NCSX
Specification

Product Specification
For the
Vacuum Vessel System Sub-Assembly

NCSX-CSPEC-121-02-02

24 August 2004

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Controlled Document

This is a controlled document. Check the NCSX Engineering Web prior to use to assure that this document is current.

Record of Revisions

Revision	Date	ECP	Description of Change
Rev. 0	5/9/2003	NA	Pre-release version for cost estimating purposes
Rev. 1	6/23/2004	NA	Updated to FDR configuration
Rev. 2	8/24/2004	NA	Updated paragraphs 4.1.3 and 4.1.4 to reflect agreement with Major Tool

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1 SCOPE

This specification covers the fabrication of three Vacuum Vessel Sub-Assemblies (VVSA's) for the National Compact Stellarator Experiment (NCSX), including the supply of all required labor and materials, machining, fabrication, and factory acceptance inspections and tests. The Seller shall deliver each VVSA and its constituent components to the Princeton Plasma Physics Laboratory (Laboratory). All of the labor for the final installation and assembly of the VVSA will be supplied by the Laboratory.

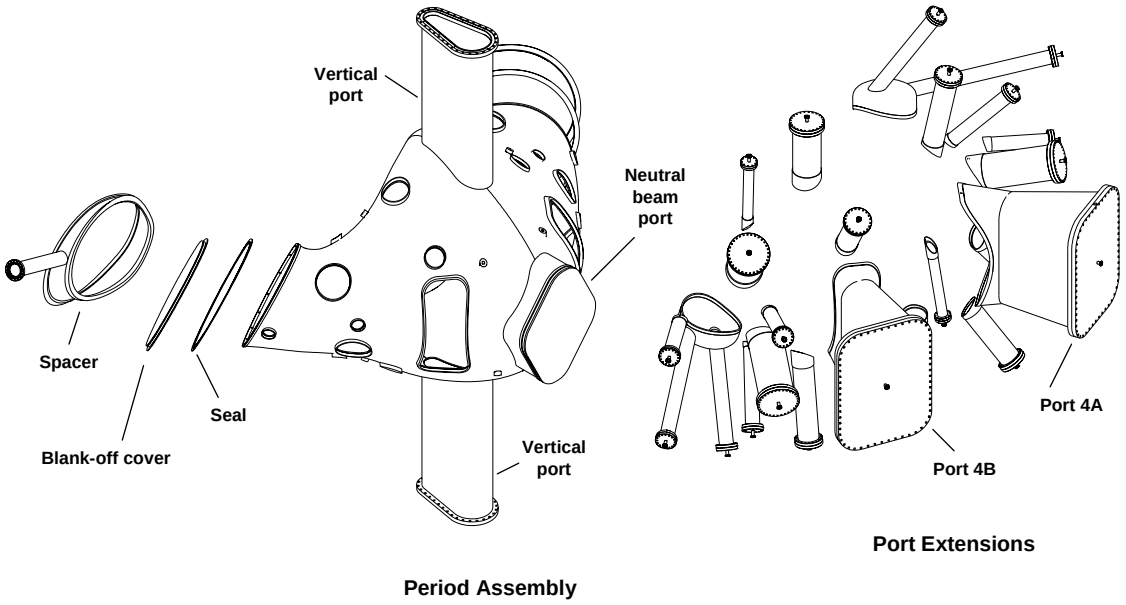

Figure 1 - VVSA Components

2 APPLICABLE DOCUMENTS

2.1 Codes and Standards

The versions of the United States Codes and Standards defined below are to be used in the performance of this work. Other equivalent foreign codes may be proposed:

a. ASME SFA 5.14 Nickel and Nickel Alloy Bare Welding Rods Electrodes.

b. American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Sections V (Articles 2 and 9).

c. ASTM B 443-00 Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219)* Plate, Sheet, and Strip.

d. ASTM B 444-00 Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219)* Pipe and Tube.

e. ASTM B 705-00 Standard Specification for Nickel-Alloy (UNS N06625, N06219 and N08825) Welded Pipe.

f. ASTM B 446-00 Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219)* Rod and Bar

g. ASTM A 240-02 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

h. ASTM A193/A193M-01b Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

i. ASTM A1014 Standard Specification for Precipitation-Hardening Bolting Material (UNS N07718) for High Temperature Service

j. AWS D1.6: 1999 Structural Welding Code - Stainless Steel, (Paragraph 6.29.1).

k. American Welding Society (AWS) QC1, Standard and Guide for Qualification and Certification of Welding Inspectors, 1996.

l. American Society of Nondestructive Testing (ASNT) 2055, Recommended Practice SNT-TC-1A, 1996.

m. ASTM E 498-95 Standard Test Methods for Leaks Using the Mass Spectrometer Leak Detector or

n. Residual Gas Analyzer in the Tracer Probe Mode1,2.

o. ASTM A 800/A 800M–01 Practice for Steel Casting, Austenitic Alloy, Estimating Ferrite Content Thereof.

