***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.m Safety Issues Associated with the 10 O'Clock Blue Valve Box

| C-A OPM Procedures in which this Attachment is used. | | |
|---|---|---|
| 7.1.65 | | |
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Hand Processed Changes

| HPC No. | Date | Page Nos. | Initials |
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Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

M. Sardzinski

BROOKHAVEN NATIONAL LABORATORY

# SAFETY ISSUES ASSOCIATED WITH THE 10 O'CLOCK BLUE VALVE BOX

**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 the 10 o'clock blue valve box. 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 valve box.

## MECHANICAL SAFETY ISSUES

### Component Details

The 10 o'clock blue valve box is part of the RHIC Cryogenic Distribution System. It is comprised of a vacuum tank that houses liquid pots, process piping, heat shield piping, temperature devices and liquid level probes. The following is detailed description of some of the major components, taken from ***Cryogenic System, vii System Components manual***.

**Inlet Recooler (liquid pots):** The Inlet Recooler is a heat exchanger assembly located in a valve box. By means of this heat exchanger helium gas which is about to enter the, magnet string at one end (Dipole D0) of a sextant is cooled to a temperature close to the temperature of the boiling liquid helium bath provided on one side of the heat exchanger.1 **Process Piping and valves:** The (present) conceptual design envisions that all the piping for a ring will be carried in a common jacket with a heat shield. Pipes will be provided to carry the helium for the following: Magnet coolant, with power leads, Supply header, Return header, Utility header and Heat Shield.

This connecting piping also contains all the isolation and diverting valves required to meet the RHIC operating scenarios. Groups of these valves have been gather into a single valve box located between each pair of sextants.2

### Confined Space

The 10 o'clock yellow valve box is considered a confined space. Any work inside the box must adhere to the confined space regulations described in the BNL SBMS.

1 Vii System Components, RHIC Design Manual, pg29
2 Vii System Components, RHIC Design Manual, pg 33

**Trapped Helium Volumes**

The potential exists for trapped pockets of high pressure helium inside the valve box. Prior to penetrating the box, contact the cryo- control room at x3837 to verify no trapped helium volumes exist.

**Pressurized Helium Sources**

10 o'clock Blue Valve box is part of the RHIC cryogenic system and has the potential to see pressurized Helium gas and Nitrogen gas sources. Following are a list of potential sources and the valves associated with isolating them (Reference drawing(s) 3A995088,
3A995089, 3A995069, 3A995090, 3A995071 and 3A995092

**3A995088 8 o'clock Blue Ring P&ID**

| | |
|---|---|
| **H4867M** | **"M" " Line Vacuum Manifold** |
| **H4831M** | **"M" " Line Isolation** |
| **H4868M** | **"S" Line Vacuum Manifold** |
| **H4805M** | **"S" " Line Isolation** |
| **H4869M** | **"H" Line Vacuum Manifold** |
| **H4802A** | **"H" " Line Isolation** |
| **H4870M** | **"U" Line Vacuum Manifold** |
| **H4803A** | **"U" " Line Isolation** |
| **H4871M** | **"R" Line Vacuum Manifold** |
| **H4804A** | **"R" " Line Isolation** |
| **HM4822** | **Block and Bleed** |
| **H4880M** | |
| **H4881M** | |
| **H4882M** | |
| **H4883M** | |
| **H4884M** | **Lead Flow Return to Warm Return Line** |
| **H4885M** | |
| **H4886M** | |
| **H4887M** | |
| **H4888M** | |
| **H4889M** | |

**Note:**

**Since the Blue and Yellow Ring have a common *Warm Return Manifold,* They share the same isolation valves, which are listed below for convenience. Since they are numerous magnet corrector thermister valves to list, check the valves in the particular sextant that needs isolation. Refer to the sextant P&ID3A995089 SEXTANT 8/9 Sheets 1-8**

