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2. TITLE

21-PWR UCF PROTOTYPE FABRICATION SPECIFICATION

3. DI (Including Rev. No.)

000-3SS-DSU0-00300-000-00A

4. QA CONTROLS

Specification subject to This is a prototype for a 21-PWR UCF Waste Package design, which is classified as Quality Level 1

5. Other Information

N/A

6. Rev. No./ (Date)	7. Description of Revision
00A	Initial Issue. This Specification supersedes 000-550-DSU0-00100-000-00A. This has been completely rewritten and incorporates the latest design changes.

8. ORIGINATOR (Name/Signature) Michael J. Plinski /Michael J. Plinski	DATE 7/9/03
9. CHECKER (Name/Signature) Doug Smith Doug Smith	DATE 7/10/03
10. EGS/DLE (Name/Signature) Jerry A. Cogar NEIL BROWN FOR	DATE 7/10/03
11. QER (Name/Signature) Dan Tunney DANIEL TUNNEY	DATE 7/10/2003
12. VERIFIER (VERIFICATION LEAD) (Name/Signature) (If required) N/A	DATE
13. PROJECT ENGINEER/PROJECT MANAGER (Name/Signature) Jack Cloud	DATE 7/10/03

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TABLES

1. INTRODUCTION

This Specification provides requirements for materials, marking, fabrication, welding, heat treatment, examination, testing, quality assurance, quality control, documentation, packaging, and shipping for the Prototype Waste Package (referred to throughout this Specification as Waste Package.) The Waste Package consists of an Inner Vessel, an Outer Corrosion Barrier, and a Basket Assembly. The Waste Package Inner Vessel shall be fabricated, and have the American Society of Mechanical Engineers (ASME) N Code Symbol Stamp, in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section III, Division 1, Subsection NC (Class 2 pressure vessel.) The Outer Corrosion Barrier shall be constructed to the specific provisions of the ASME Boiler and Pressure Vessel Code Section III, Division 1, Subsection NC (Class 2 pressure vessel) identified herein, but will not be ASME Boiler and Pressure Vessel Code (ASME Code) Stamped. It shall be inspected by an Authorized Nuclear Inspector (ANI) and certified as to meeting the specific provisions of the ASME Code identified in this Specification. The Basket Assembly shall be constructed to the specific provisions of the ASME Boiler and Pressure Vessel Code Section III, Division 1 identified herein, but will not be ASME Code Stamped.

1.1 Project Summary

The Prototype Waste Package is intended to provide a demonstration of the containment system for the disposal of commercial spent nuclear fuel. The actual Waste Packages are intended to be in emplacement drifts at the Yucca Mountain Facility.

1.2 Description of the Waste Package

The major parts of the Waste Package are as follows:

I. Outer Corrosion Barrier
   - A. Outer Barrier
   - B. Middle Lid
   - C. Outer Lid
   - D. Shell Interface Ring
   - E. Inner Vessel Support Ring

II. Inner Vessel
   - A. Stainless Steel Vessel
   - B. Inner Vessel Bottom Lid
   - C. Inner Vessel Lid
   - D. Spread Ring

III. Basket Assembly
   - A. Fuel Plates Assembly
   - B. Guides
   - C. Fuel Tubes

The Inner Vessel provides the structural strength for the Waste Package. The Outer Corrosion Barrier provides the corrosion resistant protection for the Waste Package. The functions of the Basket Assembly are to ensure proper geometry of the waste form in order to preclude criticality events and to facilitate loading of the waste form.

The items delineated in this Specification and the associated Drawings are essential and must be carefully controlled and verified during fabrication and assembly.

2. SCOPE OF WORK

This Specification sets forth the requirements for the fabrication and assembly of the Waste Package specified in the procurement documents. The Subcontractor shall ship the Waste Package to the location specified in the procurement documents.

2.1 Work Included

The Work by the Subcontractor set forth by this Specification shall include the following:

A. Preparation and submittal of a Waste Package manufacturing plan, schedule, and shop detail and assembly drawings to the Contractor for approval in accordance with the requirements of this Specification.

B. Preparation and submittal of the Waste Package fabrication travelers and/or checklists, certified material test reports for base and filler materials, welding procedures, examination procedures and reports, measurement procedures and reports, and other documentation as defined in this Specification. This is to verify that the material and work conforms to the requirements of this Specification.

C. Furnishing of materials, fabrication, welding, packaging, and shipping requirements of a complete Waste Package are as described by the Drawings, this Specification, ASME Design Specification (Appendix 7), and the procurement documents. The Subcontractor is responsible for furnishing all gauges, fixtures, and equipment to perform tests and other activities required by this Specification. The Subcontractor shall be responsible for maintenance of any test equipment required by this Specification. The Subcontractor shall be responsible for the storage of any test equipment required by this Specification, to prevent damage and deterioration, to the extent required for maintenance of the test equipment.

3. TECHNICAL TERMS

The following definitions and abbreviations shall apply as used within this Specification.

3.1 Definitions

The following definition of terms shall apply throughout this document.

A. **Contractor** is Bechtel SAIC Company, LLC Las Vegas, Nevada.

B. **Subcontractor** is the entity awarded the contract for furnishing the equipment that is specified herein.

C. **Owner** is the United States Department of Energy (DOE) Las Vegas, Nevada.

D. The **Work** is any and all equipment, material, apparatus, item, process, and parts or portions thereof to be supplied by the Subcontractor under the Subcontract.

E. The **Subcontract** is any and all contractual documents, and changes thereto, prepared by the Contractor and issued to the Subcontractor delineating the scope of work to which this Specification applies. The agreements are between the Subcontractor and the Contractor regarding the Work to be performed, and the equipment and documentation to be provided for the Work, including all terms and conditions under the Subcontract.

F. **Hold Point** is a step in the process at which the Subcontractor must contact the Contractor and obtain written authorization to proceed. Hold Points are designated in this Specification.

G. **Witness Point** is a step in the process at which the Subcontractor must contact the Contractor, so the Contractor can inspect or observe a process before the Subcontractor proceeds. Witness Points are designated in this Specification.

H. **Major Dimension** is a dimension that requires inspection and formal documentation with actual results in the Document Package. As applicable, Major Dimensions are recorded after welding, heat treating, and machining operations.

I. **UNS N06022** is a generic designation for the specific low-carbon nickel-molybdenum-chromium alloy.

J. **316** is defined as stainless steel type 316 (UNS S31600) except with the following additional restrictions on chemical composition:

C – 0.020% max
N – 0.060% min to 0.10% max

K. **516 Carbon Steel Grade 70** is defined as SA-516, Grade 70 (UNS K02700) carbon steel plate.

L. **Neutronit A978™** is defined as a borated stainless steel alloy with the following chemical composition and mechanical properties:

C – 0.04% max	Cr – 18.5% max	Ni – 13.0% max
Co – 0.20% max	Mo – 2.2% max	Fe – Balance

B – 1.60% min – 1.74% max
Density = 7.76 g/cm^3 (20°C) Specific Heat = 0.5 J/g-K (20°C)
Modulus of Elasticity = 200 GPa (20°C) Tensile Strength (min) = 550 MPa
Elongation = 6% min
Thermal Conductivity = 10.3 W/m-K (20°C), 11.7 W/m-K (130°C), 13.4 W/m-K (260°C)

C-227.

M. **6061 T4** is the grade and heat treatment for Aluminum SB-209 A96061 T4.

3.2 Abbreviations

ANI	Authorized Nuclear Inspector
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASME Code	ASME Boiler and Pressure Vessel Code
ASTM	American Society of Testing and Materials
AWS	American Welding Society
CMTR	Certified Material Test Report
DOE	U.S. Department of Energy
M&TE	Measuring &Test Equipment
NDE	Non Destructive Examination
NIST	National Institute of Standards and Technology
PO	Purchase Order
PQR	Procedure Qualification Record
PT	Liquid Penetrant Examination
PWR	Pressurized Water Reactor
QA	Quality Assurance
QC	Quality Control
RT	Radiographic Examination
SDDR	Supplier Deviation Disposition Request
UCF	Uncanistered Fuel
UT	Ultrasonic Examination
VT	Visual Examination
WPQR	Welder Performance Qualification Record
WPS	Weld Procedure Specification

4. SPECIFYING DOCUMENTS

Equipment and/or services for the Work furnished in accordance with this Specification shall comply with all applicable laws and with the following codes and standards to the extent referenced herein and on the Drawings. Unless otherwise noted, later Editions and Addenda may be used if mutually consented to in writing between the Subcontractor and the Contractor. Any conflicting requirements must be submitted to the Contractor in writing for resolution before proceeding with any phase of the Work.

4.1 Codes and Standards

The materials, design, fabrication, testing, examination, and shipping of the Waste Package will meet the requirements of the following codes and standards as referenced in this section. The codes and standards are applicable to the extent referenced in this Fabrication Specification and the associated Drawings.

A. ASME Boiler & Pressure Vessel Code, Section II, Materials, 2001 Edition with the 2002 Addenda.

B. ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NB, Rules for Construction of Nuclear Power Plant Components Class 1 Components, 2001 Edition with the 2002 Addenda.

C. ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NC, Rules for Construction of Nuclear Power Plant Components Class 2 Components, 2001 Edition with the 2002 Addenda.

D. ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NF, Rules for Construction of Nuclear Facility Components Supports, 2001 Edition with the 2002 Addenda.

E. ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NCA, Rules for Construction of Nuclear Power Plant Components General Requirements for Division 1 and Division 2, 2001 Edition with 2002 Addenda.

F. ASME Boiler & Pressure Vessel Code, Section V, Nondestructive Examination, 2001 Edition with 2002 Addenda.

G. ASME Boiler & Pressure Vessel Code, Section IX, Welding and Brazing Qualifications, 2001 Edition with 2002 Addenda.

H. ASME Boiler & Pressure Vessel Code, Code Cases: Nuclear Components, 2001 Edition with 2002 Addenda.

I. ASME Y14.5M-1994, "Dimensioning and Tolerancing," 1999 Edition.

J. American National Standard Institute/American Welding Society (ANSI/AWS) A2.4-98, Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. ASME B46.1-1995, Surface Texture (Surface Roughness, Waviness, and Lay) 1996 Edition.

L. ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facility Applications, Subpart 2.1, Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants, 2000 Edition.

M. ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facility Applications, Subpart 2.2, Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items of Nuclear Power Plants, 2000 Edition.