The above Standards and Codes set forth the minimum requirements. They may be exceeded by Seller with written permission from the Laboratory if, in Seller's judgment, superior or more economical designs or materials are available for successful and continuous operations, as required by the specification.

ASME Code stamping of the VVSA is not required.

3 REQUIREMENTS

3.1 System Definition

3.1.1 Geometry

The NCSX Vacuum Vessel is a contoured, three-period torus with a geometry that repeats every 120º toroidally. The geometry is also mirrored every 60º so that the top and bottom sections of the first (0º to 60º) segment, if flipped over, are identical to the corresponding sections of the adjacent (60º to 120º) segment.

3.1.2 Vacuum Vessel Subassembly (VVSA)

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. Three VVSA units, including all hardware in the referenced drawings, are to be procured, fabricated, and delivered by the Seller. Bills of material are provided in drawings listed in A.1 - List of Drawings. The three VVSA units will be welded together to form the vacuum vessel during final assembly at the operation site. The final assembly will be the responsibility of the Laboratory.

3.1.3 Description

The subassembly sequence will entail welding the port extension assemblies onto the vessel wall and then cutting off all except the large vertical ports, the neutral beam port located mid-segment, and the Spacer port, leaving stubs which will serve as reinforcement and locating positions for subsequent reinstallation of the port extensions. The cut off port extensions will be re-welded onto the Period Assemblies after installation of the modular coils and toroidal field coils as part of the NCSX vacuum vessel final assembly operation. Reinstallation of port extensions will be the responsibility of the Laboratory. The VVSA configuration and a definition of terminology used in this specification may be referenced in Figure 1. The structure will be supported from the modular coil shell structure via adjustable hangers. The interfacing structural bosses are a part of the VVSA and shall be supplied by the Seller. The port attachment concept is shown in Figure 2. The VVSA coordinate system is defined in the reference engineering drawings.