**3A995069 SEXTANT 8/9 Sheets 1-8**

| | |
|---|---|
| **H6150A** | **Flow Manifold @ 9Q3 Yellow** |
| **H6151A** | **Flow Manifold @ 9Q6 Yellow** |
| **H6152A** | **Flow Manifold @ 9Q9 Yellow** |
| **H6153A** | **Flow Manifold @ 9Q11 Yellow** |
| **H6154A** | **Flow Manifold @ 9Q14 Yellow** |
| **H6155A** | **Flow Manifold @ 9Q16 Yellow** |
| **H6156A** | **Flow Manifold @ 9Q19 Yellow** |
| **H6157A** | **Flow Manifold @ 9D20 Yellow** |
| **H6158A** | **Flow Manifold @ 8Q19 Yellow** |
| **H6159A** | **Flow Manifold @ 8Q16Yellow** |
| **H6160A** | **Flow Manifold @ 8Q14 Yellow** |
| **H6161A** | **Flow Manifold @ 8Q11 Yellow** |
| **H6162A** | **Flow Manifold @ 8Q9 Yellow** |
| **H6163A** | **Flow Manifold @ 8Q6 Yellow** |
| **H6164A** | **Flow Manifold @ 8Q3 Yellow** |

**3A995090 10o'clock Blue Ring P&ID**

| | |
|---|---|
| **H4753M** | |
| **H4754M** | |
| **H4755M** | |
| **H4756M** | |
| **H4757M** | |
| **H4758M** | **Lead Flow Return to Warm Return Line** |
| **H4759M** | |
| **H4760M** | |
| **H4761M** | |
| **H4762M** | |
| **H4763M** | |
| **H4764M** | |
| **H4765M** | **Lead Flow Return to Warm Return Line** |
| **H4766M** | |
| **H4767M** | |
| **H4854M** | |
| **H5154M** | **"M" " Line Vacuum Manifold** |
| **H5155M** | **"S" Line Vacuum Manifold** |
| **H5156M** | **"H" Line Vacuum Manifold** |
| **H5157M** | **"U" Line Vacuum Manifold** |
| **H5158M** | **"R" Line Vacuum Manifold** |
| **H5022M** | **Block and Bleed** |
| **H5033M** | **Block and Bleed** |
| **H5281M** | **Block and Bleed** |
| **H5012M** | **Block and Bleed** |
| **H5017M** | **Block and Bleed** |
| **H5163M** | **"R" Line Vacuum Manifold** |
| **H5162M** | **"U" Line Vacuum Manifold** |

| | |
|---|---|
| **H5161M** | **“H” Line Vacuum Manifold** |
| **H5160M** | **“S” Line Vacuum Manifold** |
| **H5159M** | **“M” ” Line Vacuum Manifold** |

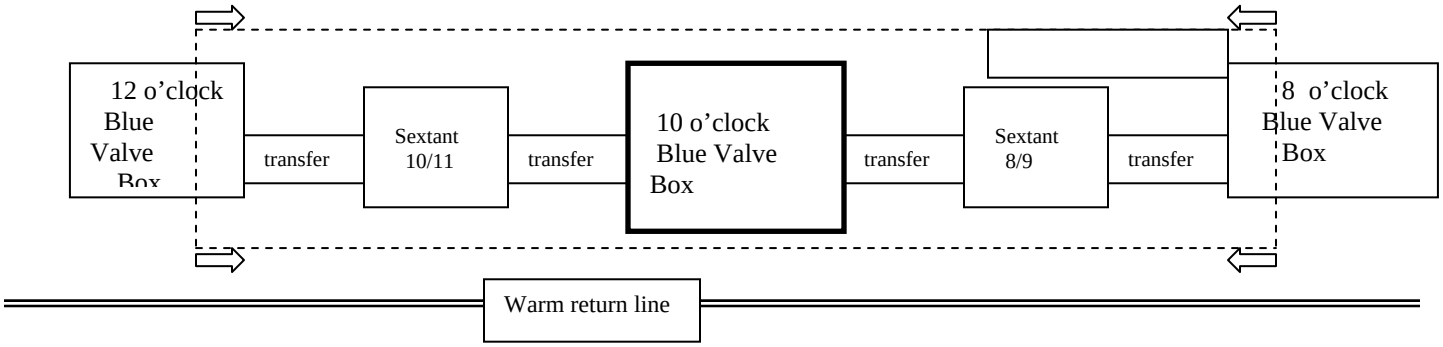
**Note:**
**Since the Blue and Yellow Ring have a common *Warm Return Manifold,* They share the same isolation valves, which are listed below for convenience. Since they are numerous magnet corrector thermister valves to list, check the valves in the particular sextant that needs isolation. Refer to the sextant P&ID 3A995091 SEXTANT 10/11 Sheets 1-8**

