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Process Specification – Radiographic Weld Inspection 65678 PPPL NCSX Vacuum Vessel Sub Assembly

1. PURPOSE

This specification establishes the process parameters required to ensure that radiographic weld inspection performed on the NCSX SE120-002 Vacuum Vessel Sub Assembly is accomplished within the guidelines of PPPL product specification NCSX-CSPEC-121-02

2. SCOPE

This specification defines the minimum requirements for radiographic weld inspection of the NCSX VVSA highly shaped vessel walls and components when required by MTM MIT 65678.

3. DEFINITIONS

PPPL – Princeton Plasma Physics Laboratory

MTM – Major Tool & Machine, Inc.

NCSX – National Compact Stellarator Experiment

VVSA - Vacuum Vessel Sub Assembly

MIT – Manufacturing, Inspection, and Test plan (MTM Mfg. Routing)

IDC – MTM Inspection Data Checklist system

QAP – MTM Quality Assurance Planning system

MQS – Cooperheat/MQS Inspections. Resident radiographic contractor, utilizing MTM's X-ray facilities.

4. REFERENCE DOCUMENTS

- PPPL Product Specification NCSX-CSPEC-121-02-01
- ASME Section VIII-03, Division 1, UW-51
- ASME Section V-03, Article 2
- 20.A.100-2 – Cooperheat / MQS Radiographic Inspection Test Procedure
- QA-SOP-01 Non-Conformance Control
- MTM Mfg. Routing / Inspection Plan / Quality Assurance Plan 65678
- PS483 – Cleanliness Control

5. PRODUCT SPECIFICATION NCSX-CSPEC-121-02-03 CORRELATION

- 2.1 k, 2.1 l
- 4.1.3, 4.2.6.2

6. EQUIPMENT AND SUPPLIES

- MTM X-Ray Booth
- Iridium 192 Isotope Gamma Source
- Kodak AA, or T speed film
- ASTM E 747 Wire penetrameters

7. INSTRUCTIONS – MTM FABRICATION PERSONNEL

7.1. Layout and number film locations on the exterior of the part using an approved marking device.

7.1.1. Use provided templates / markings / targets to orientate the film positions relative to the port holes which will be cut later.

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- 7.1.2. Each film location requires a unique serial number that will not be re-used throughout the production of all three 120 Degree Vessels.
- 7.1.2.1. Identify each film location with it's respective serial number based on the following numbering scheme:
- Work Order number (65678), Lot number, Sub ID number, Sequence number, shot number.
- 7.2. Record the film location / serial number on the x-ray map (available via the MTM MIT). Log and file the record within the MTM QAP system as required by the MIT.
- 7.3. Ensure the part is adequately supported and orientated for safe transport, and efficient inspection setup / performance.
- 7.4. Position / setup the part in the MTM X-Ray Booth per MTM NDE and/or MQS direction.
- 8. INSTRUCTIONS – MTM NDE, & MQS PERSONNEL**
- 8.1. Apply the film (double load) and transfer serial numbers from the part layout. Ensure each film is clearly identified, and traceable to its corresponding location via MTM x-ray map.
- 8.1.1. Note that two separate exposures are required for each shot. One will be filed and logged within MTM's record's control system, and the other will be provided to PPPL as a supplement to the final quality document package.
- 8.2. Perform the radiographic examination per the following:
- 20.A.100
 - ASME Section VIII, UW-51
 - ASME Section V, Article 2
- 8.3. Once the inspection is complete, and the film is processed, identified, and interpreted. Forward one complete set of film to Engineering for submittal to PPPL. Process the remaining film normally.
- 9. QUALITY ASSURANCE / DOCUMENTATION**
- 9.1. The MTM MIT will specify all in-process and final inspection documentation requirements. All quality documentation will be compiled electronically utilizing MTM's integrated IDC and QAP systems
- 9.1.1. At a minimum, the MTM MIT will require documentation for all contractual features and/or physical requirements (e.g. final component features / final material condition).
- 9.1.2. To ensure compliance is maintained throughout the manufacturing process, interim / additional documentation requirements will be provided within the associated MTM IDC, and QAP system
- 9.1.3. When an IDC record, or QAP document is completed, reference to the specific area being tested will be clearly discernable. The record will include the following information (as applicable):
- MTM Work Order Number
 - Part Identification Number
 - Part Description
 - Part Serial Number
 - Date of Inspection

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- Gage Serial Number
- Reference Standard Serial Number
- Inspector Signature / Acknowledgement, Initials, or Stamp

- 9.1.4. For all MIT operation sequences that include this document as a task requisite, but do not specify physical inspection records or documentation, the electronic completion (“clocking out”) of each sequential manufacturing operation within the MTM (Visual Manufacturing®) routing confirms compliance to the applicable requirements. The MTM employee completing the electronic transaction (which completes and closes the operation sequence) personally acknowledges completeness and compliance to the routing instructions.
- 9.2. All un-authorized exceptions / out of tolerance conditions according to MTM MIT will be documented within the MTM Non-Conformance system per QA-SOP-01.