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C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

7.1.65.g Safety Issues Associated with the 2 O’Clock Blue Valve Box

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

Hand Processed Changes

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 Collider-Accelerator Department Chairman Date

M. Sardzinski



SAFETY ISSUES ASSOCIATED WITH THE 2 O'CLOCK BLUE VALVE BOX

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This document describes the safety issues associated with working on or inside the 2 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 2 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

¹ Vii System Components, RHIC Design Manual, pg29
² Vii System Components, RHIC Design Manual, pg 33
C-A-OPM-ATT 7.1.65.g (Y)

Confined Space

The 2 o'clock blue 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 valve box. Prior to penetrating the box, contact the cryo- control room at x3837 to verify no trapped helium volumes exist.

Pressurized Helium Sources

2 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) 3A995082, 3A995084, 3A995092, 3A995081 and 3A995083.

3A995092 12 o'clock Blue Ring P&ID

H4133M		
H4134M		
H4135M		
H4136M		
H4137M		Lead Flow Return to Warm Return Line
H4138M		
H4139M		
H4140M		
H4141M		
H4142M		
H4080M		"M" " Line Vacuum Manifold
H4007M		"M" " Line Isolation
H4081M		"S" Line Vacuum Manifold
H4005M		"S" " Line Isolation
H4082M		"H" Line Vacuum Manifold
H4002A		"H" " Line Isolation
H4083M		"U" Line Vacuum Manifold
H4003A		"U" " Line Isolation
H4084M		"R" Line Vacuum Manifold
H4004A		"R" " Line Isolation
H4062M		Block and Bleed
H4063M		Block and Bleed

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 3A995081 SEXTANT 12/1 Sheets 1-8

3A995061 SEXTANT 12/1 Sheets 1-8

H7150A	Flow Manifold @ 1Q3 Yellow
H7151A	Flow Manifold @ 1Q6 Yellow
H7152A	Flow Manifold @ 1Q9 Yellow
H7153A	Flow Manifold @ 1Q11 Yellow
H7154A	Flow Manifold @ 1Q14 Yellow
H7155A	Flow Manifold @ 1Q16 Yellow
H7156A	Flow Manifold @ 1Q19 Yellow
H7157A	Flow Manifold @ 1D20 Yellow
H7158A	Flow Manifold @ 12Q19 Yellow
H7159A	Flow Manifold @ 12Q16 Yellow
H7160A	Flow Manifold @ 12Q14 Yellow
H7161A	Flow Manifold @ 12Q11 Yellow
H7162A	Flow Manifold @ 12Q9 Yellow
H7163A	Flow Manifold @ 12Q6 Yellow
H7164A	Flow Manifold @ 12Q3 Yellow

3A995082 2o'clock Blue Ring P&ID

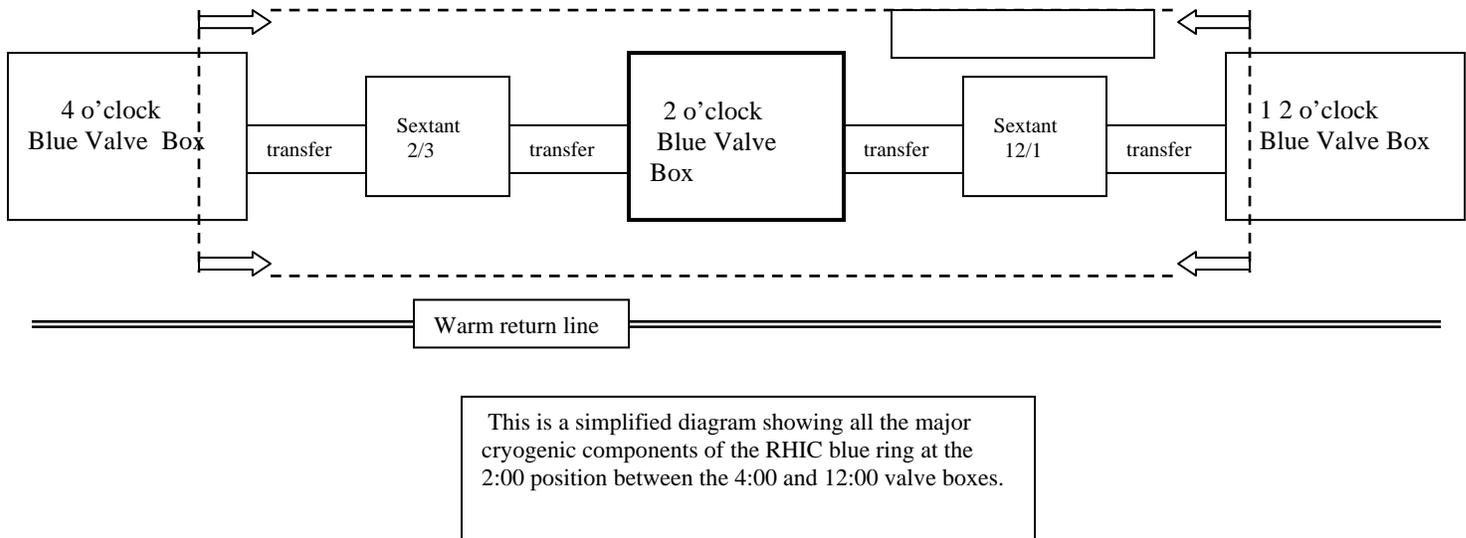
H4280M		
H4281M		
H4282M		
H4283M		
H4284M		
H4285M		
H4286M		Lead Flow Return to Warm Return Line
H4287M		
H4288M		
H4289M		
H4290M		
H4267M		“M” Line Vacuum Manifold
H4268M		“S” Line Vacuum Manifold
H4269M		“H” Line Vacuum Manifold
H4270M		“U” Line Vacuum Manifold
H4271M		“R” Line Vacuum Manifold
H4212M		Block and Bleed

