

If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

7.1.65.a Safety Issues Associated with Cold Box 3

Text Page 2 through 11

C-A-OPM Procedures in which this Attachment is used.		
7.1.65		

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Approved: _____ *Signature on File* _____
 Collider-Accelerator Department Chairman Date

M. Sardzinski



SAFETY ISSUES ASSOCIATED WITH COLD BOX 3 OF THE RHIC 24 kW REFRIGERATOR

Contributors: Bill Dejong, Len Masi, Anthony Nicoletti, Tom Tallerico, Andreas Warkentien, Mark Sardzinski, Dewey Lederle

This document describes the safety issues associated with working on or inside cold box 3 of the 24 kW RHIC cryogenic refrigerator. It is not meant to cover the details of every job. A job specific work permit reviewed by appropriate personnel is still required to complete any work inside the cold box.

MECHANICAL SAFETY ISSUES

Confined Space.

Cold Box 3 valve box is considered a confined space. Any work inside the box must adhere to the confined space regulations described in the BNL SBMS.

Trapped Helium Volumes

The potential exists for trapped pockets of high pressure helium inside the cold box. Prior to penetrating any process lines inside the box, contact the cryo control room at x3837 to verify no trapped helium volumes exists.

Pressurized Helium Sources

Cold Box 3 is part of the RHIC cryogenic system and has the potential to see pressurized Helium gas sources. Following are a list of potential sources and the valves associated with isolating them (Reference attached drawings 3A995009 and 3A995049)

From warm HX's:

Isolation valves: H314A, H714A, H313M, H713M

From Cooldown Byass Line:

Isolation valves: H346M, H746M, H156M, H157M, H425M, H825M

From Turbines 3A, 4A, 3B, 4B:

Isolation Valves: H380A, H780A, H360M, H760M

To Turbines 3A, 4A, 3B, 4B:

Isolation Valves: H352A, H752A

From turbines 1A, 2A, 1B, 2B:

Isolation Valves: H338M, H738M

From cold return of Refrigerator:

Isolation Valves: H398M, H798M, H159A

From Adsorbers:

Isolation valves: H371A, H771A

To Adsorbers:

Isolation valves: H362A, H762A

HX3A:

Isolation valves: H344A, H744A,

From Heat Shield:

Isolation Valves: H9A, H9080M

To heat Shield:

Isolation Valve: H25A, H813M

High Pressure to refrigerator:

Isolation Valves: H9114M, H9113M, H166M, H9115M, H100A, H82M,
H86A, H144M, H9111M

Helium Tube Trailers

These are occasionally used to pressurize piping for leak checking or ASME pressure checking. Check with the cryo control room (x3837) to verify there are no hazards associated with tube trailers prior to working inside the cold box.

Vacuum Systems

The only issues associated with the vacuum system are locking out the vacuum pumps that are used to establish insulating vacuum. Details are in the electrical safety section. Before entering the cold box contact the C-AD vacuum group for assistance in isolating the vacuum system and breaking the vacuum space with air/nitrogen mixture.

Pneumatic Systems

Valves located on the top of the valve box are supplied with pressurized nitrogen or air at approximately 100 psig. Nitrogen valves can be isolated via manifolds located local to the cold box. Reference drawing RD3A995059.

Heights

Work inside the cold box may involve climbing on process piping and working at elevated heights. Use harnessing and temporary scaffolding as necessary. Also care should be taken not to get tangled up in loose instrumentation wiring. If work is to be done on the outside of the box, make sure the surface is dry and free of debris.

ELECTRICAL SAFETY ISSUES

In conjunction with the accident in Coldbox 3 in which a technician burned his hand on a heater, we investigated all potential sources in the cold box that could contribute to another accident occurrence. Careful inspection of the cold box indicates the only electrical related voltage hazards are external of the valve box. There are no feed-through(s) externally that contain high voltages that pass into the coldbox.. The heater within the coldbox is inside a pipe and is fed from the top of the coldbox and into a flange See pictures below of the heater 480 volt feed-through and thermocouple.