**3A995071 SEXTANT 10/11 Sheets 1-8**

| | |
|---|---|
| **H6560A** | **Flow Manifold @11Q3 Yellow** |
| **H6561A** | **Flow Manifold @11Q6 Yellow** |
| **H6562A** | **Flow Manifold @ 11Q9 Yellow** |
| **H6563A** | **Flow Manifold @ 11Q11 Yellow** |
| **H6564A** | **Flow Manifold @ 11Q14 Yellow** |
| **H6565A** | **Flow Manifold @ 11Q16 Yellow** |
| **H6566A** | **Flow Manifold @ 11Q19 Yellow** |
| **H6567A** | **Flow Manifold @ 11D20 Yellow** |
| **H6568A** | **Flow Manifold @ 10Q19 Yellow** |
| **H6569A** | **Flow Manifold @ 10Q16Yellow** |
| **H6570A** | **Flow Manifold @ 10Q14 Yellow** |
| **H6571A** | **Flow Manifold @ 10Q11 Yellow** |
| **H6572A** | **Flow Manifold @ 10Q9 Yellow** |
| **H6573A** | **Flow Manifold @ 10Q6 Yellow** |
| **H6574A** | **Flow Manifold @ 10Q3 Yellow** |

**3A995092 12o’clock Blue Ring P&ID**

| | |
|---|---|
| **H4000A** | **“M” Line Isolation** |
| **H4001A** | **“S” Line Isolation** |
| **H4002A** | **“H” Line Isolation** |
| **H4003A** | **“U” Line Isolation** |
| **H4004A** | **“R” Line Isolation** |
| **H4085M** | **“M” ” Line Vacuum Manifold** |
| **H4086M** | **“S” Line Vacuum Manifold** |
| **H4087M** | **“H” Line Vacuum Manifold** |
| **H4088M** | **“U” Line Vacuum Manifold** |
| **H4089M** | **“R” Line Vacuum Manifold** |
| **H4070M** | **Block and Bleed** |
| **H4069M** | **Block and Bleed** |




This is a simplified diagram showing all the major cryogenic components of the RHIC blue ring at the 10:00 position between the 12:00 and 8:00 valve

**1.Vacuum Systems**

The only possible operations and environmental issues associated with the vacuum system are locking out the turbo vacuum pumps that are used to establish insulating vacuum. Details are in the electrical safety section. Before entering the valve box contact the C-AD vacuum group for assistance in isolating the vacuum system and introducing Air/Nitrogen into the valve box. The main isolation valve for the valve box is V5002A.

**2.Pneumatic Systems**

Valves located on the top of the valve box are supplied with compressed air at approximately 100 psig. Air to valves can be isolated via manifolds located at the valve box. Reference drawing 3A995100. Exercise extreme caution when working on top of the valve box, not to damage the plastic tubing that feeds the air to the valves.

**3.Tube Trailers**

Occasionally helium tube trailers are used to pressurize cryo process lines. These penetrations can be at various locations inside the valve box and may bypass locked out valves. Any person entering the valve box should inspect the area for a tube trailer connection and check with the cryo-control (x3837) room to make sure there are no trailer hazards.

