

Specification
For
NCSX Modular Coil
Autoclave Vessel Fabrication
NCSX-CSPEC-142-01-00

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1.0 SCOPE

- 1.1 This document provides the requirements and specifications for the fabrication of the NCSX Modular Coil Autoclave vessel.
- 1.2 The vessel consists of the tank, ports and the support structure.
- 1.3 Platforms, heating, vacuum and control systems are **NOT** covered in this specification.

2.0 APPLICABLE DOCUMENTS

2.1 Fabrication Standards

- 2.1.1 EM-002 “PPPL General Welding & Brazing Requirements”

2.2 Testing Standards

- 2.2.1 ENG-014 "Hydrostatic and Pneumatic Testing"Rev.0

2.3 Drawings

- 2.3.1 The Autoclave vessel shall be fabricated per the following drawings:

- 2.3.1.1 SE144-307
- 2.3.1.2 SE144-308
- 2.3.1.3 SE144-310
- 2.3.1.4 SE144-312
- 2.3.1.5 SE144-313
- 2.3.1.6 SE144-316
- 2.3.1.7 SE144-307
- 2.3.1.8 SE144-331
- 2.3.1.9 SE144-332
- 2.3.1.10 SE144-335
- 2.3.1.11 SE144-340
- 2.3.1.12 SE144-341
- 2.3.1.13 SE144-344
- 2.3.1.14 SE144-345
- 2.3.1.15 SE144-363
- 2.3.1.16 SE144-371
- 2.3.1.17 SE144-378
- 2.3.1.18 SE144-379

- 2.3.2 Other

2.3.2.1 NCSX-BSPEC-142-01-00 “Autoclave Design Specification”

2.3.2.2 NCSX-BSPEC-142-02-00 “Autoclave Heating System Fabrication Specification”

3.0 **REQUIREMENTS:**

3.1 System Definition

3.1.1 The autoclave vessel chamber houses materials that are cured at elevated temperatures, under pressures and/or vacuum. The vessel is designed to operate from room temperature to 300 degrees Fahrenheit, and withstand a pressure range from full vacuum (0 psia), to one atmosphere gauge (30 psia). The vessel consists of cylindrical mid-section, with upper and lower domes. The lower dome is welded to the mid-section, while the upper dome is attached via a bolted flange. An O-ring provides a vacuum/pressure compatible seal.

3.2 Characteristics

3.2.1 Performance

3.2.1.1 Vacuum capability

3.2.1.1.1 The vessel shall be capable of achieving and maintaining a base pressure of 1×10^{-3} torr.

3.2.1.1.2 The aggregate leak rate for the vessel (includes all welds and O-ring seals) shall be not greater than 1×10^{-4} torr-liters/sec., as measured with a Helium Mass Spectrometer Leak Detector (HMSLD).

3.2.1.2 Pressure capability

3.2.1.2.1 The vessel shall be capable of achieving and maintaining a maximum positive pressure of 15 psig (30 psia).

3.2.1.2.2 All vessel joints shall be checked for gross leaks. Leaks shall be repaired until undetectable.

3.2.1.2.3 The vessel assembly shall have an aggregate leak rate less than 0.5 psig/hour when pressurized to 15 psig.

3.2.1.3 Temperature capability

3.2.1.3.1 The vessel shall be compatible with sustained operation at 300 degrees Fahrenheit, while under vacuum or at maximum pressure.

3.3 Design and Construction

3.3.1 Production Drawings

3.3.1.1 The Autoclave vessel shall be fabricated and assembled in accordance with the drawings, parts list, and other documents listed in section 2.3.1

3.3.2 Standards of Manufacture

3.3.2.1 Mechanical Fabrication

3.3.2.1.1 Tolerances are specified on the mechanical drawings. Dimensional tolerances are to be met unless stated otherwise, in writing, by the Cognizant Engineer.

3.3.2.2 Welding

3.3.2.2.1 Welding shall be done in accordance with PPPL Procedure EM-002 "General Welding and Brazing Requirements".

3.3.2.2.2 Weld inspections shall be identified on the part drawing.

3.3.3 Workmanship

3.3.3.1 In addition to adherence to PPPL procedures, best shop practices shall be employed.

3.3.3.1.1 Remove burrs and sharp edges.

- 3.3.3.1.2 Completed parts must be clean of dirt, grease, cutting fluids and other foreign matter.
- 3.3.3.1.3 Vessel internal surfaces must be free of scale.

3.4 Documentation

- 3.4.1 Maintain and forward copies to the Operations center of all material tests, certifications and inspections, accumulated during the fabrication, setup and pre-operational testing phases.

4.0 QUALITY COMFORMANCE

4.1 The following chart delineates the actions to be taken to verify the requirements listed in section 3

Requirement	Description	Verification	Remarks
3.2.1.1	Vacuum		
3.2.1.1.1	Achieve base pess.	Test	Pump down test
3.2.1.1.2	Leak rate	Test	With HMSLD
3.2.1.2	Pressure		
3.2.1.2.1	Hold pressure	Test	
3.2.1.2.2	Gross leaks	Test	Soap bubble test
3.2.1.2.3	Leak down rate	Test	Less that 0.5 psig/hour@15 psig
3.2.1.2	Temperature		
3.2.1.2.1	Temp readouts	Test	ISTP
3.3.2	Manufacture		
3.3.2.1	Mechanical	Inspection	Conformance to drawings
3.3.2.2	Welding	Inspection	Per EM-002
3.3.3	Workmanship		
All	All	Inspection	