N. ANSI/AWS A5.32/A5.32M-97, Specification for Welding Shielding Gases, 1998 Edition.

4.2 Drawings

The Detail Drawings specified in the Subcontract are hereinafter referred to as Drawings, and set forth the extent of the Work to be performed under the Subcontract.

4.3 Design Specification

ASME Design Specification for the Inner Vessel (Appendix 7) prepared in accordance with the ASME Boiler and Pressure Vessel Code Section III, Division 1, NCA-3250.

5. FUNCTIONAL REQUIREMENTS

It is essential that the specified dimensional tolerances for the Waste Package be maintained.

5.1 Dimensional Interfaces and Limitations

All dimensions are essential. Major Dimensions identified in Drawings are for acceptance at the assembly level. Dimensions apply after final machining and welding. It is important that the tolerances for the Major Dimensions be met. In addition, material thicknesses are essential to final acceptance of the Waste Package. The dimensions and tolerances on the final assembled components after welding and machining are the controlling dimensions. Refer to Section 6.3.5 Piece Part Tolerance.

5.2 Decontamination

Exterior surfaces of the Outer Corrosion Barrier shall be readily decontaminable. This requires smooth surfaces on all sheet, plate, and welds. All exposed surfaces shall have a finish that meets or exceeds that specified on the Drawings in accordance with ASME B46.1. The Inner Vessel and Outer Corrosion Barrier Shells shall not be bead- or sand-blasted.

6. MANUFACTURING REQUIREMENTS

6.1 General Requirements

Materials, fabrication, welding, and examination and testing shall comply with the requirements of this Specification.
The Subcontractor shall accept complete responsibility for all the Work performed in compliance with this Specification. Review or approval of data or procedures by the Contractor with regard to the Work performed to accomplish the requirements of this Specification does not constitute a release from conformance to the Scope of Work established by this Specification. The requirements of this Specification shall be met.

Alternative fabrication details proposed by the Subcontractor shall be submitted to the Contractor in writing. These details shall not be incorporated in the Subcontractor's fabrication drawings without prior written approval from the Contractor.

6.2 Materials

Certified Material Test Reports (CMTRs) for all materials of fabrication shall be provided to the Contractor. No materials may be substituted or changed without written approval of the Contractor. The Subcontractor may propose alternative materials, components, or parts other than those specified in this Specification to the Contractor for approval. The Subcontractor must show the substitution is more economical and better qualified to operate under the conditions and performance requirements, and is equivalent to, and, as applicable, in compliance with the applicable ASME Code requirements as original. All proposed substitutions shall be clearly defined by the Subcontractor, with a complete description including supporting data establishing equivalence to the specified item, and submitted 15 days prior to material order.

6.2.1 Inner Vessel and Outer Corrosion Barrier Materials

Materials for the Inner Vessel and the Outer Barrier shall comply with the requirements of the ASME Boiler and Pressure Vessel Code, Section III, NC-2000, and the applicable Section II Material Specifications, and the following additional requirements. Certified Material Test Reports shall be furnished for all materials. The Subcontractor shall perform a material composition positive material identification on all UNS N06022 material. As an alternative to meeting NCA-3800, materials may be furnished in accordance with ASME Code Case N-483-3 except for Inner Vessel. Examination and repair shall be in accordance with NC-2500.

Materials for the Basket Assembly shall comply with the requirements of the ASME Boiler and Pressure Vessel Code, Section III, NC-2000, and the applicable Section II Material Specifications (except Neutronit A978™), and the following additional requirements. Certified Material Test Reports shall be furnished for all materials.

A. Material Identification and Traceability Marking

Marking shall be done by any permanent method that will not result in harmful contamination or sharp discontinuities. Marking of all materials shall be maintained in a manner that provides traceability to the associated material records.

B. Examination and Repair of Plate

No repairs shall be performed until the Contractor has approved the Subcontractor's written procedure in accordance with Section 8.6 of this Specification.

1. Inner Vessel

   Examination and repair of the Inner Vessel shall be in accordance with the ASME Code, Section III, Division 1, NC-2530 (Class 2).

2. Outer Corrosion Barrier

   Examination and repair of the Outer Corrosion Barrier shall be in accordance with the ASME Code, Section III, Division 1, NB-2530 (Class 1) and the following additional requirements.

   a. The Outer Corrosion Barrier base material shall be examined by the angle beam ultrasonic method in accordance with ASME Section III, NB-2532.2, and all reportable shall be charted and reported.

   b. In lieu of the examination requirements of ASME Section III, NB-2539.4, repair welds in the Outer Corrosion Barrier base material shall be examined by the radiographic method, by the angle beam ultrasonic method, and by liquid penetrant method in accordance with ASME Section III, NB-5110, meeting the acceptance standards of ASME Section III, NB-5320, NB-5330, and NB-5350, respectively, with the following limitation. Instead of the maximum indication lengths specified by ASME Section III, NB-5320 (b) and NB-5331 (a), the maximum acceptable indication length shall be 1/16 inch regardless of material thickness.

3. The Basket Assembly shall be examined and repaired in accordance with the requirements of ASME Code, Section III, Division 1, NC-2530 except for Neutronit A978™. The Contractor must approve proposed repairs and repair procedures to Neutronit A978™.

C. Welding Materials

All welding filler metals shall conform to the requirements of the ASME Section III, Division 1, NC-2400. (Note: Welding materials may be purchased in accordance with the Edition and Addenda of the ASME Code effective at the time the material purchase order is

placed.) Filler metals shall be tested as specified below. CMTRs shall accompany each lot or heat of the material purchased.

1. Stainless Steel

   a. Covered stainless steel electrodes for shielded metal arc welding shall conform to the requirements of ASME SFA-5.4, Classification E316, with exceptions to 316 chemistry as stated in section 3.1.J.

   b. Bare stainless steel welding electrodes and rods shall conform to ASME SFA-5.9, Classification ER316, with exceptions to 316 chemistry as stated in section 3.1.J.

2. UNS N06022

   Bare welding electrodes and rods shall conform to ASME SFA-5.14, Classification ERNiCrMo-10 or ERNiCrMo-14. The decision to use ERNiCrMo-10 or ERNiCrMo-14 will be decided later by the Contractor.

3. Carbon Steel

   Carbon steel electrodes and rods shall conform to ASME SFA-5.18, Classification ER70S-2.

4. Shielding Gases

   → All shielding gases shall meet the requirements specified in ANSI/AWS A5.32/A.5.32M-97.

5. Carbon Steel to Stainless Steel

   a. Covered stainless steel electrodes for shielded metal arc welding shall conform to the requirements of ASME SFA-5.4, Classification E309Mo.

   b. Bare stainless steel welding electrodes and rods shall conform to ASME SFA-5.9, Classification ER309Mo.

6.2.2 Other Materials

Piece parts and standard products (e.g., Fuel Tubes) incorporated into the Waste Packages have been designated on the Drawings as American Society of Testing and Materials (ASTM) materials or by manufacturer's call-out, when applicable.

6.3 Fabrication

All cutting, forming, machining and fitting operations shall be performed in accordance with the approved shop procedures or drawings, and the provisions of this Specification. All cutting,

forming, machining, and fitting operations applied to the Inner Vessel and the Outer Corrosion Barrier shall meet the requirements of ASME Section III, Division 1, NC-4000.

6.3.1 Cutting

When practical, weld preparations shall be prepared by non-thermal means. Thermally cut surfaces and associated heat affected zones shall be ground or machined to provide base metal that is slag free and not heat-affected. See Section 7.1 for Non Destructive Examination (NDE) requirements for weld edge preparation surfaces.

6.3.2 Forming

All plates used for the Inner Vessel and Outer Corrosion Barrier cylinders shall be rolled, cut to size, and formed to final shape before welding.

6.3.3 Machining

Machining shall be performed using tooling suitable for the task, capable of producing the required dimensional control and surface finishes specified on the Drawings.

6.3.4 Fitting and Aligning

The accuracy of fit up for all parts shall be as required to meet the components and assembly tolerances specified on the Drawings.

6.3.5 Piece Part Tolerance

When piece part tolerances are not shown on the Drawings, the Subcontractor shall establish piece part tolerances that provide a finished product meeting the overall tolerances specified in the Drawings. All piece part tolerances shall be stated on the shop drawings.

The Subcontractor may recommend variations in the piece part tolerances established by the Drawings, provided a system is established that ensures that the finished product meets the overall tolerances specified in the Drawings.

The Subcontractor shall adjust dimensions as needed to perform all fabrication processes, including welding, to accommodate shrinkage and distortion to comply with the finished dimensions and tolerances shown on the Drawings.

6.3.6 Dimensional Verification

The Subcontractor shall submit Measurement Reports in accordance with Section 10 of this Specification. Measurement Reports certify that the Major Dimensions (Major Dimensions are all dimensions other than Reference Dimension as show in Drawings) of each assembly and component, identified by a component serial number and Major Dimension label that are in compliance with Major Dimensions as shown on the Drawings and Table 6-1. Verification of

dimensions shall be performed with calibrated equipment. The ambient temperature shall be recorded and reported with all dimensional verifications.

Trial fit of the Inner Vessel Lid and Spread Rings to the Inner Vessel is required. It shall be noted in the Measurement Reports by the unique part numbers that were trial fit.

6.4 Assembly

The Subcontractor shall develop a manufacturing plan and schedule that provides sufficient detail to clearly define the proposed assembly chronological sequence including the required cutting, fitting, aligning, and welding steps, to ensure that the overall tolerances are maintained. The manufacturing plan and schedule shall be submitted 45 days before fabrication to the Contractor for approval.

6.4.1 Assembly Requirements

The Subcontractor shall establish tolerance criteria for each sub-assembly, consistent with the overall finished dimensions and tolerances specified in the Drawings. These tolerances shall be included on the shop drawings. Prior to assembly all parts shall be cleaned in accordance with section 6.6 of this Specification.

6.4.2 Marking (Labeling) of Completed Assemblies

This section lists the requirements for permanent marking of completed assemblies. It does not include temporary markings used to maintain CMTR/heat/lot traceability during shop fabrication of piece-parts. Completed components shall be sequentially identified with serial numbers in accordance with Table 6-1.

