

## Princeton Plasma Physics Laboratory Procedure

Procedure Title: **Field Period Assembly Component Receipt Inspection**

Number: <b>D-NCSX-FPA-QA1-00</b>	Revision: <b>0</b>	Effective Date: April 27, 2006 Expiration Date: <i>(2 yrs. unless otherwise stipulated)</i>
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### Procedure Approvals

Author: Mike Viola

ATI: John Edwards

RLM: Larry Dudek

Responsible Division: **NCSX Project**

### Procedure Requirements

Designated by RLM

**LABWIDE:**

<b>X</b>	Work Planning Form (ENG-032) <b>WP 1224</b>		Lockout/Tagout (ESH-016)
	Confined Space Permit (5008,SEC.8 Chap 5)		Lift Procedure (ENG-021)
	Master Equip. List Mod (GEN-005)	<b>X</b>	ES&H Review (NEPA, IH, etc.) <b>NEPA 1261</b>
	RWP (HP-OP-20)		Independent Review
	ATI Walkdown	<b>X</b>	Pre-Job Brief
<b>X</b>	Post-job Brief *		

**D-SITE SPECIFIC:**

<b>X</b>	D-Site Work Permit (OP-AD-09)		Door Permit (OP-G-93)
	Tritium Work Permit (OP-AD-49)		USQD (OP-AD-63)
<b>X</b>	Pre-Job Brief (OP-AD-79)		T-Mod (OP-AD-03)
	** DCA/DCN (OP-AD-104) #		

- \* Required for installations involving internal vacuum installations, critical lifts, and for the initial installation of repetitive work.
- \*\* OP-AD-104 was voided by procedure ENG-032. However, DCA's that were open at the time of adoption of ENG-032 are still considered valid for work approval purposes.

<b>REVIEWERS</b> (designated by RLM)		<b>Rec'd/ Incorp. Comments</b>
Accountable Technical Individual .....	John W Edwards	X
Test Director .....		
Independent Reviewer .....		
D-Site Shift Supervisor .....		
Independent .....		
NCSX Dimensional Control Coordinator .....	Brent Stratton	
Vacuum Vessel Cognizant Engineer .....	Paul Goranson	
NCSX Field Supervisors .....	Steve Raftopoulos, Mike Viola	X
Project Engineer for Stellerator Systems (WBS 1) Manager	Brad Nelson (ORNL)	
FPA tooling and constructability .....	Tom Brown	X
Quality Assurance/Quality Control. ....	Frank Malinowski	X
Maintenance and Operations Division .....		
Energy Conversion System/Motor Control Division .....		
Engineering .....	Wayne Reiersen	X
Environmental Restoration & Waste Management Division		
Environmental, Safety & Health .....	Jerry Levine	X
Industrial Hygiene .....	Bill Slavin	
Health Physics .....		
RLM .....	Larry Dudek	

<b>TRAINING</b> (designated by RLM)			
No training required _____		Instructor: <b>John Edwards</b>	
Personnel (group, job title or individual name)	Read Only	Instruction <b>Pre-job Briefing</b>	Hands On
<b>Lead Tech.</b>		<b>X</b>	
<b>Technicians performing task</b>		<b>X</b>	
<b>Field Supervisors</b>		<b>X</b>	
<b>Quality Control Representative</b>		<b>X</b>	
<b>Training Rep.</b>			
RLM: <b>Larry Dudek</b>			

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**RECORD OF CHANGE**

<b>Revision</b>	<b>Date</b>	<b>Description of Change</b>
00	4/27/06	Initial release

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# **Field Period Assembly Component Receipt Inspection**

## **D-NCSX-FPA-QA1**

### **1 Scope**

The Field Period Assembly (FPA) task involves assembling 3 identical 120° Field Period Assemblies using 5 separate workstations. The field period assemblies include many small individual parts as well as major components being delivered by outside suppliers.

This procedure is used to describe the general FPA component receipt inspection and specifically addresses the Vacuum Vessel Sub Assemblies (VVSA) being delivered by Major Tool.

