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C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

7.1.65.n Safety Issues Associated with the 12 O’Clock Yellow Valve Box

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

M. Sardzinski

SAFETY ISSUES ASSOCIATED WITH THE 12 O'CLOCK YELLOW VALVE BOX

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This document describes the safety issues associated with working on or inside the 12 o'clock yellow 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 12 o'clock yellow 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 12 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
C-A-OPM-ATT 7.1.65.n (Y)

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

12 o'clock Yellow 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) 3A995022, 3A995061, 3A995072, 3A995073, 3A995071 and 3A995070.

3A995062 2 o'clock Yellow Ring P&ID

H6271M	"M" " Line Vacuum Manifold
H6200A	"M" " Line Isolation
H6272M	"S" Line Vacuum Manifold
H6201A	"S" " Line Isolation
H6273M	"H" Line Vacuum Manifold
H6202A	"H" " Line Isolation
H6274M	"U" Line Vacuum Manifold
H6203A	"U" " Line Isolation
H6275M	"R" Line Vacuum Manifold
H6204A	"R" " Line Isolation
H6222M	Block and Bleed

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 @ 12Q16Yellow
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

3A995072 12o'clock Yellow Ring P&ID

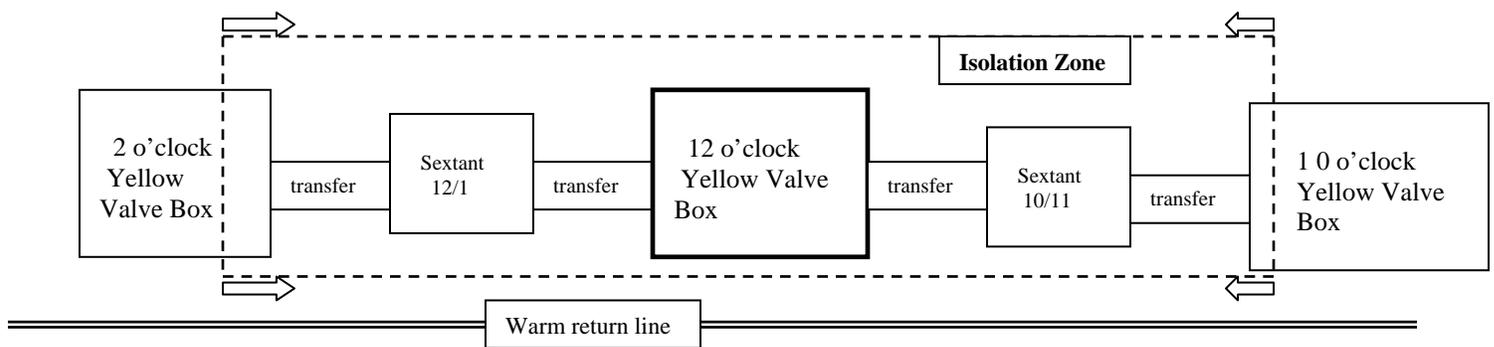
H6059V	
H6060M	
H6061M	
H6062M	
H6065M	Lead Flow Return to Warm Return Line
H6066M	
H6067M	
H6068M	
H6069M	
H6083M	"M" Line Vacuum Manifold
H6084M	"S" Line Vacuum Manifold
H6085M	"H" Line Vacuum Manifold
H6086M	"U" Line Vacuum Manifold
H6087M	"R" Line Vacuum Manifold
H6052M	Block and Bleed
H6071M	Block and Bleed
H6012M	Block and Bleed
H6028M	Block and Bleed
H6017M	Block and Bleed
H6022M	Block and Bleed
H6082M	"R" Line Vacuum Manifold
H6081M	"U" Line Vacuum Manifold
H6080M	"H" Line Vacuum Manifold
H6079M	"S" Line Vacuum Manifold
H6078M	"M" Line Vacuum Manifold

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

3A995070 10o'clock Yellow Ring P&ID

H7067M	"M" Line Isolation
H7066M	"S" Line Isolation
H7002A	"H" Line Isolation
H7003A	"U" Line Isolation
H7004A	"R" Line Isolation
H7076M	"M" " Line Vacuum Manifold
H7077M	"S" Line Vacuum Manifold
H7078M	"H" Line Vacuum Manifold
H7079M	"U" Line Vacuum Manifold
H7080M	"R" Line Vacuum Manifold
H7022M	Block and Bleed
H7129M	
H7130M	
H7131M	
H7132M	
H7133M	
H7135M	
H7137M	Lead Flow Return to Warm Return Line
H7138M	
H7139M	
H7140M	
H7141M	
H7142M	
H7143M	



This is a simplified diagram showing all the major cryogenic components of the RHIC yellow ring at the 12:00 position between the 2:00 and 10:00 valve boxes.

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 V7702A.

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 12 o'clock yellow 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 1-5 below are some of the external views of the 12 o'clock Yellow 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 valve box man-hole cover with the Confine space card.



Fig. 3 A view on top of the valve box showing the actuators of the process valves.



Fig. 4 A ground level view showing the 12o'clock yellow (near) and the blue (far) valve boxes.



Fig. 5 An outside view of the 10o'clock side of 12 o'clock, showing the VJR piping and the 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 yellow valve box in service building 12.

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 YVBA, YVBB, YVBC, YVBD and YVBE) that exist are for low-level instrumentation (temperature sensors and level probes).

Fig. 6 Instrumentation Cables (bottom of the valve box).



Fig. 7a, 7b, 7c Instrumentation Cables (top of the valve box).



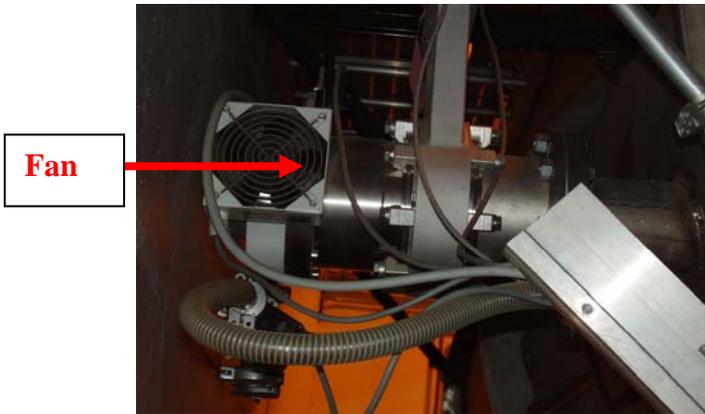
INSULATING VACUUM

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.



SLIDE VALVES

Each valve box has an associated slide valve as shown in the photo below. There is 120 Volts ac associated with these valves. There are rotating fan blades and thus caution must be observed.



Supporting Documents :

3A995062 2:00 Yellow ring P&ID
3A995072 12:00 Yellow ring P&ID
3A995070 10:00 Yellow ring P&ID
3A995061 Sextant 12/1 Yellow ring P&ID
3A995071 Sextant 10/11 Yellow ring P&ID