6.4.2.1 Waste Package Marking

Each piece (cylinder, lids, basket, etc.) shall be uniquely identified. The Subcontractor shall establish a weld map, material map, and radiographic map for the Waste Package. The weld and material maps shall provide traceability of all materials to heat (lot) numbers throughout the fabrication sequence and final assembly. Each weld shall be marked to identify the welder and weld material by heat or lot number and shall be traceable to applicable NDE reports and to fabrication travelers. These maps shall be included in the final document package. Identification for traceability of materials is required.

A. Method: Vibro-etching, direct engraving, laser marking, or photo engraving is recommended for identification. Any Inner Vessel and Basket Assembly Component may be impression stamped using low stress blunt-nosed continuous-, or blunt-nosed interrupted-dot die stamps. High stress die stamping or pin stamping is not permitted.

B. Marking Text Font: The text font shall be an upright, sans serif, and modern type font such as Gothic, Arial, or equivalent. Height-to-width ratio of the letters and numbers in the font may be from 1/1 to 2/1. All letters shall be upper case.

C. Marking Text Height: Text height shall be a minimum of 5/8 in.

D. Marking Die Stamp: Die stamps shall be low-stress type (blunt-nosed continuous dies or blunt-nosed interrupted dot die) stamps. The tip radius of the dies for 5/8 in. character size letters shall be 0.010 in. minimum. The impression depth shall not exceed 0.010 in.

E. The Inner Vessel Lid shall be marked with the ASME "N" stamp information as required for nameplates as specified in ASME NCA-8200. Location shall be opposite the Evacuation/Backfill Valve immediately inboard from the serial number stamp location specified in Table 6-1 of the inner shell. Format of figure ASME NCA-8212-1 "Form of Stamping" shall be as follows:

1. Code symbol, method: stamp
2. Class of construction, method: stamp
3. "Certified by", method: stamp or electro-etch
4. Certificate Holders name, method: stamp or electro-etch
5. Serial Number, method: stamp or electro-etch

Table 6-1: WASTE PACKAGE LABELING

ITEM	SERIAL NUMBER	LOCATION AND ORIENTATION ON COMPONENT
Outer Corrosion Barrier Cylinder	OC-001	Middle of cylinder opposite long seam of upper shell course
Inner Vessel Cylinder	IC-001	Middle of cylinder opposite long seam of upper shell course and top edge
Outer Lid	OL-001	Outside surface of lid six inches from the outer edge
Inner Vessel Lid	IVL-001	Outside surface of lid, opposite Evacuation/Backfill Valve, six inches from the outer edge
Middle Lid	ML-001	Outside surface of lid six inches from the outer edge
Evacuation/Backfill Cover	EBC-001	Outside Surface of lid in the middle of lid
Shell Interface Ring	IR-001	Top surface of ring in the middle
Inner Vessel Support Ring	IVSR-001	Top surface of ring in the middle
Spread Ring	SR-001	Top surface of ring in the middle
Upper Trunnion Sleeve	UTS-001	Outside Surface
Lower Trunnion Sleeve	LTS-001	Outside Surface

6.5 Welding

Use of temporary welded attachments during fabrication shall be avoided as much as possible. If they are used, every effort shall be made to place them on offal. If they are placed on material to be left in the completed Inner Vessel, Outer Corrosion Barrier, or Basket Assembly, they must be completely removed by grinding, and the area shall be examined by the liquid dye penetrant (PT) method in accordance with the ASME Section III, NC-4335 and section 7.1.D of this Specification.

6.5.1 Welding Processes

Only the following welding processes, with the restrictions listed, are permitted for the Outer Corrosion Barrier. Alternative welding processes may be proposed, subject to approval by Contractor. Welding processes used on the Inner Vessel, the Outer Corrosion Barrier, and the

welds that attach the Basket Assembly to the Inner Vessel shall comply with ASME Section III, NC-4000 and Section IX. The other Basket Assembly welds shall used welding processes that comply with NF-4000 and Section IX.

A. Gas Tungsten Arc

An inert gas backing purge must be used for the first 3/16 inch of deposited weld metal thickness for full penetration welds.

B. Gas Metal Arc

This process, except for the short-circuiting arc mode, may be used for UNS N06022. The short-circuiting arc mode is prohibited for all fabrication of the Outer Corrosion Barrier.

6.5.2 Welding Procedure Specifications and Procedure and Performance Qualifications

The Subcontractor shall prepare written Welding Procedure Specifications (WPSs).

Each WPS used for any welding on any Waste Package materials except for Basket Assembly welds that do not attach Basket Assembly to the Inner Vessel shall be prepared and qualified in accordance with the requirements of ASME Section III, NC-4000, Section IX and this Specification. The WPS(s) used for welding Basket Assembly welds that do not attach Basket Assembly to the Inner Vessel shall be prepared and qualified in accordance with the requirements of ASME Section III, NF-4000, Section IX and this Specification. The Subcontractor shall qualify all welders used to make any weld in the Waste Package except for Basket Assembly welds that do not attach Basket Assembly to the Inner Vessel in accordance with ASME Section III, NC-4000 and Section IX. The Subcontractor shall qualify all welders used to make any weld for Basket Assembly that do not attach Basket Assembly to the Inner Vessel in accordance with ASME Section III, NF-4000 and Section IX.

Procedure Qualification Records (PQRs), and Welder Performance Qualification Records (WPQRs) shall be in form of clear, sharp, reproducible prints, including all applicable essential and nonessential variables listed in the ASME Code, Section IX.

Approved WPSs shall be shown on the Subcontractor's shop drawings for each weld. Thirty days prior to the start of welding operations, the Subcontractor shall submit to the Contractor, for approval, one copy of the WPS, corresponding PQR, and qualification procedure for the welders. The welding and quality control procedures shall include the requirement that no welder shall have in his possession more than one type of filler metal at any one time.

6.5.3 Preheat and Interpass Temperatures

A. The maximum interpass temperature for welding austenitic stainless steel materials shall be 350°F. The minimum preheat temperature is 50°F. The maximum interpass temperature for welding UNS N06022 is 200°F. The minimum preheat temperature is 50°F. The maximum

interpass temperature for welding carbon steel is 500°F. The minimum preheat temperature is 50°F.

B. Preheat and interpass temperature shall be determined by temperature indication crayons, optical or contact pyrometers, or other suitable means accepted by the Contractor. Temperature indication crayons shall not be used on austenitic stainless steel or UNS N06022.

C. Interpass temperature requirements listed above shall also apply to tack welding, fillet welds, and attachment welds.

6.5.4 Workmanship and Visual Weld Quality

A. All of the following workmanship criteria shall be applied to each weld, as applicable to the type of weld.

B. Each weld shall be essentially uniform in width and size throughout its full length. Each layer of welding shall be visually free of slag, inclusions, cracks, porosity, and lack of fusion.

C. Fillet welds shall be of the specified size with full throat thickness. Excessive convexity or concavity shall be avoided. Fillet welds shall meet the minimum size required by the Drawings, but may vary in size above the minimum, as long as a reasonably uniform appearance is maintained.

D. Elimination of defects and surface preparation of welds by chipping, grinding or gouging shall be done in such a manner as not to gouge, groove, or reduce the adjacent base-material thickness below the required design thickness. Only the Contractor approved repair procedures shall be used.

E. Precautions shall be taken to minimize weld spatter and arc strikes. If these occur, they shall be removed by procedures approved by the Contractor.

F. Peening shall not be used without the prior written Contractor's acceptance of the method and controls to be used. Use of pneumatic tools for slag removal is not considered peening, and is acceptable.

G. Welds shall be considered ground flush when they are within 1/32 in. of the base metal surface. Weld caps on all shell seams shall be a maximum of 1/32 in. high. If grinding is required to maintain the maximum weld height, the finish shall be equivalent to a finish produced by 80 grit or finer abrasive media.

H. Tack welds used to secure alignment shall either be removed completely, when they have served their purpose, or their stopping and starting ends shall be properly prepared by grinding or other approved means so that they may be satisfactorily incorporated into the final weld. Tack welds and temporary attachment welds shall be made by qualified welders

using qualified welding procedures, in accordance with Section 6.5.2 of this Specification. Tack welds and temporary attachment welds' filler metal shall be in accordance with Section 6.2.1.C.

6.5.5 Repair by Welding

A. Weld Repair of Defects in Base Material:

Defects in plates used in the Inner Vessel, the Outer Corrosion Barrier, and Basket Assembly shall be repaired as specified in Section 6.2.1 of this Specification. Repair welding shall be performed using welding procedures and welders qualified in accordance with ASME Section IIII, NC-4000 and Section IX.

B. Repair of Defects in Completed Welds:

Defects in welds in or on the Inner Vessel, Outer Corrosion Barrier, or Basket Assembly shall be repaired in accordance with ASME Section III, NC-4450 or NF-4450. Repairs to welds shall be examined in accordance with the requirements for examination of the welds in Section 7.1.

Repair welding shall be performed using welding procedures and welders qualified in accordance with Section 6.5.2 of this Specification. All repairs to completed welds are to be documented on an NDE/Weld History record that shall include the type, location of defect repaired, subsequent heat treatment, if performed, and the results of re-examination(s) performed after repair.

C. Number of Weld Repair Cycles

Contractor shall be notified in accordance with Section 8.6 when weld or base material defect exceeds two cycles for any individual repair.

6.5.6 Heat Treatment

Heat treatment may be accomplished by any suitable methods of heating and cooling, provided the required heating and cooling rates, metal temperature uniformity, and temperature control are maintained.

Heat treatment shall be performed with thermocouples in contact with the material.

The preferred method of heat treatment is furnace heating the entire outer shell with one heat treatment.

The Subcontractor shall prepare written Heat Treatment Procedure that meets the ASME Code Section III, Division 1, NC-4600 and this Specification that includes the number of thermocouples, and showing their locations. Heat Treatment Procedure shall be in the form of clear, sharp, reproducible prints and shall be submitted 30 days before fabrication for Contractor's approval.

Time-Temperature Recordings of all heat treatments shall be maintained and be part of the document package.

A. Solution Annealing of Outer Barrier

The Outer Corrosion Barrier shall be solution annealed after completion of welding and dimensional inspection. The Outer Corrosion Barrier shall be furnace heated at a soak temperature of 2050° Fahrenheit ± 50° Fahrenheit for 20 minutes minimum, after reaching temperature. Cooling will be achieved by immersion in water or spray quenching. Cooling rate for the entire outer shell shall be greater than 150° Fahrenheit/minute from soak temperature to below 700° Fahrenheit.