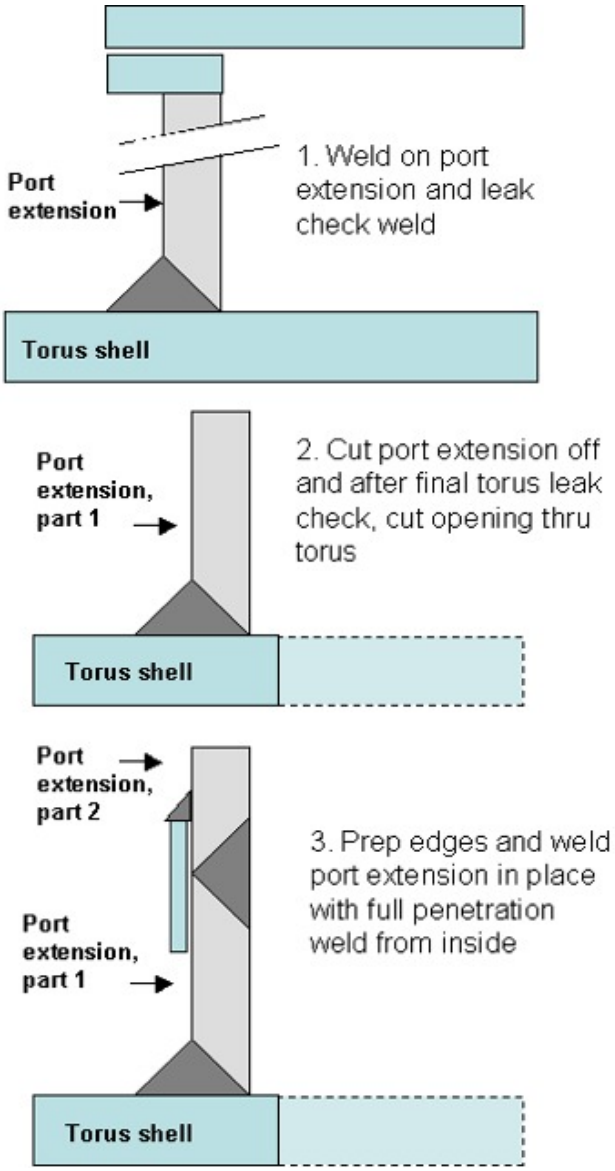

Figure 2 - Port attachment concept

3.2 Characteristics

3.2.1 Vacuum Performance

The spacer assembly, period assembly, and port extensions shall remain leak tight after thermal cycling three times to the maximum operating temperature. No detectable leak greater than 2 x 10-8 t-l/s is acceptable with the base pressure below 10^{-5} torr.

3.2.2 Interior Surface Finish

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. Scratches, pits, weld pin holes and other surface imperfections exceeding depth limits set forth in the Engineering Drawings shall be repaired by welding before finish polishing.

3.2.2.2 Tools

Tools utilized in polishing and lapping operations shall be nonferrous ceramics or nonmagnetic stainless steel, which have never been in contact with materials other than Inconel.

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.

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.

3.3 Design and Construction

3.3.1 Fabrication Models and Drawings

All the Drawings and CAD models are provided in Pro-E® format and it is the Seller's responsibility to work with this format. Vacuum vessel Pro-E® models are referenced on the fabrication drawings. Appendix A provides a list of models and drawings (including Bills of Material) to be used for fabrication of the VVSA. Figures provided in the text of this document are to provide clarity and are for information only; equipment shall be provided in conformance with the models and drawings listed in Appendix A.

The Pro/Engineer models and drawings of the VVSA components are available through the PPPL anonymous FTP server. The following FTP commands can be used to access the files:

```
ftp> ftp.pppl.gov
User: anonymous                          <- login as anonymous
Password:                                <- enter your email address
ftp> cd pub/ncsx/manuf/production_vessel <- lowercase
ftp> bin                                 <- binary transfer mode
ftp> mget *                              <- retrieve files
ftp> quit
```

The files may also be accessed through a web browser using the following URL address:

ftp://ftp.pppl.gov/pub/ncsx/manuf/production_vessel

3.3.2 Materials/Processes/Parts

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 tubing and pipe shall be seamless or welded Alloy (UNS N06625) and meet the requirements of ASTM B 444 or ASTM B 705.

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 flange shall meet the requirements of ASTM A 240.

3.3.2.5 Weld Filler Metal

Weld filler metal shall meet the requirements of the applicable AWS A series specifications or ASME SFA specifications. Certified material test reports shall be supplied for all materials (see section 4.2.7).

Welding of stainless steel conflat flanges to Inconel 625 (UNS N06625) ports shall use ASME/AWS SFA/A 5.14 ERNiCr-3 or ERNiCrMo-3 filler metal

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 ports shall use ASME SA 453 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 Seals

3.3.2.7.1 Metal Seals

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

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 ® [1]o-rings, and differentially pumped between the seals. The neutral beam port will be sealed with two Helicoflex Delta ® [2]metal o-rings, type HNV, and will also be differentially pumped. Dimensions and o-ring grooves shall conform to specifications listed in the drawings as shown in A.1 - List of Drawings.

[1] Registered trademark of DuPont Dow Elastomers

[2] Registered trademark of Garlock Helicoflex, Sealing Technologies.

3.3.2.8 Welding

All welding shall be done by qualified personnel using written and qualified welding procedures in accordance with the ASME Code, Section IX. Welds may be made by the GTAW or GMAW processes. Welds using SMAW process are not permitted.

3.3.2.9 Cutting, Forming and Bending

For the fabrication of the Vessel, all cutting, forming and bending shall be done in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

3.3.2.10 Cleaning

After completion of assembly and surface preparation, the interior surfaces shall be cleaned per a mutually agreed upon written procedure. As a minimum this procedure will include:

a. Degreasing to remove oils, greases, and die lubricant residues resulting from handling and fabrication of the Vessel.

b. Solvent (e.g. non-chlorinated) wipe down of the surfaces.

c. Blow drying of surfaces with oil-free instrument air.

d. Use of lint-free wipes.

3.3.3 Fabrication

Wall [shell] components of the Period Assembly and Spacer are to be made up of contoured plate segments, welded together and mated to end flanges. The contoured plate segments shall be fabricated by forming, pressing, or other related processes that result in a contour, conforming to the Pro-E® model and tolerances supplied by the Laboratory. The Seller's segmentation scheme (number of segments and approximate seam locations) shall be approved by the Laboratory.

