Subject: VACUUM PROCEDURES FOR BEAMLINE X1B

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*Document must contain approved signatures for validity.

The following procedures must be followed when bleeding up different beam line sections and when returning these sections to operation .

I. FRONT END (PROCEDURE TO BE PERFORMED BY NSLS VACUUM GROUP ONLY)

A Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Refer to Front End Vacuum Procedures (SLS-07.19-13-1).

B. Return to Operation

1. Notify the Coordinator (Beeper 5824).
2. Refer to Front End Vacuum Procedures (SLS-07.19-13-1).

II. SECTION BETWEEN VALVE V1A/B AND VALVE V2A/B (M0A MIRROR CHAMBER)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V1A/B and Front End Valve.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V1A/B and Front End Valve.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors Front End pressure.

B. Return to Operation

1. Bake and pump to $< 2\times10^{-9}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V1A/B into Front End provided pressure $< 2\times10^{-9}$ Torr downstream of valve.
5. Perform RGA scan.*
6. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V1A/B and the Front-End Valve.*
7. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

III. SECTION BETWEEN VALVE V2A/B and VALVE V3B (M0B,M1B MIRROR CHAMBER)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V2A/B and Valve V1A/B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V2A/B and Valve V1A/B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the M0A mirror chamber.

B. Return to Operation

1. Bake and pump to $< 2\times10^{-9}$ Torr.

2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V2A/B into M0A mirror chamber provided pressure < 2×10^{-9} Torr downstream of valve.
5. Open Valve V1A/B into the Front End provided pressure < 2×10^{-9} Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V2A/B and Valve V1A/B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

IV. SECTION BETWEEN VALVE V3B AND VALVE V4B (ENTRANCE SLIT SECTION)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V3B and Valve V2A/B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V3B and Valve V2A/B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the S0B entrance slit section.

B. Return to Operation

1. Bake and pump to < 2×10^{-9} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V3B into the M0B,M1B mirror chamber provided pressure < 2×10^{-9} Torr downstream of valve.
5. Open Valve V2A/B into the M0A mirror chamber provided pressure < 2×10^{-9} Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V3B and Valve V2A/B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

V. SECTION BETWEEN VALVE V4B AND VALVE V5B (GRATING CHAMBER)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V4B and Valve V3B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V4B and Valve V3B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the S0B entrance slit section.

B. Return to Operation

1. Bake and pump to <5×10^{-9} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*

4. Open Valve V4B into the entrance slit section provided pressure $<5\times10^{-9}$ Torr downstream of valve.
5. Open Valve V3B into the M0B,M1B mirror chamber provided pressure $<2\times10^{-9}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V4B and Valve V3B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

VI. SECTION BETWEEN VALVE V5B AND VALVE V6B (S1B EXIT SLIT SECTION)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V5B and Valve V4B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V5B and Valve V4B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the grating chamber.

B. Return to Operation

1. Bake and pump to $< 1x10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V5B into the grating chamber provided pressure $< 1\times10^{-8}$ Torr downstream of valve.
5. Open Valve V4B into the S0B entrance slit section provided pressure $< 5\times10^{-9}$ Torr downstream of valve.
6. Perform RGA scan. *
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V5B and Valve V4B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

VII. SECTION BETWEEN VALVE V6B and V7B (I0 CHAMBER)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V6B and Valve V5B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V6B and Valve V5B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the S1B exit slit section.

B. Return to Operation if I0 Chamber is Ultra High Vacuum (UHV) type:

1. Bake and pump to $< 1x10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V5B into the S1B exit slit section provided pressure $< 1\times10^{-8}$ Torr downstream of valve.
5. Open Valve V4B into the grating chamber provided pressure $< 1\times10^{-8}$ Torr downstream of valve.
6. Perform RGA scan. *

7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V6B and Valve V5B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

C. Return to Operation if I0 Chamber is non-UHV type:

1. Pressure interlock to valve Valve V6B must be in place and operating at a trip point ≤ 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve V6B into S1B exit slit section with window isolation valve VW6B closed. Valve V6B can remain open **ONLY** if pressure in S1B exit slit section is < 1×10^{-8} Torr.
5. Open Valve V5B into the grating chamber provided pressure < 1×10^{-8} Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V6B and Valve V5B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

VIII. SECTION BETWEEN VALVE V7B AND VALVE V8B (EXPERIMENTAL CHAMBER #1)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V7B and Valve V6B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V7B and Valve V6B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in the I0 Chamber.

