

BSC

Specification Cover Sheet

QA: QA

Page 1 of 50

YUCCA MOUNTAIN PROJECT ENGINEERING SPECIFICATION

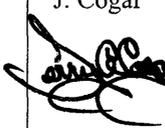
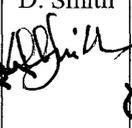
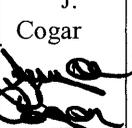
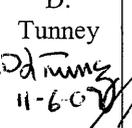
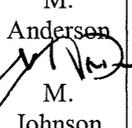
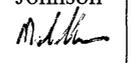
Prototype Drip Shield

Quality Level: QL-1

Safety Category: ITWI

DOE Contract No.:

DE-AC28-01RW12101

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¹ The item produced is a prototype for testing and will not be used for operations. Reference: EG-PRO-3DP-G04B-00027, Section 2.0, paragraph 5.

² Design verification is not required. This specification, although developed as a generic specification, will be used for acquisition of prototype Drip Shields for test purposes, incorporating lessons learned into an evolving design process. The design is not yet complete.

CONTENTS

		Page
1.	SCOPE	4
	1.1 PROJECT DESCRIPTION.....	4
	1.2 PROJECT SUMMARY	4
	1.3 DESCRIPTION OF THE DRIP SHIELD	4
	1.4 REQUIREMENTS.....	5
	1.5 WORK INCLUDED.....	5
	1.6 TECHNICAL TERMS.....	5
2.	APPLICABLE DOCUMENTS	7
	2.1 CODES AND STANDARDS.....	7
	2.2 DRAWINGS	9
3.	DESIGN REQUIREMENTS	9
	3.1 QUALITY LEVEL	9
	3.2 MATERIAL BACKGROUND.....	9
	3.3 SERVICE ENVIRONMENT	11
	3.4 DIMENSIONAL INTERFACES AND LIMITATIONS	11
	3.5 DRIP SHIELD SURFACE CONDITION	11
	3.6 DRIP SHIELD HANDLING	11
4.	MATERIALS.....	12
	4.1 GENERAL REQUIREMENTS.....	12
5.	FABRICATION.....	13
	5.1 CUTTING.....	13
	5.2 MACHINING	13
	5.3 FITTING AND ALIGNING.....	14
	5.4 ASSEMBLY	14
	5.5 WELDING	15
	5.6 HEAT TREATMENT.....	18
	5.7 CLEANING AND SURFACE PREPARATION.....	19
6.	EXAMINATION AND TESTING REQUIREMENTS.....	20
	6.1 NONDESTRUCTIVE EXAMINATION (NDE)	21
	6.2 PRESSURE TESTING	24
	6.3 PERFORMANCE TESTS	24
7.	PACKAGING AND SHIPPING REQUIREMENT.....	24
	7.1 GENERAL REQUIREMENTS.....	24
	7.2 PACKAGING & SHIPPING REQUIREMENTS	24
	7.3 DELIVERY.....	25
8.	DOCUMENT AND RECORD SUBMITTAL REQUIREMENTS	25
	8.1 DOCUMENTS.....	25
	8.2 GENERAL REQUIREMENTS FOR FINAL RECORDS PACKAGES.....	26
9.	QUALITY ASSURANCE PROGRAM REQUIREMENTS	28
	9.1 ACCEPTANCE OF SUBCONTRACTOR'S QUALITY ASSURANCE PROGRAM	28
	9.2 SUBCONTRACTOR'S SUB-TIER SUPPLIER REQUIREMENTS.....	28
	9.3 EXAMINATION POINTS	31
	9.4 SUBCONTRACTOR QUALITY CONTROL PROCEDURES.....	32

9.5 ACCESS TO FACILITIES FOR QUALITY ASSURANCE AND QUALITY CONTROL.....	32
9.6 NONCONFORMANCE AND CORRECTIVE ACTION	32
9.7 SERIAL AND LOT TRACEABILITY RECORDS.....	34
9.8 QUALITY REQUIREMENTS FOR SHIPPING RELEASE.....	34
9.9 CERTIFICATE OF CONFORMANCE	34
9.10 CALIBRATION RECORDS.....	34
APPENDIX A – Drawings.....	36
APPENDIX B – Supplier Deviation Disposition Request (SDDR).....	37
APPENDIX C – Engineering Hold and Witness Points	40
APPENDIX D – YMP-1 Manufacturer’s Data Report for Drip Shield Assembly.....	41
APPENDIX E – Engineering Document Requirements – Form G-321-E.....	42
APPENDIX F – Quality Verification Document Requirements – Form G-321-V.....	46

1. SCOPE

1.1 PROJECT DESCRIPTION

The primary purpose of this fabrication specification is to detail the requirements for the fabrication of a Drip Shield that will be used within the repository program.

Bechtel SAIC Company, LLC (BSC), CONTRACTOR that supports the U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management (OCRWM) has developed this Drip Shield Fabrication Specification. The OCRWM is a program of DOE assigned to develop and manage a federal system for disposing of spent nuclear fuel from commercial nuclear reactors and high-level radioactive waste from national defense activities.

