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

7.1.24 COLD EXPANDER PURGE PROCEDURE

Text Pages 2 through 8

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

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

D. Lederle

7.1.24 Cold Expander Purge Procedure

1. Purpose

This procedure provides the instructions for purging the cold expander trains with the brake assembly installed to remove air contaminants from system. The procedure contains the following sections:

5.1 Purge of turbine 5A only.
5.2 Purge of turbine 6A only.
5.3 Purge of turbines 5A , 6A and heat exchanger HX7A.
5.4 Purge of turbine 5B only.
5.5 Purge of turbine 6B only.
5.6 Purge of turbines 5B, 6B and heat exchanger HX7B.

2. Responsibilities

2.1 The shift supervisor or an operator designated by the shift supervisor is responsible for conducting the procedure and providing documentation in the cryogenic control room log.

2.2 Should a problem arise in the process of purging an expander, the shift supervisor shall report to the technical supervisor for instructions before continuing.

3. Prerequisites

3.1 The expander must be offline while purging.

3.2 The oil system must not be operation during purging.

3.3 The pure helium supply line must be pressurized.

4. Precautions

If the refrigerator is operating, all personnel entering the refrigerator wing of Bldg.1005R must have a Personal Oxygen Monitor (POM) and carry an emergency escape pack.

5. Procedure

5.1 Expander 5A Only

_____ 5.1.1 Install brake assembly per C-A OPM 7.1.26.

_____ 5.1.2 Ensure regulator PR9182M is installed.

_____ 5.1.3 Close valve H385A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.1.4 Ensure closed valves H397M____ H393M____ and H430M____.

_____ 5.1.5 Apply LOTO to H397M.

_____ 5.1.6 Back off regulator PR9182M.

_____ 5.1.7 Open expander vane valve H390A.

_____ 5.1.8 Open valves H431M____ and H395M____.

_____ 5.1.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.1.10 Open valves H9182M____ and H393M____.

_____ 5.1.11 Adjust regulator PR9182M to 40-psi as read on outlet pressure gauge PI9215H.

_____ 5.1.12 Purge expander for a minimum of 15 minutes.

_____ 5.1.13 Close valves H695M____ H395M____ and H393M____.

_____ 5.1.14 Close valves H9182M____ H431M____.

_____ 5.1.15 Close vane valve H390A.

_____ 5.1.16 Restore air supply to valve H385A.

_____ 5.1.17 Remove LOTO from H397M.

5.2 <u>Expander 6A Only</u>

_____ 5.2.1 Install brake assembly per C-A OPM 7.1.26.

_____ 5.2.2 Ensure regulator PR9190M is installed.

_____ 5.2.3 Close valve H402A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.2.4 Ensure closed valves H410M____ H409M____ H414M____ H430M____ and H812M____.

_____ 5.2.5 Apply LOTO to H410M and H409M.

_____ 5.2.6 Back off regulator PR9190M.

_____ 5.2.7 Open expander vane valve H464A.

_____ 5.2.8 Open valves H431M____ and H412M____.

_____ 5.2.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.2.10 Open valves H9190M____ and H414M____.

_____ 5.2.11 Adjust regulator PR9190M to 40-psi as read on outlet pressure gauge PI9212H.

_____ 5.2.12 Purge expander for a minimum of 15 minutes.

_____ 5.2.13 Close valves H695M____ H412M____ and H414M.

_____ 5.2.14 Close valves H9190M____ and H431M____.

_____ 5.2.15 Set vane valve H464A to 25% open.

_____ 5.2.16 Restore air supply to valve H402A.

_____ 5.2.17 Remove LOTO from H409M and H410M.

5.3 Expanders 5A, 6A and Heat exchanger HX7A

_____ 5.3.1 Ensure brake assemblies are installed per C-A OPM 7.1.26.

_____ 5.3.2 Ensure regulator PR9182M is installed.

_____ 5.3.3 Close valve H385A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.3.4 Ensure the following valves are closed (apply LOTO where indicated):

Process:

H399M____ (apply LOTO)
H409M____ (apply LOTO)
H410M____ (apply LOTO)

Valves to Atmosphere, Relief Valve Header or Pure Helium:

H430M____	H395M____
H414M____	H9190M____
H814M____	H700M____
H793M____	H812M____
H9184M____	H795M____

_____ 5.3.5 To avoid spinning the turbines, ensure pressure in HX7A is approximately equal to expander pressure (within 0.5 atm).

_____ 5.3.6 Open process valves H397M____ and H402A____ (air line must be jumpered at valve).

_____ 5.3.7 Back off regulator PR9182M.

_____ 5.3.8 Open the following valves:

H412M____	H431M____
H9182M____	H390A____ (Vanes)
H393M____	H464A____ (Vanes)

_____ 5.3.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.3.10 Adjust regulator PR9182M to 40 psig as read or outlet pressure gauge PI9215H.