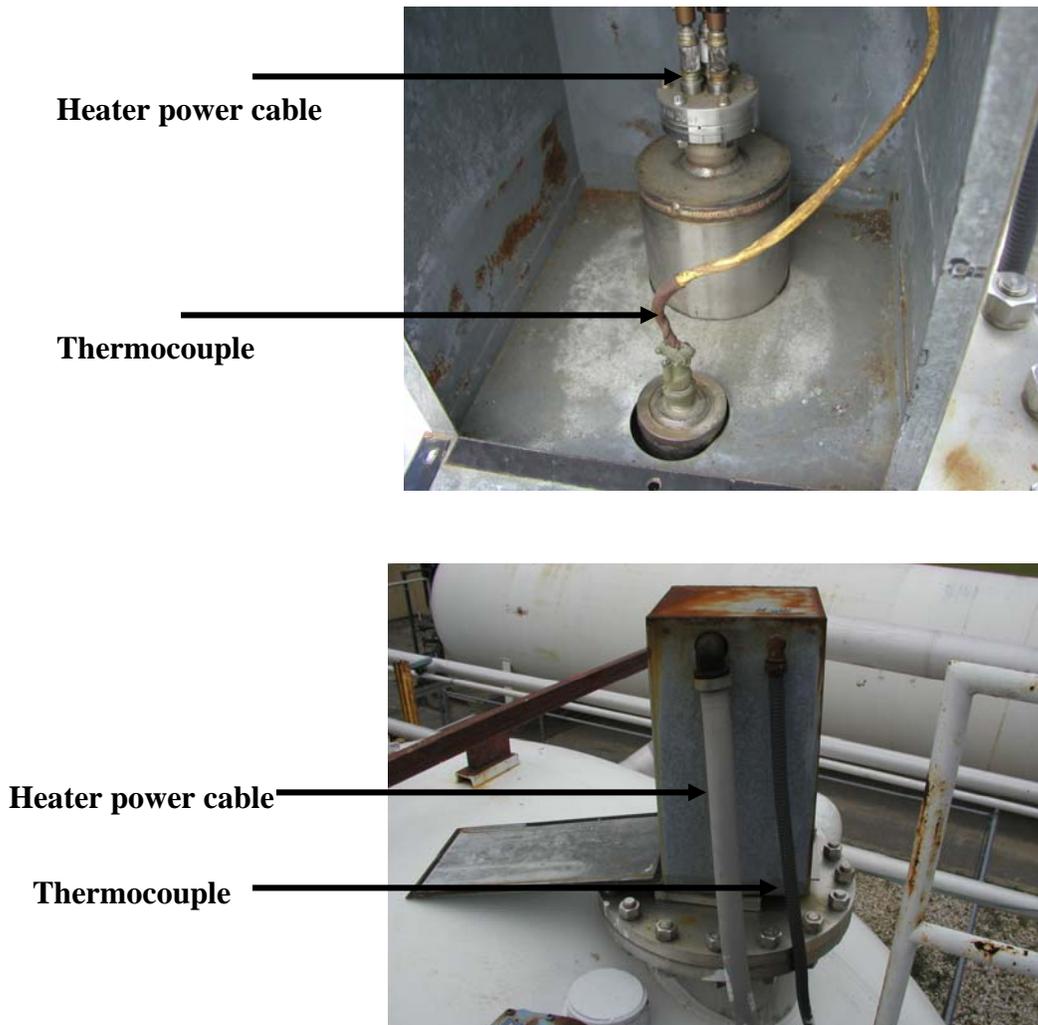


Fig.1 Cable entrance for 480v heater in Coldbox 3

A picture of the actual heater enclosure in cold box 3 appears below.

Heater enclosed
in this pipe.