No repairs shall be performed on the Outer Corrosion Barrier after solution annealing until the Contractor has approved the Subcontractor's written procedure in accordance with Section 8.6 of this Specification.

6.6 Cleaning, Coating, and Surface Preparation

Cleaning and surface preparation shall be as specified on the Drawings and in accordance with the following requirements:

A. All metal surfaces shall have a surface cleanliness classification C as defined in ASME NQA-1-2000 Edition, Subpart 2.1 Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants.

B. All welding by-products such as slag, spatter, or smoke stains shall be removed.

C. Use of any mechanical method that produces excessive roughness, or cleaning agents that may have corrosive effects or affect the performance or the material, is prohibited.

D. No materials or methods used during cleaning shall contain halogens, sulfur, or other deleterious materials in concentrations greater than 25 ppm. Copies of the halogen and sulfur content certification shall be included in the final document package.

E. Written procedures prepared in accordance with ASME NQA-1-2000 Edition, Subpart 2.1 for cleaning, inspection, and testing of cleanness shall be submitted to the Contractor for approval 30 days before fabrication.

F. Prior to welding, all components shall be degreased using a cleaning agent that does not contain more than 25 ppm halogens and sulfur. No markings made with dye or paint markers shall remain. The cleaning technique shall be included in the cleaning procedure. Copies of the halogen and sulfur content certification shall be included in the final document package.

G. The inside and outside surfaces of all finished parts shall be free from all mill scale, machining chips, grease, oil, weld spatter, arc strikes, or foreign matter. It is essential that the annulus between the cylinders, and the basket spaces be clean and not contain any foreign matter. This cleaning shall be done before any heat treatment.

H. During fabrication, contact with clean carbon steel bed plates, cutting tables, lathes, boring mills, tooling, handling equipment, test equipment, etc., is permitted. Any of the above carbon steel surfaces shall be clean of any loose scale, rust, or steel particles that could become embedded in the stainless steel or UNS N06022.

I. All grinding wheels shall be made of aluminum oxide, all wire brushes shall be Type 300 stainless steel, and both shall be used only on stainless steel or UNS N06022 material. The grinding wheels and wire brushes can only be used on either stainless steel or UNS N06022 material, and not on both materials. Nonferritic material shall be isolated from grinding or welding of carbon steels to avoid contamination.

J. Cutting oils, lubricants, inks, labels or other means of marking fabrication progress, and all other materials/chemicals used during the fabrication and examination (such as liquid penetrant dye and developer, ultrasonic testing couplants, etc) shall have a maximum halogen and sulfur content of 250 ppm. An exception is permitted for liquid penetrant materials that may be up to a maximum halogen and sulfur content on no greater than 350 ppm, due to availability. Certifications of halogen and sulfur content shall be included in the final document package.

7. EXAMINATION AND TESTING REQUIREMENTS

The Waste Package shall undergo the tests, examinations, performance tests, and leakage tests described herein. The purpose of these tests and examinations is to ensure the quality of workmanship and to assure that the Waste Package meets the functional requirements specified herein. A test plan and a test schedule shall be provided by the Subcontractor 45 days before fabrication for the Contractor's approval. The Subcontractor shall furnish all shop examination and test facilities, materials, and labor necessary for performance of the tests and examinations, or for any modifications resulting form the tests or examinations. The Subcontractor shall repair or replace all or any parts of the Work not in compliance with this Specification as determined by such examinations and tests.

The Contractor and the Owner reserve the right to use a designated Representative of the Contractor during tests and examinations including hold/witness point activities. The presence of either the Contractor or the Representative during fabrication shall not relieve the Subcontractor from performing his required in-house quality control functions. The Subcontractor is responsible for first line examination and verification of items and services within the contractual scope of work. The Representative shall be entitled to the same site access privileges as the Contractor and provided all necessary documents and records necessary to perform the Contractor's inspection work and surveillance duties during hold and witness point activities.

The Subcontractor shall notify the Contractor at least 14 working days in advance of designated hold points or witness points. Hold points may not be waived without specific written consent of the Contractor. Work may proceed past a designated witness point upon notification and written agreement from the Contractor or the Contractor's Representative.

For tests and examinations, the Subcontractor shall submit to the Contractor documentation identifying the Subcontractor's Quality Assurance (QA) examination, test, and hold points to occur during manufacturing, assembly, and testing. This list will be used by the Contractor to select the required surveillance hold and witness points stated in this Specification. The minimum hold and witness points are listed in Appendix 5.

7.1 Nondestructive Examination

A. General

All NDE shall be performed after final machining, surfacing, or heat treatment, except for liquid penetrant examination shall be performed prior to heat treatment. All welds in or on the Inner Vessel and the Outer Corrosion Barrier shall be examined in accordance with the requirements of the ASME Section III, NC-5200 and NC-5300, by Level II or III NDE personnel qualified in accordance with NC-5500.

The Subcontractor shall submit the following documentation for the Contractors approval:

1. The Subcontractor's NDE personnel qualification and certification written practice.

2. The Subcontractor's NDE personnel qualification and certification records. These records shall include:

    a. Valid vision acuity and color differentiation examination.

    b. Objective evidence of NDE training, experience, and examinations.

    c. Level of formal education.

    d. Statement of certification (level and method) signed by a company official attesting to personnel qualifications.

    e. Dates of certification and/or recertification and the dates of assignment to NDE.

3. The Subcontractor's NDE method procedures for radiographic examination, ultrasonic examination, liquid penetrant examination, and visual examination shall be submitted 30 days before fabrication.

B. Radiographic Examination (RT)

All 316 and UNS N06022 full penetration welds and top weldment of the upper Trunnion Sleeve to Outer Corrosion Barrier shall be radiographically examined in accordance with the requirements of the ASME Section III, NC-5320. The maximum acceptable indication length shall be 1/16 inch for all UNS N06022 full penetration welds and 1 millimeter for the top weldment of the upper Trunnion Sleeve to Outer Corrosion Barrier. The following additional requirements apply:

1. The Subcontractor shall use calibrated densitometer when verifying the optical density of the radiograph. Comparator strips are not acceptable.

2. A written report containing the results of the examination shall be prepared and signed by the level II or III radiographer for each weld radiographically examined.

3. A complete radiographic history including exposure diagram, reader sheet, record of defects, record of repairs, and final cleared exposure record shall be submitted to the Contractor. Film and reader sheets shall be marked or noted to show any condition other than normal (e.g., surface conditions or defects within acceptance standards, etc) and reader sheets shall be marked to show the level of the qualification of the reader. Radiographic film shall be sent to the Contractor as part of the document package.

C. Ultrasonic Examination (UT)

All UNS N06022 full penetration welds and top weldment of the upper Trunnion Sleeve to Outer Corrosion Barrier shall be ultrasonically examined in accordance with the requirements of ASME Section III, NC-5330. The maximum acceptable indication length shall be 1/16 inch for all UNS N06022 full penetration welds and 1 millimeter for the upper Trunnion Sleeve to the Outer Corrosion Barrier. The following additional requirements apply:

1. Couplants used on nickel base alloys shall not contain more than 250 ppm of sulfur.

2. Couplants used on austenitic stainless steel shall not contain more than 250 ppm of halides (chlorides plus fluorides).

3. A written report of each weld examined by ultrasonic examination shall be prepared and signed by a level II or III UT examiner. As a minimum the report shall include part or weld number, couplant manufacturer, couplant type, batch numbers, sulfur content for nickel base alloys only, halides (chlorides plus fluorides) content for austenitic stainless steel only, and results of examination.

D. Liquid Penetrant Examination (PT)

All welds using ASME Section III, Subsection NC shall be examined by liquid penetrant methods in accordance with the requirements of the ASME Section III, NC-5350. All welds

shall be examined prior to heat treatment. The field weld joint preparation surfaces for the plate shall be examined by the liquid penetrant method after heat treatment. The acceptance criteria for liquid penetrant examination shall be ASME Section III, NC-5352. The following requirements apply:

1. The weld and adjacent base material for at least 2 inches on each side of the weld at the external and accessible internal surfaces shall be included in the examination.

2. Penetrant materials used for examination of austenitic stainless steels and nickel-based alloys shall be analyzed for contaminant as specified in the ASME Code Section V, Article 6, T-640, and meet the proper limits. Copies of the analysis reports shall be included in the document package.

3. Liquid penetrant testing shall be by the solvent or water washable removal method, except when water washable is specifically noted on the Drawings.

4. Flushing the surface with solvent, following the application of the penetrant and prior to application of developer is prohibited.

5. The penetrant materials shall be thoroughly removed after the examination has been completed, followed by a wiping or flushing of the area with demineralized water, approved solvents, or isopropyl alcohol.

6. A written report of each weld examined by liquid penetrant shall be prepared and signed by a level II or III PT examiner. As a minimum the report shall include part or weld number, penetrant manufacturer, penetrant type, batch numbers, and results of examination.

E. Visual Examination (VT)

All non-NC ASME Code welds in the Basket Assembly shall be examined by the visual method, by Level II or III NDE personnel qualified in accordance with NF-5500, and shall meet the following acceptance criteria.

1. Cracks are unacceptable.

2. Minimum thickness dimensions shall not be violated

3. A fillet weld is permitted to be less than size specified by 1/16 in. for one-fourth the length of the weld. Oversized fillet welds are acceptable if the oversized weld does not interfere with mating parts.

4. For fillet welds, incomplete fusion of 3/8 in. in any 4 in. segment, and ¼ in. in welds less than 4 in. long, is acceptable. For groove welds, incomplete fusion is not acceptable. For fillet and groove welds, round end conditions that occur in welding

(starts and stops) shall not be considered indications of incomplete fusion and are irrelevant.

5. Overlap is acceptable provided the criteria for weld size and fusion can be satisfied. When fusion in the overlap length cannot be verified, an overlap length of 3/8 in. in any 4 in. segment, and ¼ in. in welds less than 4 in. long, is acceptable.

6. Craters are acceptable when the criteria for weld size are met. Craters that occur outside the specified weld length are irrelevant provided there are no cracks.