If trailers are stationed at other locations in the Ring, the potential exists for Gas to reach the 10 blue o'clock valve box via cryogenic process lines (Magnet, Heat shield, Utility, Supply and Return). Check with the cryogenic control room to determine if trailers are stationed at other locations in the ring and to insure local LOTO is in place in the area where the trailer connects to the cryo system The LOTO list should be covered in the job specific work permit.

**Piping arrangement.**

**External**

Extreme caution should be exercised when working on or around the valve box , a review of the work plan should be done prior to working on the valve box.

There are numerous hazardous conditions associated with the piping arrangement. For example low hanging piping can cause head injuries. Also work that is outside of the "railed" platform shall not be attempted by "climbing" over the rail.

**Internal**

A detailed plan should be in place before working inside the valve box the following is a list of hazards inside the valve box.

- the valve box is shaped like a cylindrical tank with no floor built into it, this makes it difficult to move around.
- The piping arrangement is close together and is covered in MLI.
- Care should be taken not to damage small instrument tubing.
- Sharp edges from brackets are a hazard.
- If there is any welding and cutting involved in working inside the valve box a CONFINE SPACE PERMIT is required.

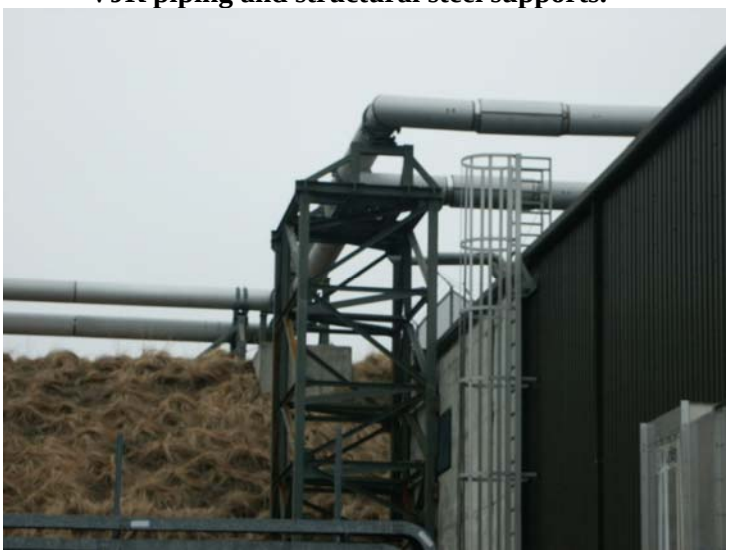
Figures 1-5 are external views of the valve box.

**Fig. 1 Posted at the entrance of each valve box building is a caution sign stating the ODH hazard level and a building manager contact card.**


**Fig. 2 The man-hole cover to the valve box, with Confine Space Sign.**

**Fig. 3 A partial view of the top of the valve box, in the background is the orange fence that as power leads enclosed.**


**Fig. 4 An outside view of the 8o'clock side of 10o'clock,showing VJR piping and structural steel supports.**



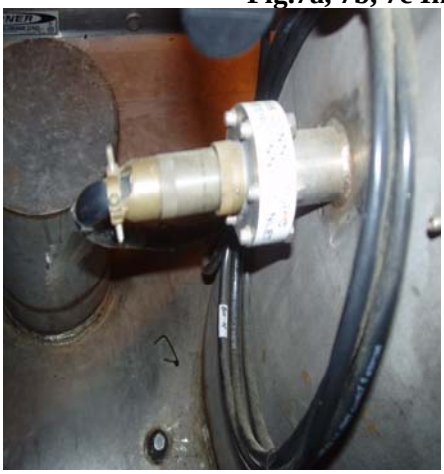
## Electrical Safety Issues

1) In conjunction with the accident in Cold-box 3 in which a technician burned his hand on a heater, we investigated the potential for a similar event in the blue valve box in service building 10.

