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| **Princeton Plasma Physics Laboratory**  **Procedure** | | | | | | | |
| **NSTX-U Midplane Wire-Seal Flange Replacement Installation Procedure** | | | | | | | |
| **Number: D-NSTXU-IP-1.4-4075** | | | **Revision: 0** | | | Effective Date:  Expiration Date:  *(3yr. unless otherwise stipulated)* | |
| **CAT: ☒A1 ☐A2 ☐A3** | | **Justification:**  (If required)  CE and/or ES&H Head: | | | | | |
| Author: Justin Bradley | | | | | | | Date: |
| Responsible Engineer: Robert Ellis | | | | | | | Date: |
| **Procedure Requirements**  designated by Responsible Engineer  Labwide: | | | | | | | |
| √ | Work Planning Form # 3063 (ENG-032) | | |  | Lockout/Tagout (ESH-016) | | |
| √ | Confined Space Permit (5008, Sec. 8, Chap 5) | | |  | Lift Procedure (ENG-021) | | |
|  | Master Equip. List Mod (MC-002/MC-003) | | | √ | ES&H Review (NEPA, IH, etc.) | | |
|  | RWP (HP-OP-20) | | |  | Independent Review | | |
| √ | Walkdown | | | √ | Pre-job Brief | | |
| √ | Post-job Brief | | | √ | Job Hazard Analysis – JHA (ESH-004) | | |  |
|  | T-MOD (ENG-036) | | |  | Special archiving requested for completed Run Copies:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |  |
| √ | Run Copy Required (performance of procedure must be documented and archived per ENG-030) | | |  |
| D-Site Specific: | | | | | | | |
| √ | D-Site Work Permit (OP-AD-09) | | |  | Door Permit (OP-G-93) | | |
|  | Work on Tritium Contaminated Sys. (OP-AD-77) | | |  | Activity Certification Committee Review | | |
| √ | USI Screening (OP-AD-131) | | |  |  | | |  |
|  | | | | | | | |  |
| FOR INSTALLATION PROCEDURES ONLY: Was an ECN required? – No. Repair of original Design. | | | | | | | |  |
| If ECN was required, list drawing numbers affected: | | | | | | | |  |

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| **MANDATORY REVIEWERS** (set according to ENG-030 Attachment 1) |
| Quality Assurance – Andres Castaneda |
| ES&H – Bill Slavin |
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| **OPTIONAL REVIEWERS** (set according to ENG-030 Attachment 1) | | | |
|  | Decline and sign | Accept – no comment | Accept - comment |
| HP – Patti Bruno |  |  |  |
| IH – Neil Gerrish |  |  |  |
| USI Screener – Mark Cropper |  |  |  |
| RE Diagnostics – Brently Stratton |  |  |  |
| RE VVIH – Steve Raftopoulos |  |  |  |
| TA Vacuum Systems – Dang Cai |  |  |  |
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| **REVIEWERS** (designated by Chief Engineer for A1) |
| Independent Reviewer |

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| **TRAINING** (designated by Responsible Engineer)  No training required \_\_\_\_\_\_**X**\_\_\_\_\_\_\_ Instructor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |
| Personnel (group, job title, or individual name) | Read Only\* | Instruction | Hands-On |
| Lead Technician |  | √ |  |
| Additional Technician(s) |  | √ |  |
| Accountable Technical Individual (ATI) | √ |  |  |
| QA/QC Representative |  | √ |  |
| Field Supervisor |  | √ |  |
| Certified Welding Inpsector (CWI) | √ |  |  |
|  |  |  |  |
| Responsible Engineer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |

\* “Read Only” training for Administrative, Alarm Response, and Emergency Operations procedures must be documented on a Record of Training form (attachment 6). The completed Run Copy will serve as the documentation of “Read Only” training for all other types of procedures.

# Purpose:

## This procedure provides instructions for the installation of the replacement Mid-plane Flange Bays F, H, and I male Wire-Seal flanges within the National Spherical Torus eXperiment (NSTX).

# Scope:

## This procedure shall be completed using cost center \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## This procedure shall cover the following:

### Preparing the working Bay area around the Midplane Flange being reinstalled.

### Beveling the Nozzle tube for welding of the replacement Flange.

### Rigging the replacement Flange for welding on to the Nozzle tube.

### Welding the replacement Flange on to its respective Nozzle tube.

### Cleanup and Removal of all equipment from the Test Cell.

# References:

## Drawing No. E-DB1001: Vacuum Vessel Center Section Weldment Plan view

## Drawing No. E-DB1002: Vacuum Vessel Center Section Weldment Views A-A, B-B, D-D, Sections C-C, E-E and details.

# Precautions:

## Individuals are not permitted to lift more than 50 lbs. at any one time. If an object weights in excess of 50lbs., then it shall be lifted by more than one individual, or with the aid of mechanical system(s).

## An approved method of fall protection shall be established for individuals working at elevated positions.

## Use appropriate PPE (per JHA) and/or per guidance from Industrial Hygiene.

## Before removal Health Physics shall survey all materials that were in the test cell during the last run of NSTX or any material or tools left in the test cell overnight. This includes any cutting dust which must be collected and surveyed by HP prior to disposal.