7. Requirements for acceptability of undercuts are as follows:

   a. For material 3/8 in. and less nominal thickness, undercut depth of 1/32 in. on one side of the member for the full length of the weld, or 1/32 in. on one side for one-half the length of the weld, and 1/16 in. for one-fourth the length of the weld on the same side of the member is acceptable. For members welded on both sides where undercut exists in the same plane of a member, the cumulative lengths of undercut are limited to the lengths of undercut allowed on one side. Melt-through that results in a hole in the base metal is unacceptable.

   b. For material greater than 3/8 in. nominal thickness, undercut depth of 1/32 in. for the full length of the weld and 1/16 in. for one-fourth the length of the weld on both sides of the member is acceptable. When either welds or undercut exist only on one side of the member or are not in the same plane, the allowable undercut depth of 1/32 in. may be increased to 1/16 in. for the full length of the weld.

8. Only surface porosity whose major surface dimensions exceeds 1/16 in. shall be considered relevant. Fillet and groove welds that contain surface porosity are unacceptable if the sum of diameters of random porosity exceeds 3/8 in. in any linear inch of weld or ¾ in. in any 12 in. of the weld, or four or more pores are aligned and the pores are separated by 1/16 in. or less, edge to edge.

9. The length and location of welds shall be specified on the Drawing, except that weld lengths may be longer than specified. For weld lengths less than 3 in., the permissible underlength is 1/8 in., and for welds 3 in. or longer, the permissible underlength is ¼ in. Intermittent welds shall be spaced within 1 in. of the specified location.

10. Arc strikes and associated blemishes on the weld or in the base material shall be removed by grinding.

11. Slag whose major surface dimension is 1/8 in. or less is irrelevant. Isolated surface slag that remains after weld cleaning and does not exceed ¼ in. in its major surface dimension is acceptable. [Slag is considered to be isolated when it does not occur more frequently than once per weld or more than once in a 3 in. weld segment.]

12. A written report containing the results of the examination shall be prepared and signed by the level II or III VT examiner for each weld visually examined.

7.2 Pressure Testing

The Inner Vessel shall be hydrostatic or pneumatically tested in accordance with ASME Section III, NC-6220 or NC-6320. The Subcontractor shall provide to the Contractor written pressure testing procedure for approval, 30 days prior to start of testing.

7.2.1 Hydrostatic Testing

The Inner Vessel shall be hydrostatically tested to 1.25 times the Design Pressure as stated in Appendix 7 for at least ten minutes prior to initiation of the examination. The examination of leakage shall be performed in accordance with ASME Section III, NC-6224.

7.2.2 Pneumatic Testing

The Inner Vessel shall be pressurized with helium to 1.1 times the Design Pressure as stated in Appendix 7 for a minimum total time of ten minutes, after which the pressure shall be reduced to that required by section 7.3.1 below. The examination for leakage required by AMSE Section III, NC-6324 shall be satisfied by checking Inner Vessel surfaces for helium leakage in accordance with Section 7.3.1 below.

7.3 Helium Leakage Tests

Personnel performing and interpreting helium leakage test results shall be certified in accordance with Section 7.1A.

7.3.1 Helium Leakage Test for Inner Vessel

Upon successful completion of the pressure testing the entire surface of the Inner Vessel, and Basket Assembly shall be helium leak tested. The helium leakage test shall be in accordance with the ASME Code, Section V, Article 10, Appendix IX, Hood Technique. The helium leakage test shall be performed using a pressure differential of not less than 0.1 MPa (1 atmosphere). The maximum acceptable leakage is $1x10^{-6}$ std-cm^3/sec helium.

The helium leakage test system must be calibrated with a National Institute of Standards and Technology (NIST) traceable calibrated standard in the $1x10^{-6}$ std-cm^3/sec range. The helium leakage standard shall be positioned in the system such that it represents the spectrometer leakage detector. The helium standard must be continuously evacuated by an auxiliary pump just prior to being released into the system. The helium response time and system sensitivity shall be included in the test report.

Leakage from the temporary seal between the lid and vessel is permitted, provided any such leakage is directed away from the surface of the Inner Vessel to avoid masking any other leakage.

The Subcontractor shall provide the Contractor with written procedures for the helium leakage test for approval 30 days prior to the start of testing. The results of each helium leakage test shall be provided to the Contractor as part of the applicable document package.

7.4 Performance Tests

The Subcontractor shall provide to the Contractor written procedures for all performance tests for approval 30 days prior to the start of testing. All performance tests shall be conducted at room temperature with test pieces and gauges at the same nominal temperature. No intentional heating or cooling of either the gauge or the test piece will be allowed. The results of the tests shall be provided to the Contractor as part of the applicable document package. The Subcontractor shall complete the following functional performance tests for the Waste Package:

7.4.1 Basket Gauge Test

Following complete assembly of the Waste Package, and with the Waste Package oriented in the vertical position, the Subcontractor shall demonstrate that the fuel assembly basket insertion gauge (Basket "Go" Gauge) can be passed through each tube of the basket and that they extend the full length. The Basket "Go" Gauge shall slide freely with no force. The performance of this test shall be designated as a Contractor witness point in the Subcontractor's manufacturing plan.

7.4.2 Empty Weight Measurement

The Subcontractor shall weigh the Waste Package components and fully assembled Waste Package and record the weights. The dry weight of the following components shall be supplied to the Contractor:

- Outer Corrosion Barrier
- Inner Vessel including Basket Assembly
- Inner Vessel Lid including Spread Rings
- Middle Lid
- Outer Lid

Prior to performing the weight tests, the calibration of the weighing device shall be verified. Calibration certificates for the weighing device shall be provided to the Contractor.

7.5 Test Gauge Calibration

Test gauges shall be provided by the Subcontractor and made to the dimensions listed in Table 7-1. The Subcontractor shall fabricate the gauges and provide a Certificate of Calibration that each gauge meets the specified dimensional requirements.

Table 7-1: TEST GAUGES

Name	Square Dimension	Length
Basket "Go" Gauge	9.020 inches x 9.020 inches	185 inches
Basket "No Go" Gauge	9.120 inches x 9.120 inches	185 inches

Notes

1. Gauges may be fabricated from steel plate. The minimum wall thickness of the gauges shall be 0.25 inches.
2. All gauge control surfaces shall be machined.
3. Sufficient care shall be taken to safeguard the gauges from damage when not in use. The gauges shall be dimensionally verified prior to each use. The gauges shall become the property of the Contractor at completion of the purchase contract.
4. All listed dimensions of the gauges are at the project's reference temperature, 68° F.
5. The Subcontractor shall suitably label gauges with a unique identification.
6. Gauges shall be retained by the Subcontractor until notified otherwise.
7. The Subcontractor shall ensure that measures are taken during the handling, packaging, and shipping of all gauges to prevent damage and deterioration to the extent required for maintenance of the gauge accuracy.

8. QUALITY ASSURANCE PROGRAM REQUIREMENTS

8.1 Acceptance of Subcontractor QA Program

A. As evidence that the Subcontractor has a QA program, the Subcontractor shall submit as part of their Bid/Proposal, evidence indicating the portions of their QA program that satisfies the quality criteria in ASME Code Section III, Subsection NCA, the Contractor's procurement documents, elements of the Owner's QA program identified in Appendix 2, and the Subcontractor's ASME Code Certificate. The Subcontractor's QA program shall be reviewed and accepted by the Contractor prior to the award of the subject procurement. The Contractor reserves the right to perform a survey of the Subcontractor's or sub-tier supplier's facility to verify implementation of the Subcontractor's QA program. Any conditions adverse to quality identified during a survey shall be documented by the Contractor in the Survey Report and forwarded to the Subcontractor or sub-tier supplier for resolution. No work will be awarded until acceptance of the resolution by the Contractor.

B. The Contractor may accept, or accept with comments, the QA program. The Subcontractor may not proceed with activities related to the QA program until acceptable changes to their

QA program documents have been agreed to by the Contractor. All changes must be submitted to the Contractor for final acceptance.

C. Acceptance of a Subcontractor's QA program by the Contractor does not relieve the Subcontractor of the obligation to comply with the requirements of the procurement documents. If the QA program is subsequently determined by the Contractor to be ineffective or inadequate in providing acceptable quality, the Contractor reserves the right to impose restrictions as necessary to bring the Subcontractor in compliance with the procurement requirements. All proposed QA program revisions shall be submitted to the Contractor for review and acceptance prior to implementation of the revision.

8.2 Subcontractor's Sub-tier Supplier Requirements

All materials shall conform to the Drawings requirements. Certified Material Test Reports (CMTRs) shall be provided for each heat (lot) used and the actual CMTRs not typical CMTRs must be included in the document package.

8.2.1 Sub-tier Supplier Selection Requirement

A. The Subcontractor shall select any sub-tier supplier based on an evaluation of the sub-tier supplier's capability to provide items and services in accordance with the Contractor's procurement documents. Measures for evaluating, selecting, and reevaluating procurement sources shall be based on one or more of the following:

1. For the pressure-retaining materials and fabrication on the Inner Vessel, and welds thereto, sub-tier suppliers must have the appropriate ASME Accreditation for the scope of work performed.

2. For all materials and fabrication of the Inner Vessel, Outer Corrosion Barrier, and Basket Assembly, the Subcontractor shall evaluate and document the sub-tier supplier's current QA program and records supported by quantitative and qualitative objective evidence, that demonstrate compliance to the Contractor's QA program requirements specified in the Contractor's procurement documents. In addition, the Subcontractor shall evaluate and document the sub-tier supplier's technical and quality capability based on an evaluation of the sub-tier supplier facilities, personnel, and QA program implementation. If a sub-tier supplier is performing any fabrication, an on-site audit by the Subcontractor shall be performed also.

B. Acceptance of sub-tier supplier qualification based solely on applicable portions of their ISO 9000 or similar third party certification is not sufficient.

8.2.2 Pass down of QA/Technical Requirements

The appropriate QA and technical requirements of the Contractor's procurement documents shall be documented in all sub-tier supplier's purchase orders adequately describing those requirements. The Subcontractor shall forward an unpriced copy of their procurement

documents to the Contractor and shall maintain records to substantiate the evaluation and acceptance of the sub-tier supplier's technical capabilities and QA program.

8.3 Examination Points

The Subcontractor's manufacturing plan shall include a listing of all the Subcontractor witness points and hold points.

8.4 Subcontractor Quality Control (QC) Procedures

The Subcontractors and the Subcontractor's sub-tier supplier QC procedures shall include the use of fabrication travelers or other process control documents. Fabrication travelers shall reference or describe the procedures used in accomplishing the tasks, the examination, the test requirements, and any witness points and hold points and sign offs. The traveler shall provide a method to ensure the accumulation of signatures attesting to the completion of a sequence.