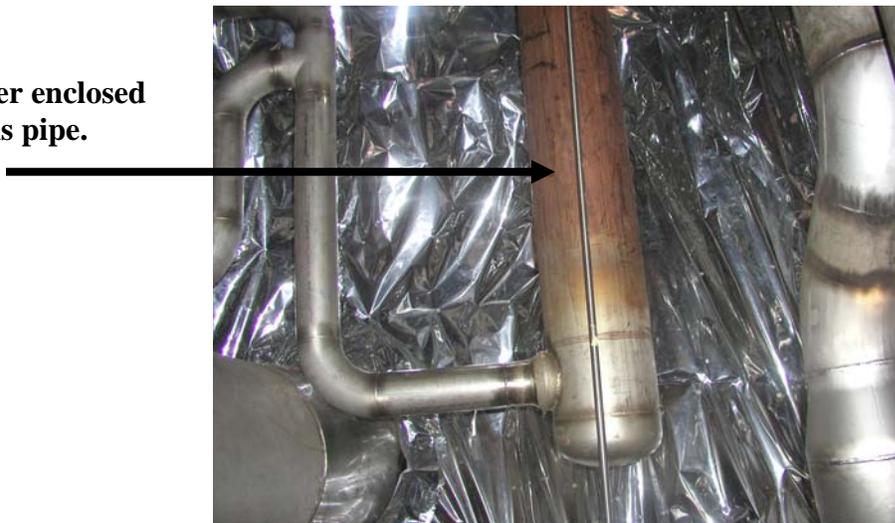


Fig.2

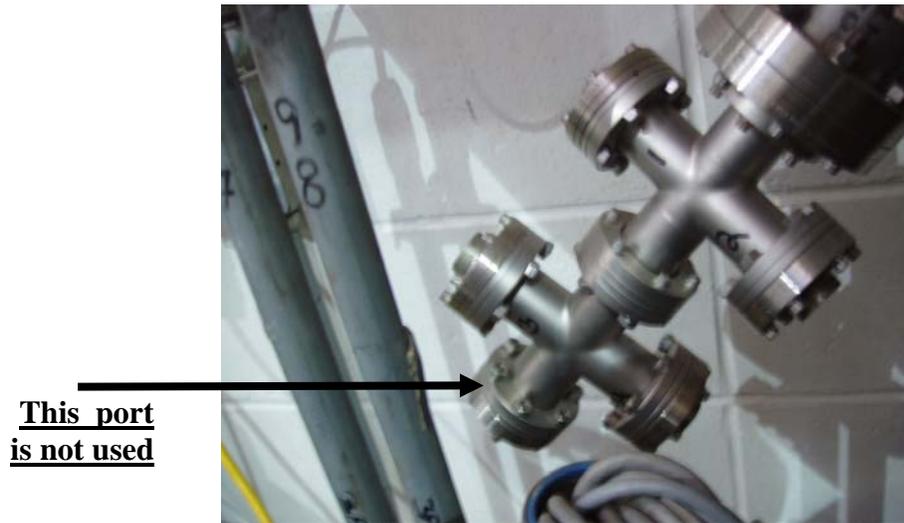
Locking Out Heater Power

The heater voltage for coldbox 3 can be removed by locking out the power switch on the calorimeter cabinet as shown in the picture below.



**Fig.3 Calorimeter for Cold box 3
LOTO is applied.**

The only feed-through(s) that exist are for low-level instrumentation (temperature sensors). See picture below for instrumentation feed-through(s) into cold box 3.



**Fig.4 Instrumentation feed-through with four connectors
Cold box 3**

There is a diffusion vacuum pump external to coldbox 3 that requires 480 volts AC. However it is on a plug and when service is required it can simply be unplugged. No LOTO is required. The 480 volts for this vacuum system does not enter coldbox 3. See figure below of vacuum pumps.

HOT SURFACE
REAR WINDOW



480 volt plug for
Diffusion pump can
be unplugged.

Fig. 5 Vacuum Diffusion Pump

There are vacuum gauges external of the coldbox as shown in the picture below. None of these gauges have voltages that enter into coldbox 3.



Fig.6 Vacuum Gauges



Fig.7 Pressure Gauges

There are six valves external to the coldbox and directly on top of it that require 120 volts ac. None of these voltages are internal to coldbox 3. See figures below of the valves on top of coldbox 3.

Note: the curve surface of the Cold Box (work hazard)

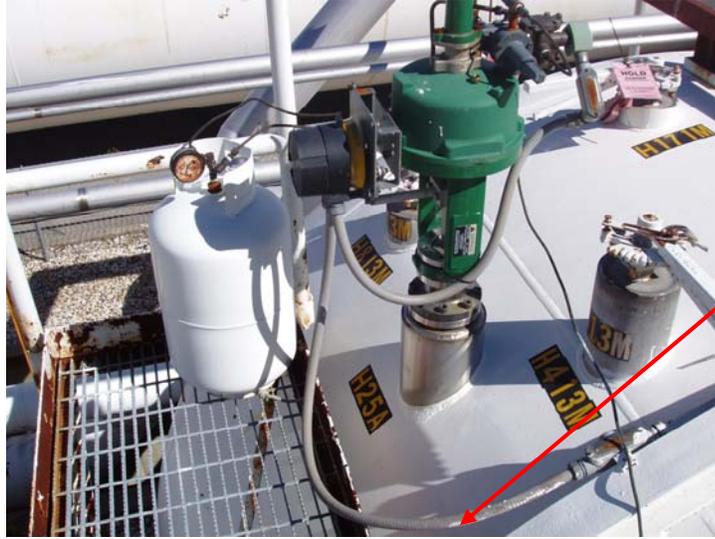


Note: The kick-plate on the edge of the walk way

Fig 8 Valve H9A



Fig. 9 Valve H344A, H744A and H153A



Electrical conduit runs are on top and sides of the cold box (120V AC for solenoid operation)

