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C-A OPERATIONS PROCEDURES MANUAL

8.3.6 Installation, Maintenance and Repair of RHIC Insulating Turbomolecular Vacuum Pumps

Text Pages 2 through 5

Attachments Pages 6 and 7

Hand Processed Changes

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

D. Weiss

8.3.6 Installation, Maintenance and Repair of RHIC Insulating Turbomolecular Vacuum Pumps

1. Purpose and Scope

- 1.1 This procedure covers the installation of RHIC Turbomolecular Pump Stations (TMPS) and maintenance and repair of installed RHIC TMPS. This OPM may be used for a RHIC TMPS installed on any cryostat of the RHIC Collider.
- 1.2 This OPM is constructed to protect against the possibility of bleed-up of RHIC magnet cryostats during TMPS maintenance and installation activities.

2. Responsibilities

- 2.1 This procedure is to be executed by properly trained personnel within the Vacuum System Section, and by other trained operations personnel in coordination with the Vacuum Technical Supervisor.
- 2.2 Persons who install or maintain and repair installed TMPS are responsible for and required to following this procedure.
- 2.3 Appropriate vacuum component and handling processes shall be followed to insure that components are clean and remain clean for the intended application. Only trained vacuum system section personnel shall manipulate TMPS vacuum system components.

3. Prerequisites

- 3.1 All personnel involved in executing this procedure shall have working knowledge of this procedure and the equipment assigned by the Vacuum Technical Supervisor.
- 3.2 All personnel involved in executing this procedure shall be trained and authorized to operate the TMPS per C-AD [OPM 8.3.5](#) titled RHIC Turbomolecular Pump Station (TMPS) Operation.
- 3.3 All personnel involved in executing this procedure shall be familiar with the RHIC Turbomolecular Pump (TMP) System Schematic, Attachment 1, and System Installation Drawing, Attachment 2.
- 3.4 All personnel involved in executing this procedure shall be familiar with the RHIC TMP PET pages.
- 3.5 All personnel involved in executing this procedure shall be trained in C-A Access Training and Radworker 1.

- 3.6 A list of personnel trained in this procedure shall be maintained by the Vacuum Technical Supervisor.
- 3.7 Before work is scheduled to begin, work planning per C-AD [OPM 2.28](#), C-AD [OPM 2.28d](#) and C-AD [OPM 2.28i](#) shall be conducted.
- 3.8 Any activity specifying lock-out or tag-out shall comply with C-AD [OPM 2.36](#) “Lock and Tag Program for Control of Hazardous Energy.”

4. Precautions

- 4.1 Avoid accidental bleed-up of cryostats and unnecessary wear on turbomolecular pumps by verifying all connections and settings as prescribed herein, prior to operating the TMPS.
- 4.2 RHIC TMPS are only effective when the TMP inlet pressure is less than approximately 5 torr. Although successful operation may be possible at higher pressure, a turbopump at normal operating speed should NOT be valved in (i.e. cryostat isolation valve opened) if the cryostat pressure is above 5 torr.
- 4.3 Blank vacuum flanges shall be installed on open ports if vacuum systems will be exposed to atmosphere for maintenance or repair activities that will extend beyond a normal shift.

5. Procedure

Caution 1:
Manual Gate Valves (MGV) installed on interconnect pumpout ports prevent bleed-up of cryostats, when closed. To prevent accidental bleed-up of a cryostat, do NOT open the MGV without first following this procedure.

Caution 2:
TMPS logic design protects the TMPS and cryostat vacuum following a complete installation. To protect the TMPS and cryostat vacuum, do NOT attempt to operate a TMPS prior to the completion of the TMPS installation.

Caution 3:
When closed, Manual Gate Valves (MGV) installed on interconnect pumpout ports prevent bleed-up of cryostats. To prevent accidental bleed-up of a cryostat, insure the MGV is CLOSED prior to beginning maintenance or repair of an installed TMPS.