8.5 Access to Facilities for QA and QC

A. The Contractor, the Owner or their representative(s) shall be given free access to the Subcontractor's and/or their sub-tier supplier's facilities to perform audits, surveillance, or verification, to ensure QA program requirements are being met.

B. Copies of all records, procedures and personnel qualifications shall be available for review by the Contractor, the Owner, or their representative(s).

C. All phases of the specified work performed by the Subcontractor and/or their sub-tier suppliers may be subjected to audit, surveillance, or verification at the Contractor or the Owner's discretion.

D. The Owner's QA program requires that the Subcontractors be audited a minimum of every three years on site at the Subcontractor's facility. An annual evaluation of the Subcontractor's QA program is performed off-site by the Contractor requiring input by the Subcontractor, which may determine that additional audits or surveillance is necessary. Any conditions adverse to quality identified as a result of the audits, surveillance, or annual evaluations will be reported on the appropriate form and communicated to the Subcontractor for timely resolutions.

8.6 Nonconformance/Corrective Action

A. The Subcontractor shall prepare a Supplier Deviation Disposition Request (SDDR) form in accordance with the instructions provided in the procurement documents for each reportable condition adverse to quality as defined below. Alternatively, the Subcontractor may attach their nonconformance or corrective action report to the SDDR and submit to the Contractor prior to offering the service for acceptance. The Subcontractor shall include a recommended disposition as well as a technical justification for the disposition of each condition adverse to quality.

B. For work performed for the Contractor, the Subcontractor shall notify the Contractor whenever a condition adverse to quality is identified that meets one or more of the following:

1. Technical or material requirements of the procurement documents are violated.

2. A requirement in the Subcontractor documents approved by the Contractor is violated.

3. The item/service for the Contractor does not conform to the original the Contractor requirement(s) even though the item can be restored to a condition such that the capability of the item to function is unimpaired.

4. The disposition of the condition adverse to quality is "use-as-is" or "repair to other than original".

5. Any repair work.

C. The Contractor shall evaluate and approve in writing the Subcontractor proposed dispositions of "use-as-is" or "repair," and verify the implementation of the disposition, before the item may be offered for acceptance.

D. A stop work condition exists when continuing work would cause one or more of the following:

1. The quality of results are irreparably compromised.

2. An item does not function as intended due to condition adverse to quality in processing, installation, modification, or operation.

3. A significant hazard is presented to the health or safety of workers and/or the public.

4. A significant break down or failure in the implementation of QA program requirements compromises the quality of the Waste Package.

E. All conditions adverse to quality shall be resolved between the Subcontractor and the Contractor before the item may be offered for acceptance in the manner specified in the procurement documents.

F. The Subcontractor shall respond to all the Contractor-initiated deficiency reports by the due date(s) indicated on the report.

G. Any work that is done to piece or assembly after the normal processing/fabrication steps are complete is considered rework. (This includes use of filler material added to the Waste Package to rework surface defects and meet specifications.) The Subcontractor shall keep a record (in the form of a map) of all locations where rework or repair has been performed on the Waste Package. Defects such as small pits or scratches less than 1/32 in. deep do not

require rework or repair (except for sealing surfaces) as long as they do not violate minimum wall thickness.

H. The Subcontractor shall report any nonconformances discovered after delivery of the Waste Package in writing to the Contractor within 15 working days of discovery.

8.7 Serial and Lot Traceability Records

The Subcontractor shall prepare and maintain serial and lot traceability records and provide these to the Contractor for review. Materials used must be identifiable by lot number, material type, and specification and shall be traceable to records of acceptance. When two (2) or more parts are joined to form an assembly, the Subcontractor shall prepare an assembly parts list identifying each part in the assembly by part number or lot control number and the lot of material from which the part was fabricated, if fabricated by the Subcontractor or lot control number when the part is a standard purchased part.

The Subcontractor shall serialize piece parts, components and assemblies as required by drawings and specifications. Serialization shall be accomplished so that duplication of serial numbers is precluded. The Subcontractor shall provide for traceability of all serialized parts and materials to the source. When two or more serialized parts are joined in an assembly, a list for each assembly number with part numbers and component serial numbers must accompany each shipment.

8.8 Quality Requirements for Shipping Release

The Waste Package shall not be shipped until the following requirements are met:

A. All tests and examinations and final inspection have been performed with acceptable results obtained.

B. The Waste Package document package is complete and approved by the Contractor's quality representative. The Subcontractor shall notify the Contractor 14 working days before his intended shipping date and allow the Contractor sufficient time prior to shipment to review the document package as described in Section 10.3. The document package shall be complete and final before it is submitted for review, including documentation of the performance tests in Section 7.4.

8.9 Certificate of Conformance

With the document package, the Subcontractor shall submit to the Contractor, Quality Verification Document requirements (Certificate of Conformance) (Appendix 4) that shall be signed by the ANI for the barrier.

8.10 Calibration Records

The Subcontractor shall provide Certificates of Calibration attesting to the validity of the results. The Subcontractor Certificates of Calibration shall contain the following information:

A. Procurement document number (PO [Purchase Order])

B. The Subcontractor's name and location

C. Unique identification is required for all of the calibrated measuring and test equipment (M&TE). This includes model number, serial number, and description of the calibrated M&TE.

D. Unique identification of the calibration standard used and a statement of traceability to the National Institute of Standards and Technology (NIST) or other nationally recognized standard.

E. Identification of the person who performed the calibration.

F. Signature or other authentication by a person who is responsible for approving the certificates or providing the objective evidence.

G. A statement certifying the results of the calibration, and certifying conformance to the procurement document requirements.

H. Identification of the requirements (such as codes or standards, procedures, inspection or test methods specifications etc, and any approved changes, waivers, or deviations) used in the calibration. Include document title or number and revision level.

I. Identification of the Subcontractor's Quality Assurance Program, including revision level that was used to provide the calibration service.

J. Calibration data

K. The data calibrated and the recommended next calibration date or interval.

L. For re-calibrations, identification of the "as-found" and "as-left" condition including actual measurements, specified tolerances, and the identification of the M&TE use range. When M&TE is found to be out of calibration, include the evaluation results that identifies the extent of the error(s) over a specified range.

M. Environmental conditions, when applicable.

8.11 Manufacturing Data Reports

The Subcontractor will complete, for each Inner Canister, an ASME Code Data Report, Form N-1, Certificate Holders' Data Report for Nuclear Vessels. The form N-1 shall be signed by the Subcontractor and his Authorized Nuclear Inspector.

The Subcontractor will complete, for each Outer Barrier, a Manufacturer's Data Report, Manufacturer's Data Report for Nuclear Vessels. The Subcontractor and his Authorized Nuclear Inspector shall sign this Report.

9. PACKAGING AND SHIPPING REQUIREMENT

9.1 General Requirements

9.1.1 Applicable ASME/ANSI Guidelines

All packaging and shipping shall be in accordance with ASME NQA-1-2000 Edition, Subpart 2.2, Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants. All packaging and shipping shall conform to Level C requirements or better. The Subcontractor shall provide a packaging plan with details by component, 90 days before shipment, to the Contractor for approval.

9.1.2 Shipping Information

On the date of shipment, the Subcontractor shall inform the Contractor of the following: The carrier bill of lading number, the routing and destination instructions, and a list of the items being shipped.

9.1.3 Subcontractor Liability for Shipping

The Subcontractor shall ensure that the as-fabricated, as-tested condition of the Waste Package is maintained, and that distortion or creep during shipment is prevented. Any damage or distortion of the Waste Package as a result of improper packaging, in transit handling, or shipping, shall be repaired at the expense of the Subcontractor.

9.2 Detailed Requirements

9.2.1 Packaging and Shipping Procedures

The Subcontractor shall provide the Contractor with the written procedures (including drawings and engineering sketches as appropriate) for packaging, wrapping, labeling, and shipping the Waste Package. The procedure shall include maintaining shell roundness, restricting movements of the outer shell, inner shell, and basket assembly, package lift point provisions, and lifting weight. The Subcontractor shall obtain the Contractor approval of the packaging, labeling and shipping procedures before shipment of the Waste Package.

9.3 Delivery

Truck or other conveyance unloading will be the responsibility of the Contractor. The truck or other conveyance may be unloaded within the Owner's protected area at a location designated by the Contractor. At least twenty-four (24) hours notice of truck or other conveyance arrival shall be given to the Contractor's receiving representative. In addition, the Subcontractor shall comply with the specific delivery times mandated by the Contractor.

10. DOCUMENT AND RECORD SUBMITTAL REQUIREMENTS

This section contains the requirements for document and record submittals. Appendix 3 summarizes the required documents to be submitted for review and approval, and the required records to be submitted at the time of shipment. The engineering document requirements are defined in Appendix 3, and the quality verification document requirements are defined in Appendix 4.

10.1 Documents

10.1.1 Shop Drawings

The Subcontractor shall prepare shop drawings as necessary for normal shop practice for all assembly, sub-assembly, and piece parts associated with the Waste Package. The Subcontractor shall prepare and submit one reproducible Mylar and two prints of all shop drawings to the Contractor. If shop drawings are prepared using a computer-aided design (CAD) system, plot files are submitted for review/comment cycle to the Contractor, and for the final shop drawings then the native files plus plot files plus hardcopy when signatures are required (until electronic signatures are approved) are submitted to the Contractor.

The shop drawings are to be full-sized and legible with uniform background density suitable for microfilming and subsequent reproduction from microfilm. The electronic geometry database (lines, circles, arcs, and splines) in CAD files shall be drawn using nominal-size dimensions of parts to accurately represent the physical layout of components. Intersecting lines, arcs, splines, and circles used to draw parts shall be trimmed to exact intersections an/or endpoints at terminations.

The shop drawings will be reviewed and, if satisfactory, will be approved by the Contractor. The shop drawings must be approved by the Contractor before fabrication begins. If not satisfactory, the Subcontractor will be notified of the items requiring further explanation or correction; after which, one reproducible Mylar and two prints of the corrected drawings and CAD files shall again be submitted for approval. The Subcontractor shall appropriately note any changes by dated revisions on the shop drawings.
All shop drawings must be checked for accuracy prior to submission for approval. The Contractor approval of shop drawings shall not be construed as a complete check. The Contractor's approval of shop drawings will not relieve the Subcontractor of the responsibility for any error, which may exist on the shop drawings. The Contractor's approval of the shop

drawings does not relieve the Subcontractor of the responsibility for meeting the Contractor's drawing requirements, which are part of this specification.