# Prerequisites:

## For the Flange Bay being worked on, the male wire-seal flange being replaced has been removed from the nozzle tube it was mounted too.

## Tech: \_\_\_\_\_\_\_\_\_\_

## Obtain a D-site work permit from the shift supervisor.

## Tech: \_\_\_\_\_\_\_\_\_\_

## All workers and Performing Techs must review and sign the Job Hazard Analysis for this job.

## Tech: \_\_\_\_\_\_\_\_\_\_

## The Work Control Center must log in this procedure and provide an approved Engineering Work Package before the work can begin. Under no circumstances should the work proceed without the approved “blue or yellow folder” from the WCC.

## Tech: \_\_\_\_\_\_\_\_\_\_

## A Confined Space Entry Permit must be in place prior to work starting.

## Tech: \_\_\_\_\_\_\_\_\_\_

## A Hot Work Permit must be obtained from ES&H prior to work starting.

Tech: \_\_\_\_\_\_\_\_\_\_

## A Fire Watch must be established and available to oversee the beveling grinding and welding processes.

Tech: ­­­­­\_\_\_\_\_\_\_\_\_\_

## A Pre-job Briefing must be completed prior to work starting, including a review of the JHA, RWP, and confined space permit requirements to assure they are being implemented. The only personnel allowed to work under this procedure are those that attend this briefing.

## All Prerequisites Completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_

# Removal Procedure:

## Weld Preparation:

### Prepare the working area around the respective flange bay being reinstalled for the work as needed at the direction of the field supervisor.

#### Remove any guard-rails obstructing the working area and install any fall protection measures as needed. Shield fragile systems in the working area from damage as needed.

#### Install Herculite dust collection measures for bevel grinding as needed at the direction of the field supervisor. Approval of dust collection measures require Health Physics approval prior to proceeding to grinding.

HP Approval: ­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

### A Fire Watch must be present during all stages of bevel grinding.

### Tech: \_\_\_\_\_\_\_\_\_\_

### Prepare the Nozzle tube for the replacement flange by Beveling the protruding end per XXXXXX.

### Complete any additional weld preparation at the direction of the Certified Welder.

### Remove all Herculite sheeting and dust collection measures for Health Physics evaluation and disposal.

## Rigging of Replacement Flange for Welding

### Sling a manual Chain hoist (1/2 ton min. capacity) to the above TF Magnet supporting structure and rig the replacement flange to the chain hoist using XXXXXX.

### Bolt the replacement flange onto a mating flange using all bolt holes and tighten to XX Ft-lbs.

### Rig the replacement flange (with the mating flange attached to maintain shape and stiffness) to the Chain hoist.

### Seat the replacement flange onto its respective Nozzle tube, with one technician operating the chain hoist, and another moving and seating the flange as it approaches the Nozzle tube. Two technicians should work together to seat the flange if space in the Bay permits.

Lift Watch: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Note:** A Lift watch is required to oversee this lifting step; steel toed or safety shoes are required for all personnel during any lifts.

### Tie a heat resistant rope line through the 6 o’clock hole in the flange and tie the line off to a structural point close to the vacuum vessel to prevent the flange from sliding off the Nozzle tube and swinging forward on the chain hoist inadvertently.

### Clamp the replacement flange to the Nozzle tube and/or Vessel for welding as needed at the direction of the Certified Welder.

## Welding on Replacement Flange

### A Fire Watch must be present during all stages of welding.

### Tech: \_\_\_\_\_\_\_\_\_\_

### Begin welding on the replacement flange as per the following procedure:

#### Welds will be made in a stitch pattern, such as the tightening of flange bolts, with their placement and lengths being made at the discretion of the Certified Welder.

#### The approximate out-of-roundness of the mating Nozzle tube will be provided along with this procedure as reference for the Certified Welder to best determine the location and length of any stitch welds.

#### A weld relief groove has been machined into the replacement flange ID bore to minimize the local heat dispersion at the weld zone.

#### A visual weld inspection shall be completed and documented by the Certified Welding Inspector (CWI).

### After welding, un-rig the flange from the Chain Hoist and remove the rope line through the 6 o’clock hole.

### Remove all tools and equipment, including any dust collection measures, used in the completion of this procedure from the NSTX Test-Cell.

### Dispose of all Herculite sheeting at the direction of Health Physics.

# Final Conditions:

## The Mid-plane Male Flange being replaced has been welded back on to its respective Nozzle tube.

## All equipment and dust collection measures have been removed from the NSTX Test-Cell and properly stored or disposed.

# Completion Signoff:

This procedure and post job brief have been completed and verified by the signatures below.

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| Lead Technician |  |  |  |
|  | Signature |  | Date |
| ATI |  |  |  |
|  | Signature |  | Date |
| QA/QC Representative |  |  |  |
|  | Signature |  | Date |
| Field Supervisor |  |  |  |
|  | Signature |  | Date |

Return this completed procedure to the Work Control Center

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| Comments: |
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Note: The run copy of this procedure shall be returned to the operations center upon completion