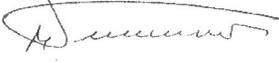
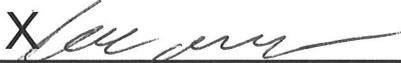
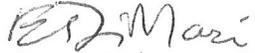


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Title: <b>Removal and Installation of the NSLS-II SMI Vacuum Removable Pipe Section</b>	

Prepared By:  9/30/2016  <b>X</b>  M. Zhernenkov SMI Beamline Scientist Signed by: Zhernenkov, Mikhail	Reviewed By:    <b>X</b>  Richard Greene SMI Beamline Work Control Coordinator	Approved By:    <b>X</b>  Elaine DiMasi SMI Lead Beamline Scientist
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## 1 WORK SCOPE

This work instruction provides instructions for the removal and installation of the NSLS-II SMI vacuum removable pipe section inside the 12-ID-B hutch.

This work instruction will enable Authorized Beamline Staff to safely perform configuration changes requiring removal and installation of the removable pipe section.

## 2 PREREQUISITES

- 2.1 Only Authorized Personnel shall perform this work. Two Authorized Personnel are required to perform installation or removal of the removable pipe section.
- 2.2 Authorized Personnel obtain the following equipment and have all available while performing this work:
  - Turbo pump cart
  - Yellow Caution Tags
  - End blanks or foil for pipe

## 3 HOLD POINTS

If there are any known hold points during the execution of the work, list them here (i.e., any steps that require specific approval prior to performance).

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#### **4 PRECAUTIONS/WARNINGS**

- 4.1 Do not leave gas venting operations unattended.
- 4.2 All installation and removal shall be done using a hutch crane ONLY and in accordance with NSLSII-12ID-WIN-002, *SMI Hoist and Rigging Work Instruction*.
- 4.3 Hoisting with the hutch crane may only be carried out by trained and authorized personnel.
- 4.4 Safety shoes are required for all workers in the hutch during the work.
- 4.5 Disposable gloves are required for handling any Beryllium articles

#### **5 INSTRUCTIONS**

**Note:** Vacuum layout is illustrated in Attachment A, *Vacuum layout Drawing*.

##### **5.1 Pipe Section Removal**

5.1.1 Record the vacuum pressure in Vacuum Section 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, 2:VacSec-3, and 2:VacSec-4 by recording the vacuum levels from the following cold cathode gauges in the Beamline Logbook:

- 0:CCath-8
- 2:CCath-1
- 2:CCath-2
- 2:CCath-3
- 2:CCath-4
- 2:CCath-5

5.1.2 Close the following gate valves:

- 2:GV-1
- 2:GV-2
- 2:GV-3

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- 2:GV-4

5.1.3 Record the vacuum pressure from the following cold cathode gauges in the Beamline Logbook:

- 0:CCath-8
- 2:CCath-1
- 2:CCath-2,
- 2:CCath-3
- 2:CCath-4
- 2:CCath-5

5.1.4 Disconnect the Solenoid Connector from Gate Valve 2:GV-3, shown in Figure 5-1 below

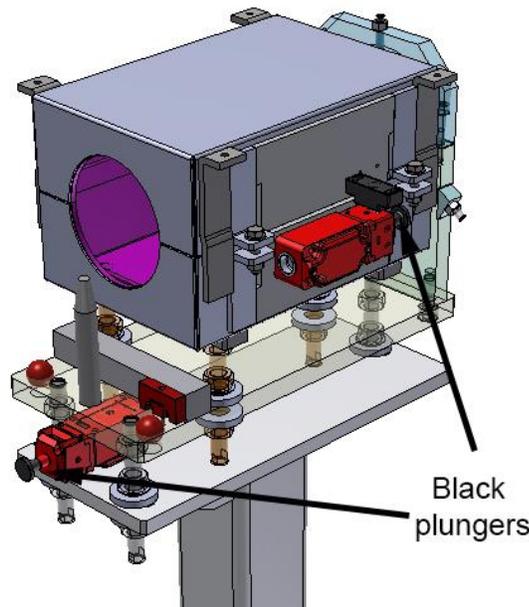


**Figure 5-1:** Gate Valve 2:GV-3 Solenoid Connector

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- 5.1.5 Attach a yellow Caution Tag to the cable at the connector, in accordance with PS-C-PRC-AO-001, *Caution ("Yellow") Tags*.
- 5.1.6 Connect a turbo pump cart to the pump-out port on Vacuum Section 2:VacSec-2 inside the 12-ID-B-1 hutch.
- 5.1.7 Vent Vacuum Section 2:VacSec-2 in accordance with PS-C-XFD-PRC-001, *NSLS-II Beamline Vacuum System Venting Procedure*.