If the Subcontractor uses sub-tier suppliers, the Subcontractor is responsible for assuring that the sub-tier supplier uses the Contractor-approved drawings for finished pieces, and that the sub-tier supplier meets all applicable specification requirements.

10.1.2 Drawing Standards

Weld symbols shall be in accordance with the requirements of ANSI/AWS A2.4-98.

The following Drafting Lettering Standards shall apply, such as supplemented by ASME Y14.5M series:

A. Minimum character height (A, B, C, size drawings); 1/8"

B. Minimum character height (D and E size drawings); 1/8"

C. Minimum spacing between lines of characters: height of characters;

D. Machine and guide generated characters: 12 point size minimum;

E. Density of characters and lines: dense, sharp, and uniform.

10.2 Examination and Test Procedures

Examination and test procedures shall include identification of each characteristic or attribute to be evaluated, the measuring and test equipment required to perform and interpret the examination or test, the examination/test set-up for each characteristic/attribute to be evaluated and other requirements as required by the ASME Code and this Specification.

10.3 Documents

The Subcontractor shall assemble and submit to the Contractor, no later than 14 working days prior to the Waste Package shipping date, a copy of the document package. The Subcontractor shall sign the Conformance Statement on Appendix 4 before presenting the items and document package to the Contractor for final review prior to shipment. After the document package has been approved by the Contractor's QA representative, a copy shall be made. The original record of the document package shall be provided to the Contractor and the copy shall be shipped with the Waste Package.

10.4 General Requirements for Document Packages

Each Document Package shall comply with the following requirements:

1. Each package shall have a Table of Contents.

11. Following satisfactory completion of all examinations and tests, the Subcontractor shall prepare a complete set of as-built dimension documentation. All dimensions shall be verified to be within the drawings tolerances specified. Major Dimensions, as specified in Section 6.3.6 and as indicated on the Drawings, shall be measured and recorded on the as-built drawings or on separate examination sheets. As-built drawings, if accompanied by dimensional examination documents recording Major Dimensions, may consist of the final revision of the shop drawings depicting the as-built condition, including nonconformances (i.e., use-as-is and repair). All as-built shop drawings shall be certified as to correctness.

12. Records shall be maintained as required by ASME Code Section III, NCA-4134.17.

WASTE PACKAGE FABRICATION APPENDICES

APPENDIX 1
DRAWINGS

Drawing Number	Drawing Title
000-MW0-DSU0-00201-000	21-PWR UCF PROTOTYPE DETAIL DRAWING DRAWING SHEET LIST & GENERAL NOTES
000-MW0-DSU0-00202-000	21-PWR UCF PROTOTYPE DETAIL DRAWING ASSEMBLY EXPLODED VIEW
000-MW0-DSU0-00203-000	21-PWR UCF PROTOTYPE DETAIL DRAWING OUTER CORROSION BARRIER EXPLODED VIEW
000-MW0-DSU0-00204-000	21-PWR UCF PROTOTYPE DETAIL DRAWING OUTER CORROSION BARRIER DETAIL VIEWS
000-MW0-DSU0-00205-000	21-PWR UCF PROTOTYPE DETAIL DRAWING TRUNNION SLEEVES & INNER VESSEL SUPPORT RING
000-MW0-DSU0-00206-000	21-PWR UCF PROTOTYPE DETAIL DRAWING INNER VESSEL
000-MW0-DSU0-00207-000	21-PWR UCF PROTOTYPE DETAIL DRAWING INNER VESSEL GUIDE LOCATION & ORIENTATION
000-MW0-DSU0-00208-000	21-PWR UCF PROTOTYPE DETAIL DRAWING SIDE, END SIDE & CORNER GUIDES
000-MW0-DSU0-00209-000	21-PWR UCF PROTOTYPE DETAIL DRAWING FUEL BASKET ASSEMBLY
000-MW0-DSU0-00210-000	21-PWR UCF PROTOTYPE DETAIL DRAWING FUEL PLATES & FUEL TUBES
000-MW0-DSU0-00211-000	21-PWR UCF PROTOTYPE DETAIL DRAWING INNER LID
000-MW0-DSU0-00212-000	21-PWR UCF PROTOTYPE DETAIL DRAWING MIDDLE LID, OUTER LID & SPREAD RING
000-MW0-DSU0-00213-000	21-PWR UCF PROTOTYPE DETAIL DRAWING MISCELLANEOUS ASSEMBLY DETAILS

APPENDIX 2
SUPPLIER QUALITY ASSURANCE PROGRAM REQUIREMENTS DATA SHEET

OCRWM	SUPPLIER QUALITY ASSURANCE PROGRAM REQUIREMENTS DATA SHEET	QA: QA Page 1 of 1

The following marked QA Program Elements apply and are subject to BSC evaluation and verification.

		PROGRAM ELEMENTS	SUPPLIER DOCUMENT AND PARAGRAPH REFERENCES TO BE COMPLETED BY THE SUPPLIER
X	1.0	ORGANIZATION	
X	2.0	QUALITY ASSURANCE PROGRAM	
X	3.0	DESIGN CONTROL	
X	4.0	PROCUREMENT DOCUMENT CONTROL	
X	5.0	INSTRUCTIONS, PROCEDURES, AND DRAWINGS	
X	6.0	DOCUMENT CONTROL	
X	7.0	CONTROL OF PURCHASED ITEMS	
X	8.0	IDENTIFICATION AND CONTROL OF ITEMS	
X	9.0	CONTROL OF PROCESSES	
X	10.0	INSPECTION	
X	11.0	TEST CONTROL	
X	12.0	CONTROL OF MEASURING AND TEST EQUIPMENT	
X	13.0	HANDLING, STORAGE AND SHIPPING	
X	14.0	INSPECTION, TEST AND OPERATING STATUS	
X	15.0	CONTROL OF NONCONFORMANCE	
X	16.0	CORRECTIVE ACTION	
X	17.0	QUALITY ASSURANCE RECORDS	
X	18.0	AUDITS	
From DOE/RW-0333P (QARD)			
N/A		SUPPLEMENT I: SOFTWARE	N/A
N/A		SUPPLEMENT II: SAMPLE CONTROL	N/A
N/A		SUPPLEMENT III: SCIENTIFIC INVESTIGATION	N/A
N/A		SUPPLEMENT IV: FIELD SURVEY	N/A
N/A		SUPPLEMENT V: CONTROL OF ELECTRONIC MANAGEMENT DATA	N/A

Supplier (Printed Name, Title, Signature, Date)	Supplier Representative (Printed Name, Title, Signature, Date)

Job No.	Specification DI No.	Appendix	Rev
DE-AC28-01RW12101	000-3SS-DSU0-00300-000-00A	2	00A

APPENDIX 3
ENGINEERING DOCUMENT REQUIREMENTS

OCRWM	ENGINEERING DOCUMENT REQUIREMENTS	1. QA: QA Page 1 of 1

2. Document Category Number	3. Specification Paragraph Reference	4. Document Description	5. Permission to Proceed Required		6. Submittal Schedule	7. Quantity Required		8. Kind of Copies	9. Remarks
			Yes	No		Initial	Final		
1.0	10.4.11	DWGS (AS-BUILT)		X	30 Days After Shipment	1	1	O	
1.2, 1.3	10.1.1	ASSEMBLY DWGS AND SHOP DET DWGS	X		30 Days Before Fabrication	3	3	O, R, E	Mylar, 2 Prints, Plot Files & Native Files
3.0	8.1.A, Appendix 2	COMP DATA SHT (QA DATA)	X		Submit with Bid	1	1	O	
3.0	8.6	COMP DATA SHT (SDDR)	X		Prior to Implementation	1	1	O	
5.0	6.4, 7.	SCHED – ENGRG & FAB/EREC (Manufacturing & Test)	X		45 Days Before Fabrication	1	1	O	
6.0	8.2.2	QA MNL/PROC (PROC DOCS)		X	30 Days After Procurement	1	1	O	
6.0	8.1.A	QA MNL/PROC (ASME CERTIFICATE AND QA PROGRAM)	X		Submit with Bid	1	1	O	
8.0	Appendix 7 - 4.2.2	ANAL & DSGN RPRT (ASME Design Report)	X		30 Days Before Fabrication	1	1	O	
12.0	6.5.2	WLDG PROC & QUALF (WPS & PQR)	X		30 Days Prior to Welding	1	1	O	
14.0	6.2.1.B, 6.5.4, 6.5.5	REPAIR PROC	X		Prior to Implementation	1	1	O	
15.0	6.6.E	CLNG & CTG PROC	X		30 Days Before Fabrication	1	1	O	
16.0	6.5.6	HEAT TR PROC	X		30 Days Before Fabrication	1	1	O	
19.0	7.1.A	UT PROC	X		30 Days Before Fabrication	1	1	O	
20.0	7.1.A	RT PROC	X		30 Days Before Fabrication	1	1	O	
22.0	7.1.A	PT PROC	X		30 Days Before Fabrication	1	1	O	
24.0	7.2, 7.3	PRESS TEST – HYDRO, AIR, BUBLE – VAC TEST PROC	X		30 Days Prior to Examination	1	1	O	
25.0	7.1.A	VT PROC	X		30 Days Before Fabrication	1	1	O	
26.1	7.4	MECH TEST (GUAGE TEST & WEIGHT)	X		30 Days Prior to Test	1	1	O	
28.0	7.1.A	PERSONL QUAL PROC (NDE)	X		30 Days Before Fabrication	1	1	O	
28.0	6.5.2	PERSONL QUAL PROC (WPQR)	X		30 Days Prior to Welding	1	1	O	
29.0	9.1.1	SPLR SHPNG PREP PROC	X		90 Days Before Shipment	1	1	O	
29.0	9.1.2	SPLR SHPNG PREP PROC (INFO)		X	Day of Shipment	1	1	O	
30.0	6.2	MATERIAL SUBSITITUTION	X		15 Days Prior to Material Order	1	1	O	
31.0	6.4, 7.	PLANS (Manufacturing & Test)	X		45 Days Before Fabrication	1	1	O	

10. Forward Copies To

Michael Plinski; C/O Document Control Center
Bechtel SAIC Company, LLC
1180 Town Center Drive; Las Vegas, NV 89144