3.3.4 Dimensions/tolerances

3.3.4.1 Measurements

The overall dimensions and dimensional tolerances shall be in accordance with the referenced Engineering Drawings. Compliance with the dimensions and tolerances shall be verified with the assembly completed, i.e. the port extensions cut off to form stubs, the holes bored, and vessel end flanges installed and after any required thermal cycling operations.

3.3.4.2 Fiducials

A minimum of four (4) fiducials on each end flange of the Period Assembly and six (6) fiducials on the Period Assembly wall (three in each half-period) shall be permanently installed to establish a reference system to be used for dimensional inspection. The wall mounted fiducials shall be accessible from both the exterior and the interior of the Period Assembly. Three (3) fiducials shall be provided on each port extension flange. The goal shall be to permit replication of Seller measurements by the Laboratory. The fiducials may be mounts for removable tooling balls or some other system proposed by the Seller. The nature, location, and installation of these fiducials shall be submitted by the Seller for approval by the Laboratory.

4 QUALITY ASSURANCE PROVISIONS

4.1 General

4.1.1 Responsibility for Tests

Tests and inspections shall be conducted at the Seller's facility or otherwise suitable location. The responsibility for performing all tests and verifications rests with the Seller. The Laboratory reserves the right to witness or separately perform all tests specified or otherwise inspect any or all tests and inspections

4.1.2 Test Hardware

The Seller shall furnish and install all temporary test fixtures, flange covers, blanking off plates, and gaskets required to seal the Period Assembly and Spacer for testing purposes. All such equipment shall be delivered to the Laboratory at the conclusion of testing.

4.1.3 Processing Outline and Procedures

Quality conformance requirements identified in Section 4.2 shall be incorporated in Major Tool and Machine's Visual Manufacturing System (VMS), Processing Outline, and procedures referenced in the SOW paragraph 2.2.

4.1.4 Inspection and Test Documentation

Actual data, except where otherwise stated within this document, and accept/reject status for each inspection and test shall be documented. The reports shall contain sufficient information to accurately locate the area involved and to reproduce the inspection or test performed. This can be accomplished by clear and direct reference to other Seller-provided documents. The procedure, and, as applicable to the process, the technique and equipment used shall be clearly identified. References to calibrated measuring and test equipment shall include date of latest calibration. Inspection and test reports shall identify the personnel performing the inspection or test and their certification level, where applicable. The reports shall be dated and verified by authorized personnel.

4.2 Quality Conformance

4.2.1 Verification of Vacuum Performance

Leak checking shall be done after completion of thermal cycling, surface preparation, and polishing operations. A Turbomolecular Pump (TMP) and a mechanical vacuum pump shall be used to evacuate the assembly under test. A mass spectrometer leak detector shall be connected to the TMP fore-line. A detection sensitivity of 10^{-10} scc/sec shall be provided. All leaks shall be documented, reported to the Laboratory, and repaired. The documentation shall include the location of the leak. If a leak requires more than one repair cycle, it must be documented on a nonconformance report. Testing shall be in accordance with ASTM E 498.

4.2.1.1 Spacer Assembly

The completed Spacer Assembly with port extension installed, shall be thermally cycled from room temperature to 375 $\pm$25 C, a minimum of three times. Port extension flanges shall be cycled from room temperature to 150C +5C/-15C. The interior shall be evacuated below 1×10^{-3} torr during the thermal cycling.

The Spacer assembly shall be evacuated and leak checked after completion of thermal cycling. Room temperature helium leak tests shall be performed to verify that the requirements stated in Section 3.2.1 are met. Prior to leak checking, the assembly shall be cleaned as defined in Section 3.3.2.10.

4.2.1.2 Period Assembly

The Period Assembly shall be thermally cycled with the port extensions welded on and the interior of the Period Assembly vessel and the volumes within Ports 4A and 4B evacuated below 1 x 10^{-3} torr. Cycling shall be performed from room temperature to 375 $\pm$25 C, a minimum of three times. Port extension flanges, except for the neutral beam port which is cycled to 375 $\pm$25 C, shall be cycled from room temperature to 150C +5C/-15C.