**Note:** The shielded box's movable top removal must be done using a hutch crane ONLY. See NSLSII-12ID-WIN-002, *SMI Hoist and Rigging Work Instruction*.



**Figure 5-2:** Removable Pipe Shielded Box Assembly

- 5.1.8 Unbolt four bolts, which hold together the top and bottom parts of the shielded box.
- 5.1.9 Rig and hoist the movable top in accordance with NSLSII-12ID-PLN-002, *SMI Hoist and Rigging Plan*.

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5.1.10 While one Authorized Person is pulling and holding the black plunger (Figure 5-2) on the red interlock, the second Authorized Person lifts and removes the movable top of the shielded box using a hutch crane.

**Note:** Pull plunger fully to avoid damage.

5.1.11 Place the movable top on a cart.

5.1.12 Repeat paragraphs 5.1.8 – 5.1.11 for the other shielded box.

5.1.13 Carefully remove the two bellows assemblies from the ends of the removable pipe section, cover both sides with the Aluminum foil AND place them in the vacuum components cabinet at the beamline.

5.1.14 Verify that the L-brackets mounted on the hutch wall supporting the removable pipe while it is not installed are free from obstruction.

**Note:** The removable pipe section must be removed using a hutch crane ONLY.



**Figure 5-3:** Vacuum Removal Pipe

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5.1.15 Hoist the removable pipe in accordance with NSLSII-12ID-WIN-002, *SMI Hoist and Rigging Work Instruction*.

5.1.16 While one Authorized Person is pulling and holding the black plungers on the red interlocks at both sides of the removable pipe, the other Authorized Person lifts the pipe section using the hutch crane from the collars of the shielded boxes (see Figure 5-2 and 5-3).

5.1.17 Using the hutch crane, guide and place the removable pipe section onto the L-brackets mounted on the hutch wall.

5.1.18 Leave the pipe section hoisted and supported by the hutch crane on the L-brackets.

5.1.19 Strap the removable pipe with TWO strap belts to the horizontal unistrut section.

5.1.20 Disconnect the hoist.

5.1.21 Place protective covers with clamps over the open pipe end at the downstream end of the hutch 12-ID-B AND on the ends of the removable pipe section.

5.1.22 Install the Be X-ray window assembly, obtained from the Be components cabinet at the beamline, to the end of the beam pipe at the upstream end of the hutch 12-ID-B in accordance with PS-C-ESH-POL-005, *Beryllium Management*.