11. Special Instructions

O=Original, R=Reproducible, and E=Electronic

12. Project/Client Identification

United States Department of Energy, Las Vegas, Nevada

13. Job No.	14. Specification No.
DE-AC28-01RW12101	000-3SS-DSU0-00300-000-00A, Page 44

APPENDIX 4
QUALITY VERIFICATION DOCUMENT REQUIREMENTS

OCRWM	QUALITY VERIFICATION DOCUMENT REQUIREMENTS	1. QA: QA Page 1 of 1

2. Document Category Number	3. Specification Paragraph Reference	4. Document Description	5. BSC Release	6. Field Receipt Inspection Check-In	7. Remarks	8. Document Supplier Page Count
12.0	6.5	WELD & QUALF VERIF DOC				
14.0	6.2.1.B, 6.5.4 6.5.5	MAJ REPAIR VERIF REPORT				
15.0	6.6.D, 6.6.F, 6.6.J	CLNG & CTG VERIF REPORT				
16.0	6.5.6	HEAT TRT VERIF REPORT				
17.1	6.2, 8.2	MAT PROP REPORT (CMTRs)				
18.0	8.11	CODE COMPL				
19.0	7.1.C	UT - REPORT				
20.0	7.1.B	RT - REPORT				
22.0	7.1.D	PT - REPORT				
24.0	7.2, 7.3	PRESS TEST – HYDRO, AIR, BUBBLE – VAC TEST REPORT				
25.0	7.4.2, 7.5, 8.10	INSPECTION & VERIF REPORT (CALIBRATION RECORDS)				
25.0	6.3.6, 10.4.11	INSPECTION & VERIF REPORT (DIMENSIONS)				
25.0	7.1.E	VT-REPORT				
25.0	Appendix 6	MANUFACTURER'S DATA REPORT				
25.0	8.7	INSPECTION & VERIF REPORT (Serial & Lot Traceability)				
25.0	8.4	INSPECTION & VERIF REPORT (TRAVELERS AND/OR CHECKLISTS)				
25.0	8.6	INSPECTION & VERIF REPORT (SDDR)				
26.0	7.4	PRFM TEST REPORTS				
33.0	10.4.9	OPEN (TABLE OF CONTENTS)				
34.0	6.5.2	PERSONL QUAL RECORD (WPQR)				
34.0	7.1.A	PERSONL QUAL RECORD (NDE)				

9. Supplier's Order No. (inc. Rev.)	10. Supplier's Part No.	11. Supplier's Part Name	12. Quantity
13. BSC Req./PO No. (inc. Rev.)	**14. BSC Line, Equipment, Tag, or Code No.**	**15. BSC Part Name**	**16.**

17. Supplier's Conformance Statement *We certify that the work and required documents meet the requirements of the procuring documents.*	Authorized Supplier Signature	Title	Date
18. PQE *Work was released based on satisfactory completion of quality surveillance and review of documentation.*	☐ With authorized deviation noted in Block 7 ☐ No deviations	Signature of PQE	Date
19. Receiving Inspection at the Field *This form and the quality verification documents referenced hereon have been received and their relationship to the hardware items verified.*	Signature of Field Inspector		Date
20. Forward Copies To Michael Plinski C/O Document Control Center 1180 Town Center Drive Las Vegas, NV 89144	21. Special Instructions		

22. Project/Client Identification United States Department of Energy, Las Vegas, Nevada			
23. Job No. DE-AC28-01RW12101	24. Specification DI No. (inc. Rev) (SCN) 000-3SS-DSU0-00300-000-00A	25. Control No.	26. File No.

APPENDIX 5
HOLD POINTS AND WITNESS POINTS

Hold Points are as follows:

1. Material Receipt
2. Start of manufacturing

Witness Points are as follows:

1. First welding of each WPS
2. Assembly of Basket Assembly into Inner Vessel
3. Annealing of Outer Corrosion Barrier
4. Assembly of Inner Vessel into Outer Corrosion Barrier
5. Final machining of Inner Vessel and Outer Corrosion Barrier
6. Pressure Test
7. Leakage Test
8. Basket Gauge Test
9. Empty Weight Measurements
10. Final inspection of the Waste Package
11. Prior to shipment.

APPENDIX 6
YMP-1 MANUFACTURER'S DATA REPORT FOR OUTER CORROSION BARRIER

YMP-1 MANUFACTURER'S DATA REPORT FOR OUTER CORROSION BARRIER

Manufactured and certified by: _____
(Name and Address of Manufacturer)

Manufactured for: United States Department of Energy Yucca Mountain Nuclear Waste Disposal Project

Manufacturer's Serial Number: _____ Year built: _____

Fabrication Specification Number and Revision: _____

Dimensions: _____ _____ _____
(overall length) (outside diameter) (minimum design thickness)

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that this Outer Corrosion Barrier conforms to the requirements of the above-referenced Fabrication Specification.

Name of Manufacturer _____

Signature of authorized representative _____ Date _____

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and the State of _____ and employed by _____ have inspected the Outer Corrosion Barrier described in this Data Report on _____, and state that to the best of my knowledge and belief, the Manufacturer has constructed this Outer Corrosion Barrier in accordance with the above-referenced Fabrication Specification.
By signing this certificate, neither the inspector nor his employer makes any warranty, expressed or implied, concerning the Outer Corrosion Barrier described in this Data Report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.
Date _____ Signed _____ Commissions _____
(Authorized Nuclear Inspector) (Nat'l Bd. (incl endorsements) and State No.)

APPENDIX 7
ASME CODE DESIGN SPECIFICATION FOR THE INNER VESSEL

ASME CODE DESIGN SPECIFICATION FOR INNER VESSEL

1. SCOPE

This Specification provides requirements for construction of the Inner Vessel of the 21 PWR UCF Prototype Waste Package. The Inner Vessel shall constructed and ASME Code Symbol Stamped in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section III, Division 1, Subsection NC (Class 2 pressure vessels). The Inner Vessel will be inserted into an Outer Barrier that is not an ASME Code item. A Basket Assembly (also not an ASME Code item) will be inserted into and welded to the inside of Inner Vessel.

2. APPLICABLE DOCUMENTS

The documents listed in this section form a part of this specification. Different Editions and Addenda may be used if mutually consented to in writing between the N Certificate Holder and the Contractor. Any perceived conflict between this specification and the referenced documents shall be brought to the attention of the Contractor for resolution. The following documents are applicable only to the extent specifically referenced.

2.1 Codes and Standards

The materials, design, fabrication, testing, examination, and shipping of the Inner Vessel will meet the requirements of the following Codes and Standards:

ASME Boiler & Pressure Vessel Code, Section II, Materials, 2001 Edition with the 2002 Addenda.

ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NC, Rules for Construction of Nuclear Power Plant Components Class 2 Components, 2001 Edition with the 2002 Addenda.

ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NCA, Rules for Construction of Nuclear Power Plant Components General Requirements for Division 1 and Division 2, 2001 Edition with the 2002 Addenda.

ASME Boiler & Pressure Vessel Code, Section V, Nondestructive Examination, 2001 Edition with the 2002 Addenda.

ASME Boiler & Pressure Vessel Code, Section IX, Welding and Brazing Qualifications, 2001 Edition with the 2002 Addenda.

2.2 Drawings

See *Appendix 1 Drawings* for reference drawings.

3. INTRODUCTION

3.1 Functional Definition

The following functions are applicable:

The Waste Package contains the waste form within its boundary for the preclosure period.

The Waste Package restricts the transport of radionuclides to the outside of the Waste Package boundary after closure.

The Waste Package, in conjunction with the waste form provides criticality control during and after loading.

The Waste Package provides conditions needed to maintain the physical and chemical stability of the waste form.

3.2 Physical Description

The Inner Vessel will be inserted into the Outer Barrier after the Vessel has been Code Stamped. The Contractor will seal the Inner Vessel after loading with fuel.

4. REQUIREMENTS

The specified dimensions and tolerances shown on the drawings shall be maintained.

4.1 Dimensional Interfaces and Limitations

All dimensions are essential. Dimensions identified in the Drawings are for acceptance at the assembly level. Dimensions apply after final machining and welding.

4.2 Inner Vessel Design

4.2.1 Code Requirements

The Inner Vessel shall be designed and constructed to the requirements of ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Subsection NC for pressure vessels (not NC-3200). The Inner Shell and Inner Lid shall be designed with a gasket and secured by the Spread Rings. The manufacturer is responsible for the selection of gasket material, design of the gasket grooves or other details, and for assuring leak tightness during the pressure test.

The Code boundaries for the Inner Vessel are:

Inner Vessel
- Inner Shell
- Inner Shell Bottom Lid
- Inner Shell Lid
- Spread Ring Sides
- Spread Ring Ends
- Basket Assembly attachment weld

4.2.2 Design Pressure and Temperature

The design pressure is 150 psi at 650°F.

The loaded dead weight is 35,000 lbs.

No other loadings, including seismic, drop loads, and fatigue, are to be considered in the design. An ASME Design Report that is certified by a Registered Professional Engineer is required.

4.2.3 Inner Vessel Dimensions

The nominal outside diameter of the Inner Vessel is 62 inches. The overall Vessel length is 184 inches.

4.3 Materials

The Inner Vessel is to be fabricated from Type 316 stainless steel with carbon limited to 0.020% max and nitrogen limited to 0.060% to 0.10%.

4.4 Protection Against Corrosion

The Outer Barrier serves as a complete barrier against corrosion of the Inner Vessel. Internal and external corrosion of the Inner Vessel need not be considered.

4.5 Welded Joints

All Inner Vessel pressure boundary welds shall be made in accordance with ASME Section III requirements. All welds shall be sufficiently smooth to enable easy decontamination. Butt welds to be ground flush. Weld joint designs shall avoid potential contamination traps to the greatest extent practicable. All pressure boundary welds shall be radiographically examined.

4.6 Overpressure Protection

Overpressure protection for the Inner Vessel is not required.

CERTIFICATION

I, the undersigned, being a Registered Professional Engineer competent in the applicable field of design and related nuclear power plant requirements relative to this Design Specification, certify that to the best of my knowledge and belief it is correct and complete with respect to the Design and Service Conditions given and provides a complete basis for construction in accordance with NCA-3250 and other applicable requirements of the ASME Boiler and Pressure Vessel Code, Section III, Division 1, 2001 Edition with Addenda up to and including 2002.

N/A for Rev. 00A
Roger F. Reedy, RPE