A leak check of the Period Assembly vessel shall be performed after thermal cycling is completed, with the port extensions still installed. The end flanges, vertical ports, and neutral beam port shall be blanked off with the appropriate flange covers and the interior evacuated; all other port extensions shall be at atmospheric pressure. Room temperature helium leak tests shall be performed to verify that the requirements stated in Section 3.2.1 are met. Prior to leak checking, the assembly shall be cleaned as defined in Section 3.3.2.10.

4.2.1.3 Port Extensions

A leak check of each of the port extensions shall be performed after thermal cycling of the Period Assembly is completed. The port configuration during vacuum leak testing shall be with the port extensions welded to the vessel as shown in Figure 2, Step 1 (Weld on port extension and leak check weld) and the Period Assembly vessel interior at atmospheric pressure. The neutral beam port and vertical ports will be leak checked during the Period Assembly leak check in Section 4.2.1.2. Room temperature helium leak tests shall be performed to verify that the requirements stated in Section 3.2.1 are met. Prior to leak checking, the assembly shall be cleaned as defined in Section 3.3.2.10.

4.2.2 Verification of Surface Finish

The interior surface finish shall be checked with a profilometer to verify compliance with Section 3.2.2. The exterior surface finish shall be visually examined to verify compliance with Section 3.2.3. Actual values need be recorded only for any out-of-tolerance conditions

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[3] 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). Actual values need be recorded only for any out-of-tolerance conditions.

4.2.4 Verification of Dimensions and Tolerances

The Seller will be required to perform dimensional checks on the Period Assembly and Spacer using full surface 3-D measurement equipment (e.g. laser tracker) to ensure that the surfaces are within the prescribed limits. The Seller shall also perform wall thickness measurements using suitable method (e.g. ultrasonic).

With the Period Assembly and Spacer unrestrained except for gravity supports, all surfaces shall be dimensionally checked on a grid no coarser than 1-inch centers. Welds seams and each end of the Period Assembly and Spacer shall be dimensionally checked on 1 inch centers. The minimum resolution of the instruments shall be at least ten times smaller than tolerances being measured. Final acceptance testing of the Period Assembly dimensions shall be performed after the ports have been cut off and holes bored out.

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3 Available from Severn Engineering Co. Annapolis, Md.

4.2.5 Materials

Material certifications traceable to the materials used shall be provided as defined below. The Seller is to develop and utilize process controls to assure traceability of materials to their certifications.

a. N06625: showing actual chemical and physical properties

b. Bolts: Manufacturer's certification of grade

c. Conflat flanges: Manufacturer's certification of grade

d. Filler metal: showing actual chemical properties

4.2.6 Weld Inspection and Examination

4.2.6.1 Visual

All welds are to be visually inspected using a written procedure prepared in accordance with Article 9 of Section V of the ASME Code, with 8X magnification. The acceptance criteria for the visually inspected welds are given in AWS D1.6, Paragraph 6.29.1. All welds that do not meet the stated acceptance criteria shall be documented, repaired, and re-inspected.

Visual weld inspection shall be done by inspectors certified to perform visual inspection of welds in accordance with AWS QC1 or ASNT, 2055, SNT-TC-1A, Level II or Level III.

Copies of welding heat treatment, Non-Destructive Examination (NDE) and special process procedures and qualification test records shall be available for review by the Laboratory. Welding procedures qualifications shall include evidence of compliance with special magnetic permeability criteria.

4.2.6.2 Volumetric Testing

Ten (10) % of the length of each seam weld in the Period Assembly wall shall be radiographically inspected. The 10% inspection shall include regions of seams which intersect holes cut in the wall for port extensions. Radiographical inspection must be done with certified personnel and a written procedure in accordance with Article 2 of Section V of the ASME Code. The inspection and acceptance criteria shall be in accordance with ASME Section VIII, Division 1, UW-51. Detection of defective welding may require, at the discretion of the Laboratory, an increase to 100 % radiographic inspection of the welds. All welds that do not meet the stated acceptance criteria shall be documented, repaired, and re-inspected

4.2.6.3 Verification of Cleaning Requirements

Visually inspect the VVSA components and examine records for compliance with Section 3.3.2.10.

5 PREPARATION FOR DELIVERY

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.

A plan shall be provided to the Laboratory prior to shipment which includes a description of methods to be used to preserve, package, skid, and identify equipment. The Seller shall contact the Laboratory ten days prior to shipment of the machine to confirm shipping method and route.

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.