**Note:** The beam stop installation shall be done using a hutch crane ONLY.

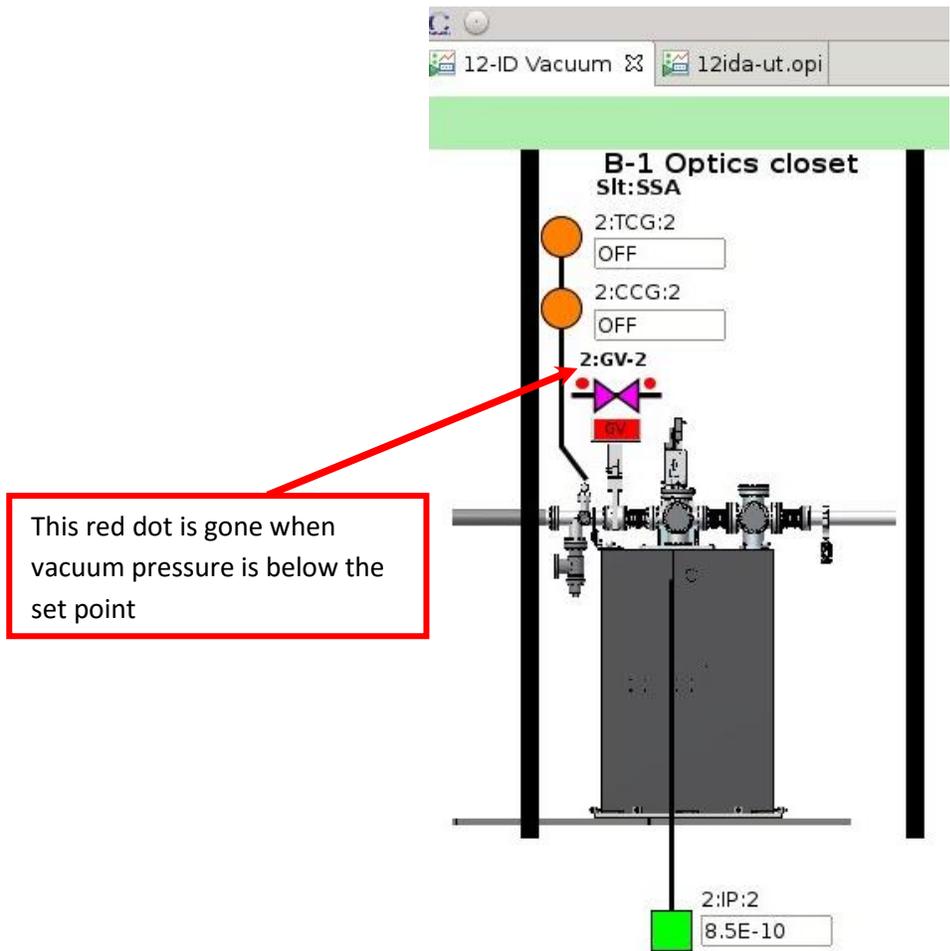
5.1.23 Hoist the beam stop in accordance with NSLSII-12ID-WIN-002, *SMI Hoist and Rigging Work Instruction*.

5.1.24 Remove the guide pin on the downstream shielded box and place it in the vacuum components cabinet at the beamline.

5.1.25 Install the beam stop into the downstream shielded box using a hutch crane.

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- 5.1.26 Ensure the proper locking of the beam stop inside the magnetic interlock system by verifying the signal at the PPS box.
- 5.1.27 Open the pump-out valve AND pump down Vacuum Section 2:VacSec-2 inside the 12-ID-B-1 hutch using the turbo pump cart.
- 5.1.28 Wait for the vacuum pressure in Vacuum Section 2:VacSec-2 to drop below the EPS set point (see Figure 5-4).



**Figure 5-4:** Typical EPS Vacuum Screen Detail

- 5.1.29 Open Gate Valve 2:GV-2.

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5.1.30 Close the pump-out valve AND turn off the turbo pump cart.

5.1.31 Vent the turbo pump cart AND disconnect the turbo pump cart from Vacuum Section 2:VacSec-2.

**Note:** Gate Valve 2:GV-3 and Gate Valve 2:GV-4 will remain closed until the removable pipe section has been reinstalled and returned to operation.

5.1.32 Connect a turbo pump cart to the pump-out port on Vacuum Section 2:VacSec-2 inside the 12-ID-C hutch.

5.1.33 Pump out the section and refill it with dry nitrogen

5.1.34 Close the pump-out valve AND turn off the turbo pump cart.

5.1.35 WHEN the vacuum pressure in Vacuum Section 2:VacSec-2 and Vacuum Section 2:VacSec-1 is below the EPS set point, THEN open Gate Valve 2:GV-1.

5.1.36 Record the vacuum pressure in Vacuum Section 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, 2:VacSec-3, and 2:VacSec-4 in the Beamline Logbook.

## **5.2 Pipe Section Installation**

5.2.1 Record the vacuum pressure in Vacuum Section 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, 2:VacSec-3, and 2:VacSec-4 in the Beamline Logbook.

5.2.2 Check that Gate Valve 2:GV-3 and Gate Valve 2:GV-4 are closed.

5.2.3 Close Gate Valve 2:GV-1 and Gate Valve 2:GV-2.

5.2.4 Record the vacuum pressure in Vacuum Section 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, 2:VacSec-3, and 2:VacSec-4 in the Beamline Logbook.