   Careful inspection of the valve box indicates no lethal voltage potentials and no installed heaters internal to the valve box. There are no feed-through(s) externally that contain high voltages that would pass into the cold-box. The only feed-through(s) (cables labeled BVBA, BVBB, BVBC, BVBD and BVBE) that exist are for low-level instrumentation (temperature sensors and level probes).

**Fig. 6 Instrumentation cables on the bottom of the valve box.**

**Fig.7a, 7b, 7c Instrumentation cables on top of the valve box.**

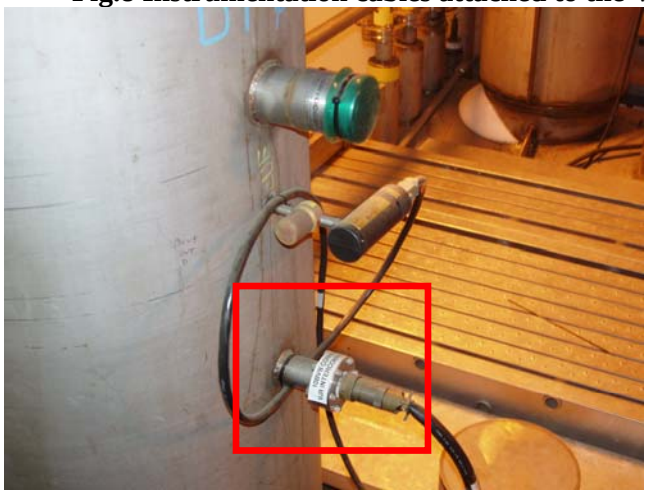




## INSULATING VACUUM

Gauges and controllers for insulating vacuum are located at various locations on the valve box. They are all external of the valve box and do not enter the valve box with any high voltage.

**Fig.8 Instrumentation cables attached to the VJR piping.**



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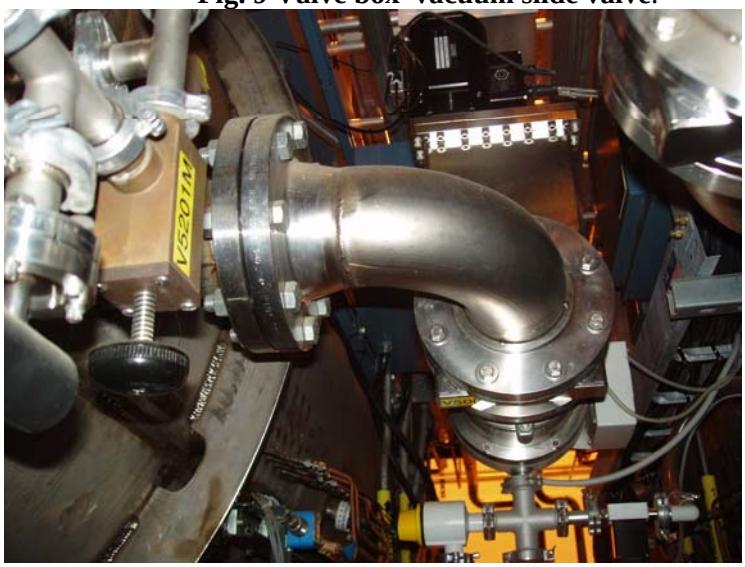
**SLIDE VALVES**

Each valve box has an associated slide valve as shown in the photo below. There is 120 VAC associated with these valves.

**Fig. 9 Valve box  vacuum slide valve**.




**Supporting Documents**

**3A995088  8o'clock Blue Ring P&ID**
**3A995069  SEXTANT 8/9 Sheets 1-8**
**3A995089  SEXTANT 8/9 Sheets 1-8**
**3A995090  10o'clock Blue Ring P&ID**
**3A995071  SEXTANT 10/11 Sheets 1-8**
**3A995091  SEXTANT 10/11 Sheets 1-8**
**3A995050  12o'clock Yellow Ring P&ID**