A – LIST OF APPLICABLE DRAWINGS AND MODELS

A.1 - List of Drawings

Drawing	Sheets	Name	Rev
se120-002	1	Vacuum Vessel-Sub-Assembly (VVSA)	0
se120-003	1-4	Vacuum Vessel Period Assembly and Removed Port Extensions	0
se120-004	1-19	Vacuum Vessel Period Inspection and Leak Check Assembly	0
se120-005	1-3	Vacuum Vessel Port Extension Weldment	0
se121-013	1-2	Vacuum Vessel Flange Detail	0
se121-014	1-2	Vacuum Vessel Spacer Weldment	0
se121-020	1	Vacuum Vessel Spacer Leak Check Assembly	0
se121-091	1	Vaccum Vessel Spacer Blank Off Cover Detail	0
se121-095	1	Vacuum Vessel Flange Seal Detail	0
se121-099	1	Vacuum Vessel Blank off Seal Detail	0
se121-102	1	Vacuum Vessel Blank Off Cover Seal Weldment	0
se122-006	1	Vacuum Vessel Port Extension Weldment	0
se122-007	1-2	Vacuum Vessel Port 17 & 18 Weldment	0
se122-018	1	Vaccum Vessel Port 12 Flange Detail	0
se122-019	1	Vacuum Vessel Port 12 Seal Retainer Detail	0
se122-049	1	Vacuum Vessel Port 4 Flange Detail	0
se122-057	1	Vacuum Vessel Port 4 Seal Retainer Detail	0
se122-072	1	Vacuum Vessel Port NB Flange Detail	0
se122-104	1	Vacuum Vessel Port 12 Cover Test Flanges Weldment	0
se122-105	1	Vacuum Vessel Leak Test Block	0
se122-112	1	Vacuum Vessel 12 In Cover Test Flange Detail	0
se122-149	1	Vacuum Vessel Port 4 Cover Test Flange Weldment	0
se122-172	1	Vacuum Vessel NB Port Cover Test Flange	0
se122-173	1	Vacuum Vessel Port NB Seal Retainer Detail	0

A.2 - List of Pro/Engineer Models

Pro/Engineer Model Name	Model Description (from Pro/Intralink database, edited)
conflat_blank_clearance_holes.prt	CONFLAT BLANK CLEARANCE HOLE NONROTATABLE (GENERIC)
conflat_bored_clearance_holes.prt	CONFLAT BORED CLEARANCE HOLES NONROTATABLE (GENERIC)
ns151465.prt	6.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 600-400 OR EQ
ns151468.prt	8.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 800-600 OR EQ
ns151469.prt	10.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 1000-800 OR EQ
ns151470.prt	12.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 1200-1000 OR EQ
ns151484.prt	4.62 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 462-000 OR EQ
ns151485.prt	6.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 600-000 OR EQ
ns151487.prt	8.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 800-000 OR EQ
ns151488.prt	10.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 1000-000 OR EQ
ns151489.prt	12.00 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 1200-000 OR EQ
ns151495.prt	1.33 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 133-000 OR EQ
se100-001-1_skel.prt	PORT LOCATIONS
se100-001-2_skel.prt	SURFACES
se120-002.asm	VACUUM VESSEL PERIOD ASSY
se120-005-12.prt	leak Test Block
se121-003.asm	VACUUM VESSEL HALF PERIOD ASSEMBLY
se121-010.asm	VV SPACER MACHINING
se121-011.prt	HALF PERIOD VACUUM VESSEL
se121-012.asm	WELDMENT OF 021 SEAL AFTER SPACER MACHING
se121-013.prt	VV WELDED FLANGE
se121-014.asm	VV SPACER WELDMENT
se121-015.prt	VV SPACER WELDED
se121-017.prt	VV SPACER WELDED FLANGE
se121-027.prt	RF SPOOL PIECE TUBE