B. Return to Operation if Experimental Chamber #1 is Ultra High Vacuum (UHV) type:

1. Bake and pump to < $1x10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V7B into the I0 chamber provided pressure < 1×10^{-8} Torr downstream of valve.
5. Open Valve V6B into the S1B exit slit section provided pressure < 1×10^{-8} Torr downstream of valve.
6. Perform RGA scan. *
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V7B and Valve V6B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

C. Return to Operation if Experimental Chamber #1 is non-UHV type:

1. Pressure interlock to valve Valve V7B must be in place and operating at a trip point ≤ 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V7B into the I0 chamber provided pressure < 1×10^{-6} Torr downstream of valve.
5. **If** pressure in I0 chamber is < 1×10^{-7} Torr, open Valve V6B into the S1B exit slit section. **However, if** pressure in I0 chamber is > 1×10^{-7} Torr, temporarily open Valve V6B into S1B exit slit section with window isolation valve VW6B closed. Valve V6B can remain open **ONLY** if pressure in S1B exit slit section is < 1×10^{-8} Torr.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V7B and Valve V6B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

IX. SECTION BETWEEN VALVE V8B AND VALVE V9B (BEAM TRANSPORT SECTION)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V8B and Valve V7B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V8B and Valve V7B.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in Experimental Chamber #1.

B. Return to Operation

1. Bake and pump to < 1 x 10^{-8} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan. *
4. Open Valve V8B into Experimental Chamber #1 provided pressure < 1x10^{-8} Torr downstream of valve.
5. Open Valve V7B into the I0 chamber provided pressure < 1x10^{-8}Torr downstream of valve if Experimental Chamber #1 is UHV type, or < 1x10^{-6} Torr downstream of valve if Experimental Chamber #1 is non-UHV type.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V8B and Valve V7B**.**
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

X. SECTION BETWEEN VALVE V9B AND VALVE V10B (REFOCUSING MIRROR CHAMBER)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V9B and Valve V8B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V9B and Valve V8B.

B. Return to Operation

1. Bake and pump to < $5x10^{-9}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V9B into Beam Transport section provided pressure < 5×10^{-9} Torr downstream of valve.
5. Open Valve V8B into Experimental Chamber #1 provided pressure < 1×10^{-8} Torr downstream of valve.
6. Perform RGA scan. *
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V9B and Valve V8B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

XI. SECTION DOWNSTREAM OF VALVE V10B (Experimental Chamber #2)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V8B and Valve V7B.
3. Hook up turbo pump to this section and isolate turbo.
4. Coordinator places Yellow Tags on Valve V8B and Valve V7B.
5. Slowly bleed up with boil-off N_2 while Coordinator monitors pressure in Experimental Chamber #1.

B. Return to Operation if Experimental Chamber #2 is Ultra High Vacuum (UHV) type:

1. Bake and pump to < $5x10^{-9}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V10B into Refocusing Mirror chamber provided pressure < 5×10^{-9} Torr downstream of valve.
5. Open Valve V9B into Beam Transport section provided pressure < 5×10^{-9} Torr downstream of valve.
6. Perform RGA scan. *
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V10B and Valve V9B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

C. Return to Operation if Experimental Chamber #2 is non-UHV type:

1. Pressure interlock to valve Valve V10B must be in place and operating at a trip point ≤ 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*

4. Temporarily open Valve V10B into Refocusing Mirror chamber with window isolation valve VW10B closed. Valve V10B can remain open **ONLY** if pressure in Refocusing Mirror chamber is $< 5\times10^{-9}$ Torr.
5. Open Valve V9B into Beam Transport section provided pressure $< 5\times10^{-9}$ Torr downstream of valve.
6 Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes Yellow Tags from Valve V10B and Valve V9B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a Yellow Tag on the valve.**

*** NSLS POLICY FOR RGA SCANS** (24 HOUR NOTICE REQUIRED)

An RGA scan is required before returning to operation if there is a major change of hardware in the vacuum system, i.e. changing of samples, mirrors, windows, monochromator crystals or gratings, manipulators, detectors, etc., **with the following two exceptions:**

1. After UHV sample chambers have been bled up for replacing components, an RGA scan will not be required if the chamber pressure is returned to $< 2\times10^{-9}$ Torr and the Front End pressure remains $< 2\times10^{-9}$ Torr when vacuum sections upstream of the chamber are opened into the Front End.

2. If any vacuum section upstream of the bled-up section remains at a pressure of $< 9\times10^{-10}$ Torr as read using a hot-filament ion gauge, when the entire beamline is opened into the Front End, and the Front End pressure does not increase, no RGA is required.

**** NSLS TURBO PUMP POLICY**

An unprotected turbo pump is one not separated from the Front End by a beamline valve which automatically closes in the event of a power loss or a pressure increase at the turbo pump. **No unprotected turbo pump can share a contiguous vacuum with the Front End.**

NSLS REVISION/REVIEW LOG	
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> See NSLS Quality Control Coordinator for review signatures <

REVISION TABLE		
Rev	**Description**	**Date**
B	Significant changes to beamline configuration	01/18/02