5.1 Installation Mode

- 5.1.1 Initial- The initial and complete TMP system installation includes the installation of the manual isolation gate valve (MGV). This step is necessary for new cryostats only. Since all cryostats are complete in RHIC the initial installation procedure is not detailed herein.
- 5.1.2 Existing- The TMPS installation procedure for existing and functioning cryostats excludes the installation of a MGV since all magnet cryostats include a previously installed MGV at all possible TMPS locations.

5.2 Existing TMPS Installation Procedure

- 5.2.1 Verify MGV is closed and sealing surface is clean prior to installing any components on the MGV.
- 5.2.2 Install all components according to the schematic and installation drawings for the TMPS. Do NOT make any control or electrical connections until all mechanical and vacuum connections are complete.
- 5.2.3 Make all pneumatic connections.
- 5.2.4 Make all control cable connections.
- 5.2.5 Make all 110 VAC electrical power distribution connections.

Note:

Insure that the MGV is CLOSED prior to powering or starting the TMPS.

- 5.2.6 Initiate LOCAL mode start-up sequence per C-AD [OPM 8.3.5](#).
- 5.2.7 With the electropneumatic cryostat isolation valve open and MGV closed, vacuum leak check the MPS through the TMPS manual leak check valve.
- 5.2.8 Upon verification of a vacuum leak tight TMPS, refer to C-AD OPM 8.3.5 for instructions on restoring the appropriate operating mode of the TMPS, including the actuation of the MGV.

5.3 Maintenance Procedure

- 5.3.1 Refer to OPM 8.3.5 for TMPS shutdown sequence.
- 5.3.2 The TMPS shall remain in LOCAL mode for the duration of the maintenance and repair activity.

- 5.3.3 Verify MGW is closed, pumps are off, TMPS is vented and electropneumatic valves are closed prior to beginning any maintenance activity on the TMPS.

Caution:

To protect the cryostat vacuum, disconnect and tag the control cable of the cryostat isolation valve for the duration of the maintenance or repair activity while the TMPS configuration is incomplete.

- 5.3.4 Disconnect power from the source prior to beginning work on any electrically powered device. If the maintenance activity extends beyond a full shift, any disconnected devices shall be tagged.
- 5.3.5 Refer to manufacturer manuals for maintenance procedures of specific TMPS components.
- 5.3.6 Refer to the appropriate paragraphs of the Installation procedure, section 5.2 herein to restore the TMPS to the appropriate operating condition.