### **2 Applicable Documents**

All work processes are governed by the “NCSX Manufacturing Facility Operations Plan”, NCSX-PLAN-MFOP-00. All governing documents associated with this procedure, are identified in the MIT/QA Plan, NCSX-MIT/QA-185-01.

### **3 Safety Requirements**

All work will be performed in a safe manner in accordance with PPPL Environmental Safety & Health Directives **ES&H 5008** and the “Integrated Safety Management” (ISM) policy.

#### **3.1 Job Hazard Analysis**

A JHA will be generated for each procedure, identifying existing or potential workplace hazards and to evaluate the risk of worker injury or illness associated with job tasks. (Reference document **ESH-004 “Job Hazard Analysis”**) The IH representative will review the JHAs for accuracy as well as completeness. It will be reviewed with all activity participants at the Pre-Job briefings.

### **4 Prerequisites & Conditions**

#### **4.1 Pre-Job Briefing**

A pre-job briefing will be held, describing the processes and safety issues prior to starting any part of this procedure. Attendance shall be documented via training sign-in sheet. All procedural records will be made in Appendix A – Document Sign-off Record

**See Appendix A – Document Sign-off Record**

#### **4.2 Daily Operations Startup and Shutdown**

Each working day, it is required to complete and initial the daily operations startup log to ensure that the station is ready to commence work activities for the day. The signoff log is located in the Daily Station Log.

#### **4.3 Daily Startup Activities:**

- 4.3.1** Check all daily supplies needed:
- 4.3.2** Verify operation of all equipment needed that day.
- 4.3.3** Check station for cleanliness
- 4.3.4** Check that safety equipment needed for day’s activities are available
- 4.3.5** Check that the day’s travelers and procedures are in their document holder.
- 4.3.6** Once completed, date and initial daily log at the back of the Station Log Book.

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### **4.4 Daily Shutdown Activities:**

- 4.4.1 Turn off power to equipment not in use.
- 4.4.2 Clean entire workstation area.
- 4.4.3 Verify that all Traveler and data sheet information is complete.
- 4.4.4 The Lead Technician shall verify that the Station's Log Book has been completed and signed for the day.
- 4.4.5 Once completed, date and initial daily log at the back of the Station Log Book.

## **5 Receipt and Inspection Process**

This procedure is to be used as to receive, inspect and store NCSX FPA components. Appendix A serves as the document sign off for the Vacuum Vessel Receipt Inspection portion of this document which, because of the value of the contract, is covered step by step reflecting the VVSA specification requirements. Appendix B lists all material and/or equipment used with this procedure. It shall serve as a running log of items received, their drawing(s), Requisition or Contract number, and storage number/location.

### **5.1 General FPA component Receipt Inspection**

Using Appendix B, list the item received, the requisition or contract number, type of material, any reference drawing numbers and then check the following indicating with a check mark that the item passed or make comments indicating an NCR was generated to reflect any unacceptable conditions. Use as many lines as needed to record these conditions.

#### **5.1.1 Perform Receipt Inspection**

Using Appendix B list each item and check items off as they are performed below.

- 5.1.1.1 Review item documents for completeness,
- 5.1.1.2 Check items for obvious damage,
- 5.1.1.3 Check proper quantity,
- 5.1.1.4 Check labeling or marking for future reference,
- 5.1.1.5 Check Material Certifications and file, if applicable
- 5.1.1.6 Arrange for QC to perform a visual inspection for surface finish, weld quality, if applicable
- 5.1.1.7 Arrange for QC to perform a permeability check, if applicable
- 5.1.1.8 Perform a dimensional check, if applicable

### **5.2 Vacuum Vessel Receipt Inspection**

Three VVSA units, including all hardware in the referenced drawings, are to be fabricated and delivered by Major Tool. This contract has specific requirements in its specification, NCSX-CSPEC-121-02, and therefore its verification is being called out separately below. Appendix C is a copy of the relevant paragraphs associated with the delivery and quality requirements of the VVSA specification. The VVSA, SE120-002, consists of a vessel shell referred to as a Vacuum Vessel Period Assembly (Period Assembly), SE120-003, a Spacer Assembly (Spacer), SE121-014, two (2) Vacuum Vessel Blank Off Covers, SE121-102, two (2) Vacuum Vessel Seals, SE121-095, and the port extension assemblies with their associated blank flanges, seals, and fasteners.

