trap on gas cart -ODH 0.

12.7 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.

12.8 With the IBC at 4K, start the flow of 3He/4He mixture to lower the IBC to 0.05 K.

12.9 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.

- 12.10 Energize the superconducting magnets within the IBC.
12.11 De-energize magnets when studies are complete.
12.12 Warm IBC by stopping flow of LHe from Buffer dewar.

13. Back Out Procedure(s) i.e. steps necessary to restore the equipment/area to a safe level.

Call M. Lowry (x 7432), X. Wei (x 5266), C. Hanretty (x 5023) or A. Sandorfi (x 5457) to assess status before attempting backout.

14. Special environmental control requirements:

14.1 List materials, chemicals, gasses that could impact the environment (ensure these are considered when choosing Subject Mater Experts) and explore [EMP-04 Project/Activity/Experiment Environmental Review](#) below

Helium, Nitrogen

14.2 Environmental impacts (See [EMP-04 Project/Activity/Experiment Environmental Review](#))

None

14.3 Abatement steps (secondary containment or special packaging requirements)

None

15. Unusual/Emergency Procedures (e.g., loss of power, spills, fire, etc.)

In case of the loss of building power, the HDice diesel generator will switch on within about 10 sec, and all pumps will auto-restart. The IBC controls are on UPS backup and will continue to monitor. Nonetheless, the status should be verified and a call should be made to one of the following:

M. Lowry (609 439 8288);
X. Wei (516 635 1957);
C. Hanretty (850 491 8382);
A. Sandorfi (631 332 1565).

16. Instrument Calibration Requirements (e.g., safety system/device recertification, RF probe calibration)

none

17. Inspection Schedules

PSS-ODH system inspection schedule: <https://jlabdoc.jlab.org/docushare/dsweb/View/Collection-10790>

18. References/Associated/Relevant Documentation

- 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>

19. List of Records Generated (Include Location / Review and Approved procedure)

[Click](#)

To Submit OSP
for Electronic Signatures

Distribution: Copies to Affected Area, Authors, Division Safety Officer

Expiration: Forward to ESH&Q Document Control

Form Revision Summary

Revision 1.5 – 04/11/18 – Training section moved from section 5 Authority and Responsibility to section 9 Training

Revision 1.4 – 06/20/16 – Repositioned “Scope of Work” to clarify processes

Qualifying Periodic Review – 02/19/14 – No substantive changes required

Revision 1.3 – 11/27/13 – Added “Owning Organization” to more accurately reflect laboratory operations.

Revision 1.2 – 09/15/12 – Update form to conform to electronic review.

Revision 1.1 – 04/03/12 – Risk Code 0 switched to N to be consistent with [3210 T3 Risk Code Assignment](#).

Revision 1.0 – 12/01/11 – Added reasoning for OSP to aid in appropriate review determination.

Revision 0.0 – 10/05/09 – Updated to reflect current laboratory operations

ISSUING AUTHORITY	FORM TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning	04/11/18	04/11/21	1.5

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Task Hazard Analysis (THA) Worksheet

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

Click
For Word

Author:	A.M. Sandorfi	Date:	Nov 15/2018	Task #: If applicable	
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 UTF 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	<ul style="list-style-type: none"> • UTF ODH: https://wiki.jlab.org/ciswiki/index.php/File:UTF_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

Task Hazard Analysis (THA) Worksheet

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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)
3	Verify 110/220 IBC power feeds from <i>Big Bertha</i> 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

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

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Task Hazard Analysis (THA) Worksheet

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

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)
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 is intact.	1

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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)
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 ($RC \geq 3$), 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](#).)

Task Hazard Analysis (THA) Worksheet

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

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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Task Hazard Analysis (THA) Worksheet

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

Click
For Word

Author:	A.M. Sandorfi	Date:	Nov 15/2018	Task #: If applicable	
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 UTF 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	<ul style="list-style-type: none"> • UTF ODH: https://wiki.jlab.org/ciswiki/index.php/File:UTF_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

Task Hazard Analysis (THA) Worksheet

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

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)
3	Verify 110/220 IBC power feeds from <i>Big Bertha</i> 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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Task Hazard Analysis (THA) Worksheet

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

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)
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 is intact.	1

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Task Hazard Analysis (THA) Worksheet

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

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)
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 ($RC \geq 3$), 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](#).)

Task Hazard Analysis (THA) Worksheet

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

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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By signing this page, you testify that you have read, understand, and agree to abide by the procedure specified in the above referenced work control document:

Serial
Number: ENP-18-80380-OSP

Title: Cool and Operate HDice IBC and its super - conducting magnets in cave - 2 of UITS

Name

Signature

Date _____

[illegible]