_____ 5.3.11 Purge expander train at an audible level for a minimum of 30 minutes.

_____ 5.3.12 Stop the purge by closing the following valves:

H695M____	H393M____
H412M____	H431M____
H9182M____	

_____ 5.3.13 Back off regulator PR9182M.

_____ 5.3.14 Close vane valve H390A____ and set H464A to 25%____.

_____ 5.3.15 Close process valves H397M____ and H402A (restore air lines to normal).

_____ 5.3.16 Restore air supply to valve H385A.

_____ 5.3.17 Remove LOTO from H399M, H409M, H410M.

5.4 Expander 5B Only

_____ 5.4.1 Install brake assembly per C-A OPM 7.1.26.

_____ 5.4.2 Ensure regulator PR9178M is installed.

_____ 5.4.3 Close valve H785A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.4.4 Ensure closed valves H797M____ H793M____ and H430M____.

_____ 5.4.5 Apply LOTO to H797M.

_____ 5.4.6 Back off regulator PR9178M.

_____ 5.4.7 Open expander vane valve H790A.

_____ 5.4.8 Open valve H431M____ and H795M____.

_____ 5.4.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.4.10 Open valves H9178M____ and H793M____.

_____ 5.4.11 Adjust regulator PR9178M to 40-psi as read on outlet pressure gauge PI214H.

_____ 5.4.12 Purge expander for a minimum of 15 minutes.

_____ 5.4.13 Close valves H695M____ H795M____ H793M____.

_____ 5.4.14 Close valves H9178M____ and H431M____.

_____ 5.4.15 Close vane valve H790A.

_____ 5.4.16 Restore air supply to H785A.

_____ 5.4.17 Remove LOTO from H797M.

5.5 Expander 6B Only

_____ 5.5.1 Install brake assembly per C-A OPM 7.1.26.

_____ 5.5.2 Ensure regulator PR9186M is installed.

_____ 5.5.3 Close H802A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.5.4 Ensure closed valves H810M____ H809M____ H814M____ H430M____ and H812M____.

_____ 5.5.5 Apply LOTO to H809M and H810M.

_____ 5.5.6 Back off regulator PR9186M.

_____ 5.5.7 Open expander vane valve H864A.

_____ 5.5.8 Open valves H431M____ and H700M____.

_____ 5.5.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.5.10 Open valves H9186M____ and H814M____.

_____ 5.5.11 Adjust regulator PR9186M to 40-psi as read on outlet pressure gauge PI9210H.

_____ 5.5.12 Purge expander for a minimum of 15 minutes.

_____ 5.5.13 Close valves H695M____ H700M____ and H814M____.

_____ 5.5.14 Close valves H9186M____ and H431M____.

_____ 5.5.15 Set vane valve H864A to 25% open.

_____ 5.5.16 Restore air supply to H802A.

_____ 5.5.17 Remove LOTO from H809M and H810M.

5.6 <u>Expanders 5B, 6B and Heat Exchanger HX7B</u>

_____ 5.6.1 Ensure brake assemblies are installed per C-A OPM 7.1.26.

_____ 5.6.2 Ensure regulator PR9178M is installed.

_____ 5.6.3 Close valve H785A. Disable the valve in the closed position by closing the air supply valve and disconnecting the air line.

_____ 5.6.4 Ensure the following valves are closed (apply LOTO where indicated):

Process:

H799M____ (apply LOTO)
H809M____ (apply LOTO)
H810M____ (apply LOTO)

Valves to Atmosphere, Relief Valve Header or Pure Helium.

H430M____	H795M____
H414M____	H9186____
H814M____	H412M____
H393M____	H812M____
H9180M____	H395M____

_____ 5.6.5 To avoid spinning the turbines, ensure pressure in HX7B is approximately equal to expander pressure (within 0.5 atm).

_____ 5.6.7 Back off regulator PR9178M.

_____ 5.6.8 Open the following valves:

H700M____	H431M____
H9178M____	H790A____ (Vanes)
H793M____	H864A____ (Vanes)

_____ 5.6.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.

_____ 5.6.10 Adjust regulator PR9178M to 40 psi as read on outlet pressure gauge PI9214H.

_____ 5.6.11 Purge expander train at an audible level for a minimum of 30 minutes.

_____ 5.6.12 Stop the purge by closing the following valves:

H695M____	H793M____
H700M____	H431M____
H9178M____	

_____ 5.6.13 Back off regulator PR9178M.

_____ 5.6.14 Close vane valve H790A____ and set H864A to 25%____.

_____ 5.6.15 Close process valves H797M____ and H802A____ (restore air line to normal).

_____ 5.6.16 Restore air supply to valve H785A.

_____ 5.6.17 Remove LOTO from H799M, H809M, H810M.

6. Documentation

6.1 The check off lines on the procedure are for place keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

7. References

7.1 C-A OPM 7.1.26, Expander Brake System Installation and Removal

7.2 Drawing 3A995009, 25KW Helium refrigerator P&ID

8. Attachments

None