Pro/Engineer Model Name	Model Description (from Pro/Intralink database, edited)
se121-043.prt	Dome part
se121-044.asm	DOME ASSEMBLY
se121-045.prt	Dome backing ring
se121-046.prt	Dome stub
se121-048.asm	RF PORT 18 ASSY
se121-054.asm	RF PORT 17 ASSY
se121-055.prt	RF PORT LAYOUT
se121-056.prt	LOWER PORT EXT FOR PORT 18
se121-065.prt	Leak Test Tube Port 4
se121-066.prt	Leak Test Tube for RF dome
se121-067.prt	4.62 O.D. CONFLAT FLG NON-ROT. HUNTINGTON 462-000 OR EQ
se121-091.asm	VACUUM VESSEL COVER FLANGE
se121-091.prt	SPACER SEALING FLANGE
se121-095.prt	SEAL- SPACER
se121-099.prt	SEAL- VESSEL
se121-102.asm	VV BLANK OFF COVER W-SEAL
se121-104.prt	WELD GAS VENT TUBE
se121-114.prt	Leak Test Tube Port 11
se121-115.prt	Leak Test Tube Port 15
se121-117.prt	Leak Test Tube Port 2
se121-119.prt	Leak Test Tube Port 5
se121-120.prt	Leak Test Tube Port 6
se121-121.prt	Leak Test Tube Port 7
se121-122.prt	Leak Test Tube Port 8
se121-123.prt	Leak Test Tube Port 9
se121-124.prt	Leak Test Tube Port 10
se122-003.asm	HALF PERIOD PORT ASSEMBLY
se122-006.asm	PORT 4A ASM W/COVER
se122-007.asm	RF PORT 17 - 18
se122-016.asm	PORT 12 ASSEMBLY
se122-017.prt	Port 12
se122-018.prt	Port 12
se122-019.prt	Port 12 RETAINER
se122-020.asm	PORT 9 ASSEMBLY

Pro/Engineer Model Name	Model Description (from Pro/Intralink database, edited)
se122-021.prt	Port 9
se122-022.asm	PORT 2 ASSEMBLY
se122-023.prt	Port 2
se122-028.asm	PORT 5 ASSEMBLY
se122-029.prt	Port 5
se122-030.asm	PORT 6 ASSEMBLY
se122-031.prt	Port 6
se122-034.prt	Port 3
se122-036.asm	PORT 7 ASSEMBLY
se122-037.prt	Port 7
se122-038.asm	PORT 8 ASSEMBLY
se122-039.prt	Port 8
se122-042.asm	PORT 10 ASSEMBLY
se122-043.prt	Port 10
se122-044.asm	PORT 11 ASSEMBLY
se122-045.prt	Port 11
se122-046.asm	PORT 4A ASSEMBLY
se122-047.prt	PORT4A
se122-049.prt	PORT4A
se122-056.prt	SS FLANGE GASKET
se122-057.prt	SS FLANGE GASKET
se122-058.asm	PORT 15 ASSEMBLY
se122-059.prt	Port 15
se122-069.asm	NB PORT EXTENSION
se122-071.prt	NB Tube Ext
se122-072.prt	NB Port Flg
se122-100.asm	2 INCH HALF NIPPLE
se122-101.prt	2_half_nipple_tube
se122-104.asm	4 INCH COVER FLANGE
se122-104_625.asm	6 INCH COVER FLANGE
se122-105.prt	leak Test Block 2" o.d.
se122-106.asm	6 INCH COVER FLANGE
se122-110.asm	10 INCH COVER FLANGE
se122-112.asm	12 INCH COVER FLANGE
se122-118.asm	VERTICAL PORT BLANK OFF FLANGE

Pro/Engineer Model Name	Model Description (from Pro/Intralink database, edited)
se122-118.prt	Port 12
se122-121.prt	Port 9
se122-122.prt	Port 9
se122-123.prt	Port 2
se122-124.prt	Port 2
se122-129.prt	Port 5
se122-130.prt	Port 5
se122-131.prt	Port 6
se122-132.prt	Port 6
se122-137.prt	Port 7
se122-138.prt	Port 7
se122-139.prt	Port 8
se122-140.prt	Port 8
se122-143.prt	Port 10
se122-144.prt	Port 10
se122-145.prt	Port 11
se122-146.prt	Port 11
se122-147.prt	PORT 4A
se122-148.prt	PORT 4A
se122-149.asm	PORT4A COVER FLANGE
se122-149.prt	PORT4A cover flg
se122-159.prt	PORT 15
se122-160.prt	Port 15
se122-172.asm	2 INCH COVER FLANGE
se122-172.prt	NB PORT COVER FLANGE
se122-173.prt	NB PORT COVER FLANGE
se124-016.prt	VERTICLE SUPPORT WELD BOSS CONFIG
se124-017.prt	VERTICLE SUPPORT WELD BOSS CONFIG
se124-046.prt	NB_VERTICLE_SUPPORT_WELD_BOSS
se124-047.prt	NB_VERTICLE_SUPPORT_WELD_BOSS