5.2.5 Connect a turbo pump cart to the pump-out port on Vacuum Section 2:VacSec-2.

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5.2.6 Vent Vacuum Section 2:VacSec-2 in accordance with PS-C-XFD-PRC-001, *NSLS-II Beamline Vacuum System Venting Procedure*.

5.2.7 Remove the protective covers from the pipe end at the downstream end of hutch 12-ID-B and from the ends of the removable pipe section.

5.2.8 Carefully remove the Be X-ray window assembly from the end of the beam pipe at the upstream end of the hutch 12-ID-B in accordance with PS-C-ESH-POL-005, *Beryllium Management* AND place the Be X-ray window in the Be components cabinet at the beamline.

**Note:** The beam stop removal shall be done using a hutch crane ONLY.

5.2.9 Hoist the beam stop in accordance with NSLSII-12ID-PLN-002, *SMI Hoist and Rigging Plan*.

5.2.10 While one Authorized Person is pulling the plunger on the red interlock box, the other Authorized Person carefully lifts the beam stop with the hutch crane and loads it onto a cart.

**Note:** The guide pin on the downstream shielded box is to be installed into the outboard position ONLY. The inboard threaded hole is blanked and SHALL NOT be used for the installation of the guide pin

5.2.11 Install the guide pin into the outboard position on the downstream shielded box.

5.2.12 Hoist the removable pipe in accordance with NSLSII-12ID-PLN-002, *SMI Hoist and Rigging Plan*. AND preload the crane while the pipe is still strapped to the L-brackets

5.2.13 Remove the straps.

**Note:** The guiding pins ensure the proper positioning the pipe on the stands.

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5.2.14 Guide the holes on the structural frame of the removable pipe over the guiding pins AND then carefully place the removable pipe section onto the support stands using a hutch crane.

5.2.15 Make sure that the interlocks on both sides of the pipe are properly engaged.

5.2.16 Remove the hoist from the pipe.

5.2.17 Carefully reinstall the bellows assemblies at each end of the removable pipe section.

**Note:** The shielded box's movable top installation shall be done using a hutch crane ONLY.

5.2.18 Hoist the movable top in accordance NSLSII-12ID-PLN-002, *SMI Hoist and Rigging Plan*.

5.2.19 Using a hutch crane carefully install the movable top onto the shielded box, ensure that the interlock is properly engaged.

5.2.20 Hand tighten four bolts, which hold together top and bottom parts of the shielded box.

5.2.21 Repeat the steps 5.2.18-5.2.20 for the other movable top.

5.2.22 Open the pump-out valve AND pump down Vacuum Section 2:VacSec-2 using the turbo pump cart.

5.2.23 Wait for the vacuum pressure in Vacuum Section 2:VacSec-2 to drop below the EPS set point (See Figure 5-4).

5.2.24 IF the vacuum pressure in Vacuum Section 2:VacSec-1 is below the EPS set point, THEN open Gate Valve 2:GV-2.

5.2.25 Close the pump-out valve AND turn off the turbo pump cart.

5.2.26 Vent the turbo pump cart AND disconnect the turbo pump cart from Vacuum Section 2:VacSec-2.

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- 5.2.27 Reconnect the Solenoid Connector from Gate Valve 2:GV-3 (see Figure 5-1) .
- 5.2.28 Remove the yellow Caution Tag from the cable at the connector, in accordance with PS-C-PRC-AO-001, *Caution ("Yellow") Tags*.
- 5.2.29 IF the vacuum pressures in Vacuum Sections 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, and 2:VacSec-3 are below the EPS set point, THEN open Gate Valve 2:GV-1 AND Gate Valve 2:GV-3.
- 5.2.30 IF the vacuum pressure in Vacuum Sections 2:VacSec-3 and 2:VacSec-4 is below the EPS set point, THEN open Gate Valve 2:GV-4.
- 5.2.31 Record the vacuum pressure in Vacuum Section 0:VacSec-6, 2:VacSec-1, 2:VacSec-2, 2:VacSec-3, and 2:VacSec-4 in the Beamline Logbook.

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### REVISION HISTORY

REVISION	SECTION(S)	PAGE #	DATE	List of Reviewers	DESCRIPTION
1	All	All	13SEP2016	Lori Stiegler	First Issue.

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### Attachment A – Vacuum Layout Drawing