6. Documentation

None

7. References

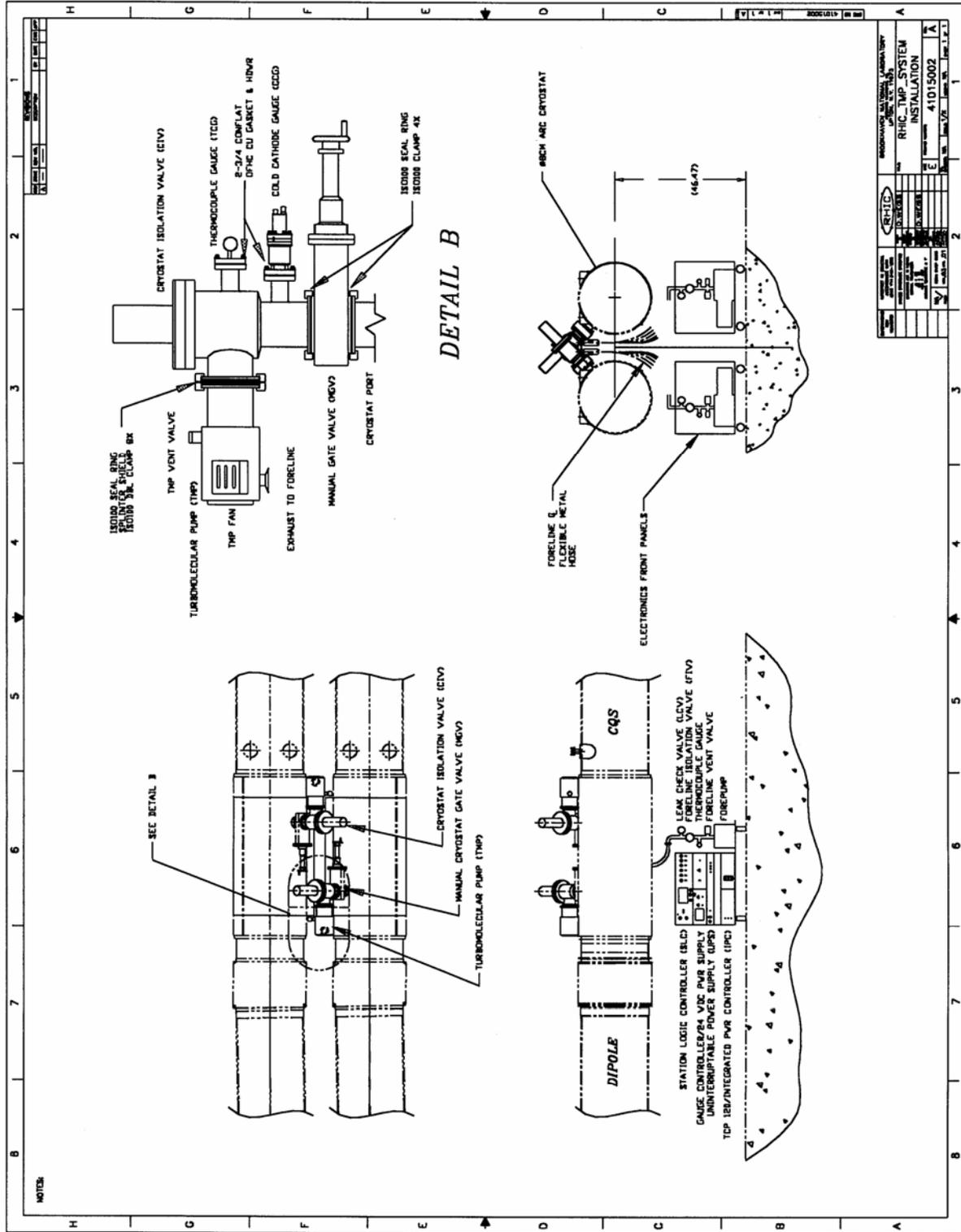
- 7.1 [C-AD OPM 8.3.5 “Turbomolecular Pump Station \(TMPS\) Operation”](#)
- 7.2 [C-A OPM 8.3.2 “Operation of the RHIC Vacuum Systems Using Control System Consoles”](#)
- 7.3 [C-AD OPM 2.28 “Procedure for Work Planning and Control for Operations”](#)
- 7.4 [C-AD OPM 2.28d “Work Screening Guideline”](#)
- 7.5 [C-AD OPM 2.28i “Conducting Effective Pre-Job Briefings, Walkdowns and Post-Job Reviews”](#)
- 7.6 [C-AD OPM 2.36 “Lock and Tag Program for Control of Hazardous Energy”](#)

8. Attachments

- 8.1 Attachment 1. - RHIC TMP System Schematic Drawing.
- 8.2 Attachment 2. - RHIC TMP System Installation Drawing.

Attachment 2

RHIC TMP System Installation Drawing



RHIC		RHIC TMP SYSTEM INSTALLATION	
DATE	4/11/06	REV	1
BY	JL	APP	JL
CHK	JL	CHK	JL
DATE	4/11/06	DATE	4/11/06
NO.	41015002	NO.	41015002
REV	1	REV	1
DATE	4/11/06	DATE	4/11/06
BY	JL	BY	JL
CHK	JL	CHK	JL
DATE	4/11/06	DATE	4/11/06