Fig.10 Valve H25A



Fig.11 Valve H15A



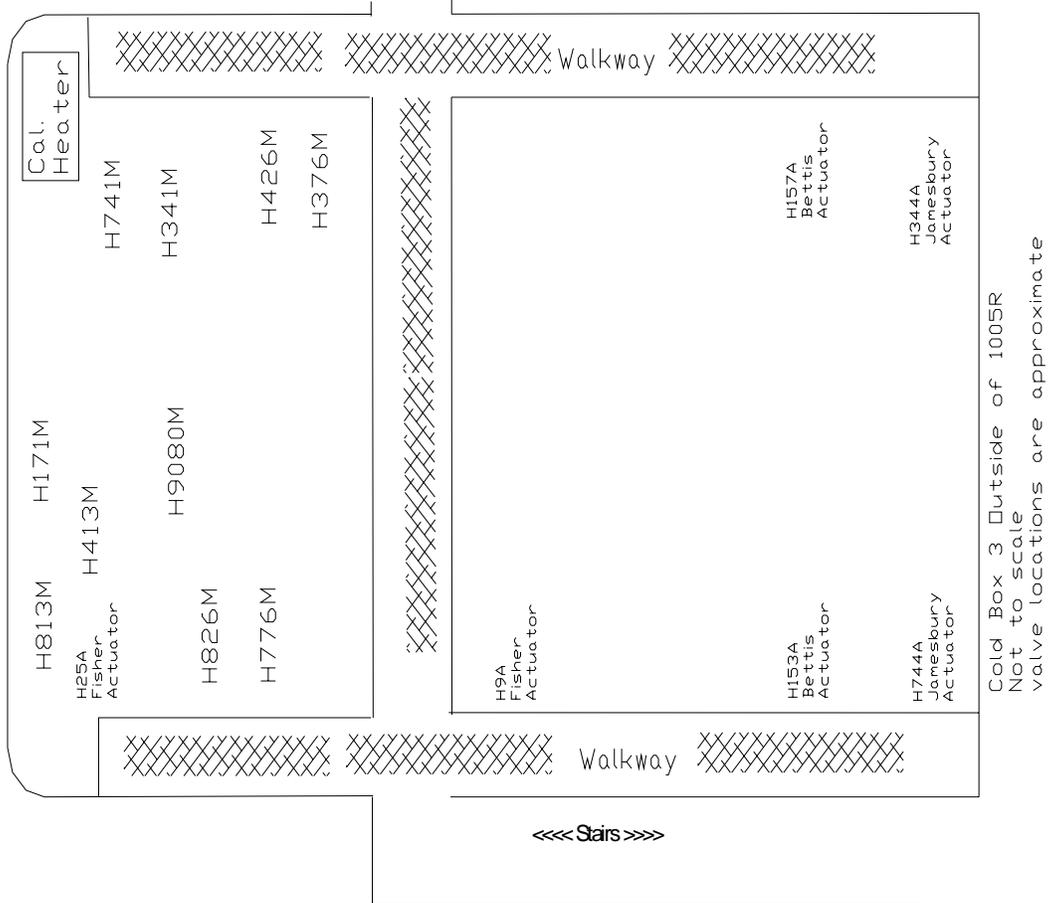
Fig.12 Slide Valve inside the refrigerator room

Connector signal lists for the feed-through(s) have been located and are attached to this document. The list clearly shows that all signals are low level instrumentation signals.

Supporting Documents:

3A985042 (Helix 7026296) Assembly Calorimeter Cold Box 3.
3A985043 rev. A (Helix 7026296) Wiring diagram Calorimeter 3 & 5 Control Panel.
3A985043 rev. B (Helix 7026296) Wiring diagram Calorimeter 3 & 5 Control Panel.
3A985044 rev. B (Helix 7026296) Calorimeter Control Panel Assy 3 & 5.
DP26-TC Differential meter users Guide

Plan view



Plan View of Cold Box 3 (outside)