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**5.2.1** Verify No Damage, Labeling, and Marking

**5.2.1.1** Check off items against material shipping list.

**5.2.1.2** Inspect for obvious damage to packaging.

**5.2.1.3** Verify all components are sealed, packaged, and skidded to provide protection against contamination, deterioration and damage during shipment. Vacuum sealing surfaces shall be protected from damage during shipping and handling.

**5.2.1.4** Verify that labeling provides a unique reference for each part and is recognizable at a later date. Subassemblies and components, except bolts and standard hardware, shall be marked with unique serial numbers to provide positive identification. Boxes containing loose parts, attachments, and accessories shall be marked identifying the assembly to which they belong.

**5.2.1.5** Verify match marking is provided to uniquely identify the location and positioning of all port extensions relative to the Period Assembly.

**See Appendix A – Document Sign-off Record**

**5.2.2** Verify Material Certifications

PQA shall spot check verify that material certifications have been received per the contract specification NCSX-CSPEC-121-02 Paragraphs 3.3.2.1 through 3.3.2.7 (See Appendix C).

**See Appendix A – Document Sign-off Record**

**5.2.3** Perform Visual Inspections

QC shall perform spot checks of approximately 10% of the surface verifying the interior meets a 32 micro-inch finish and the exterior does not have any imperfections greater than 0.04 inches deep (See Appendix C).

**See Appendix A – Document Sign-off Record**

**5.2.4** Perform Permeability check of welds components and shell surface

QC shall perform spot checks of approximately 10% of the surface verifying the relative magnetic permeability of all components does not exceed 1.02 except for welds (and heat affected zones) joining stainless steel to nickel chromium, which shall not exceed 1.2 (See Appendix C).

**See Appendix A – Document Sign-off Record**

**\*\*NOTE\*\*:** *It may be necessary to mount the VVSA into Station 1 per D- NCSX-FPA-001 in order to perform these next steps.*

**5.2.5** Using tooling ball nominals supplied by the manufacturer, align to the VVSA. Compare the “measured” locations of the tooling balls to the nominal locations supplied by the manufacturer. They should not differ by more than 0.002”

**5.2.6** Take spot measurements for the purpose of verifying the manufacturer’s metrology data. E.g. end flange position. Note that it may be necessary to move the VVSA and/or the metrology equipment and re-align to several positions to complete this step.

**5.2.7** At the discretion of either the Field Manager, Metrology Engineer or Dimensional Control Supervisor, take any additional measurements as needed or requested.

**See Appendix A – Document Sign-off Record**

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## Appendix A – VVSA Receipt Inspection

<b>TASK Description</b>	<b>Acceptable or Comment</b>	<b>Print Last Name</b>	<b>Initials</b>	<b>Date</b>
4.1 Pre job Briefing complete <b>VVSA Field Supervisor</b>				
5.2.1 Labeling and Marking <b>Lead Tech</b>				
5.2.2 Material Verification <b>PQA</b>				
5.2.3 Surface Finish <b>QC</b>				
5.2.4 Permeability <b>QC</b>				
5.2.5 Metrology Tooling datums <b>Metrology Supervisor</b>				
5.2.6 End flange positions <b>Metrology Supervisor</b>				

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**Appendix B – FPA Material Receipt List**

<b>Inspector/ Date</b>	<b>General Description</b>	<b>Requisition/ Contract Number</b>	<b>Material</b>	<b>Reference Document/ Drawing/ Metrology File</b>	<b>Documents</b>	<b>Damage</b>	<b>Quantity</b>	<b>Labeling</b>	<b>Material</b>	<b>Visual</b>	<b>Perm</b>	<b>Dimension</b>	<b>Location</b>	<b>Any NCRs?</b>	<b>Comments</b>



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## Appendix C – VVSA Specification Reference

### **VVSA Labeling and Packaging**

#### **NCSX-CSPEC-121-02 Reference Paragraph**

##### **5.1 Labeling**

Subassemblies and components, except bolts and standard hardware, shall be marked with unique serial numbers to provide positive identification. When such markings would impair proper functioning of the equipment, a metal, non-corrosive, non-magnetic tag shall be used. Match markings shall be provided to uniquely identify the location and positioning of all port extensions relative to the Period Assembly.