H4217M	Block and Bleed
H4214M	Block and Bleed
H4222M	Block and Bleed
H4250M	Block and Bleed
H4276M	“R” Line Vacuum Manifold
H4275M	“U” Line Vacuum Manifold
H4274M	“H” Line Vacuum Manifold
H4273M	“S” Line Vacuum Manifold
H4272M	“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 3A995083 SEXTANT 2/3 Sheets 1-8**

3A995063 SEXTANT 2/3 Sheets 1-8

H6545A	Flow Manifold 3Q3
H6546A	Flow Manifold 3Q6
H6547A	Flow Manifold 3Q9
H6548A	Flow Manifold 3Q11
H6549A	Flow Manifold 3Q14
H6550A	Flow Manifold 3Q16
H6551A	Flow Manifold 3Q19
H6552A	Flow Manifold 3D20
H6553A	Flow Manifold 2Q19
H6554A	Flow Manifold 2Q16
H6555A	Flow Manifold 2Q14
H6556A	Flow Manifold 2Q11
H6557A	Flow Manifold 3Q9
H6558A	Flow Manifold 2Q6
H6559A	Flow Manifold 2Q3



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 V4202A.

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 2 o'clock blue 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 CONFINED SPACE PERMIT is required.

Figures 1-3 below are some of the external views of the 2 o'clock Yellow Valve Box.

Fig. 1 View on top of the 2o'clock valve box, showing valve actuators, electric cables and pneumatic tubing.

Also notice the structural steel supporting the VJR Piping. Extreme caution is advised when working around the valve box.



Fig. 2 A partial view of the top of 2o'clock blue valve box.



Fig. 3 Another view of the top of the valve box. Notice That the high voltage leads are enclosed in the orange fence with caution signs.



Fig.3 Posted at the entrance of each valve box building is a caution sign stating the ODH hazard level. Contact information card



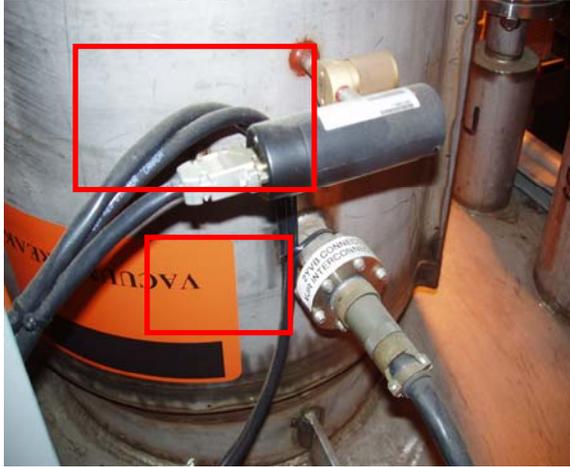
Electrical Safety Issues

- 1) In conjunction with the accident in Cold-box 3 (RHIC 25 Kw refrigerator) in which a technician burned his hand on a heater, we investigated the potential for a similar event in the yellow valve box in service building 4. 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 2BA, 2BB and 2BC) that exist are for low-level instrumentation (temperature sensors).

Fig. 4 Cables for low-level voltage instrumentation. The location of the cables are on the bottom of the valve box.



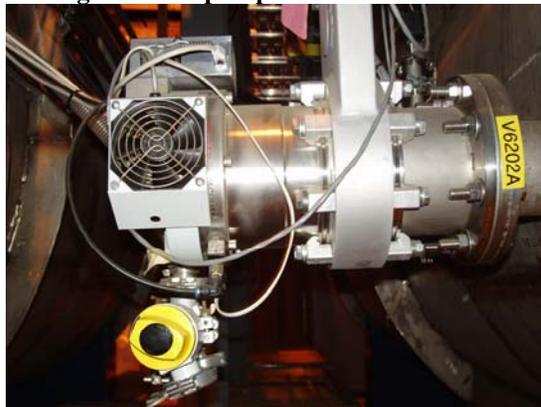
Fig. 5 Vacuum gauge and instrumentation cables.



2) 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.

3) Each valve box has an associated slide valve as shown in the photo below. There is 120 Volts ac present at this slide valve. A fan is also present so caution should be taken due to the rotating blade.

Fig. 6 Turbo-pump and slide valve.



Supporting Documents:

3A995092 12 o'clock Blue Ring P&ID

3A995081 SEXTANT (blue) 12/1 Sheets1-8

3A995061 SEXTANT (yellow) 12/1 Sheets 1-8

3A995082 2o'clock Blue Ring P&ID

3A995083 SEXTANT (blue) 2/3 Sheets1-8

3A995063 SEXTANT (yellow) 2/3 Sheets 1-8

3A995068 4o'clock Blue Ring P&ID