##### **5.2 Packing and Skidding**

All components shall be sealed, packaged, and skidded to provide protection against contamination, deterioration and damage during shipment. Vacuum sealing surfaces shall be protected from damage during shipping and handling.

##### **5.3 Marking**

Each shipping skid shall be marked with the name of the Seller, Laboratory Purchase Order Number, the component name, and gross weight. Boxes containing loose parts, attachments, and accessories shall be marked identifying the assembly to which they belong, and where possible, boxes are to be secured to the skid of the unit.

Identify each item and list the item in the Material log.

### **Material Verification**

#### **NCSX-CSPEC-121-02 Reference Paragraph**

##### **3.3.2.1 Sheet, Strip, and Plate**

All as-supplied sheet, strip, and plate shall be annealed Alloy (UNS N06625) and meet the requirements of ASTM B 443.

##### **3.3.2.2 Tubing and Piping**

All Inconel tubing and pipe shall be seamless or welded Alloy (UNS N06625) and meet the requirements of ASTM B 444, or ASTM B 705. All austenitic stainless steel tubing shall be seamless or welded 316L alloy and meet the requirements of ASTM A 249/A 249 M-04A or ASTM A 213/A 213M-03.

##### **3.3.2.3 Bar and Structural Shapes**

All bar and structural shapes shall be annealed Alloy (UNS N06625) and meet the requirements of ASTM B 446.

##### **3.3.2.4 Conflat Flanges**

The conflat flanges shall meet the requirements of ASTM A 240.

##### **3.3.2.6 Bolts**

Conflat flange bolts shall be ASTM A 193, Grade B8; silver-plated, 12-point bolt kits provided with flanges from the flange manufacturer. Non-circular o-ring flange bolts, with the exception of the neutral beam port, shall use ASTM A453 Grade 660 bolts (A286) The neutral beam port, whose flanges are Inconel 625, shall use Inco 718 bolts per ASTM A1014.

##### **3.3.2.7.1 Metal Seals**

Seals for Conflat flanges shall use standard copper seals provided from the flange manufacturer.

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### **3.3.2.7.2 Custom Flanges**

Custom non-circular flanges, with the exception of the neutral beam port, will be sealed with two Viton A seals.

## **Visual Inspections**

### **NCSX-CSPEC-121-02 Reference Paragraph**

#### **3.2.2.1 Interior (Vacuum) Surfaces**

Interior of the Period Assembly wall, Spacer, and port extensions shall be polished to a 32 micro-inch finish. Interior weld beads, scratches, and tooling marks resulting from fabrication shall be polished to a 32 micro-inch finish. Interior wall surface weld beads shall be ground to within .032 inch of the surface prior to polishing.

#### **3.2.3 Exterior Surface Finish**

Mill finish on the exterior surfaces is acceptable, but any imperfections greater than 0.04 inches deep shall be weld repaired and ground smooth.

## **Permeability check of welds components and shell surface**

### **NCSX-CSPEC-121-02 Reference Paragraph**

#### **3.2.4 Magnetic Permeability**

Relative magnetic permeability of all components shall not exceed 1.02 except for welds (and heat affected zones) joining stainless steel to nickel chromium, which shall not exceed 1.2.

#### **4.2.3 Verification of Magnetic Permeability**

To verify conformance to Section 3.2.4, magnetic permeability shall be measured in accordance with the requirements of ASTM A 800, Supplementary Requirement S1, but with the measurements taken in relative permeability, rather than ferrite content. All surfaces and features shall be checked with a calibrated Severn Permeability Indicator<sup>3</sup> for compliance with Section 3.2.4. The surfaces of the VVSA components shall be checked and documented in a 6" x 6" grid. The weld seams in the shell wall, at the conflat flanges, and at the junction between the port extension, reinforcement, and shell shall be checked every 1/2" (both inside and outside surfaces wherever possible).