Yucca Mountain is located in a remote desert on federally protected land within the secure boundaries of the Nevada Test Site in Nye County, Nevada. It is approximately 100 miles northwest of Las Vegas, Nevada.

Based in Las Vegas, BSC is implementing solutions for the Yucca Mountain Project (YMP). YMP has a requirement to develop, validate, and defend, to the U.S. Nuclear Regulatory Commission (NRC) and other regulatory organizations, the technical position regarding the design and licensing of the repository.

The Drip Shield Assembly provides the rock fall and dripping water protection to the Waste Package. The Base supports the Drip Shield on the emplacement drift floor. The Lifting Feature Assemblies allows the Drip Shield to be handled and emplaced in the emplacement drift. The Drip Shield sections overlap when assembled in the drift.

1.2 PROJECT SUMMARY

Some of the early Drip Shields to be fabricated will be prototypes. The prototype Drip Shield is intended to be used for testing such as verifying the interlock feature. In the future, actual Drip Shields will be fabricated and placed within drifts at the Yucca Mountain facility. All such activities will be in accord with the technical and quality requirements of this document and any improvements discovered during the prototyping efforts. Improvement is part of the reason for a prototyping program.

1.3 DESCRIPTION OF THE DRIP SHIELD

The major parts of the Drip Shield are as follows:

- A. Drip Shield Assembly
- B. Base
- C. Lifting Feature Assemblies (quantity 4)
- D. Stabilization Pin Assembly

1.4 REQUIREMENTS

This Specification provides requirements for materials, marking, fabrication, welding, heat treatment, examination, testing, quality assurance (QA), quality control (QC), documentation, packaging, and shipping for the Drip Shield. The Drip Shield shall be fabricated in accordance with the requirements of the ASME Boiler and Pressure Vessel Code (ASME BPVC) Section III, Division 1, Subsection NC (Class 2 pressure vessel.) It shall be inspected by an Authorized Nuclear Inspector and certified as to meeting the specific provisions of the ASME BPVC identified in this Specification.

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

1.5 WORK INCLUDED

1.5.1 General

Work by SUBCONTRACTOR set forth by this Specification shall include:

- A. Furnishing of all labor, planning, procedures, drawings, material, and equipment necessary to fabricate, test, and ship a complete Drip Shield as described by the Drawings (Exhibit F of procurement documents), content of this Specification, and procurement documents. SUBCONTRACTOR shall be responsible for furnishing all labor and materials related to gauges, fixtures, and equipment required to perform tests and activities required by this Specification. SUBCONTRACTOR shall be responsible for the calibration, maintenance, protection, and storage of test equipment required by this Specification.
- B. Preparation and submittal of a Drip Shield manufacturing plan, schedule, welding procedures, examination procedures, heat treatment procedures, and shop detail and assembly drawings to CONTRACTOR for review in accordance with the requirements of this Specification.
- C. Preparation and submittal of a Drip Shield Records Package that includes fabrication travelers and checklists, certified material test reports (CMTRs) for base and filler materials, examination reports, measurement procedures and reports, and other documentation as defined in this Specification; all of which will be used to verify that the material and work conforms to the requirements of this Specification.

1.6 TECHNICAL TERMS

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

1.6.1 Definitions

- A. Bechtel SAIC Company, LLC (BSC), located in Las Vegas, Nevada, will be referred to as **CONTRACTOR**.

- B. The entity awarded the procurement contract for furnishing the equipment that meets requirements specified herein will be referred to as **SUBCONTRACTOR**.
- C. **OWNER** is the United States Department of Energy (DOE), Las Vegas, Nevada.
- D. The **Work** is all equipment, material, apparatus, item, process, and parts or portions thereof, to be supplied by SUBCONTRACTOR in accordance with the procurement documents.
- E. The **procurement documents** are any and all contractual documents, and changes thereto, prepared by CONTRACTOR and issued to SUBCONTRACTOR delineating the scope of work to which this Specification applies. The agreements are between SUBCONTRACTOR and 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 procurement documents.
- F. **Hold Point** is a step in the process at which SUBCONTRACTOR must contact 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 SUBCONTRACTOR must contact CONTRACTOR so that CONTRACTOR can inspect or observe a process before 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. Major Dimensions are all dimensions other than Reference Dimensions as shown in Drawings. As applicable, Major Dimensions are recorded after final welding, final heat-treating, and machining operations.
- I. **UNS N06022** is a generic designation for the specific low-carbon nickel-molybdenum-chromium alloy. This material is known to be difficult to machine.
- J. **ASME SB265** Titanium Grade 7—Unalloyed titanium plus 0.12 to 0.25 % palladium
- K. **ASME SB265** Titanium Grade 29—Titanium alloy (6 % aluminum, 4 % vanadium with extra low interstitial elements, ELI) plus 0.08 to 0.14 % ruthenium.

1.6.2 Acronyms

ASME	American Society of Mechanical Engineers
ASME BPVC	ASME Boiler and Pressure Vessel Code
ASTM	American Society of Testing and Materials
BSC	Bechtel SAIC Company, LLC
CMTR	certified material test report
CAD	computer aided design

DOE	(U.S.) Department of Energy
M&TE	measuring and test equipment
NDE	nondestructive examination
NRC	U. S. Nuclear Regulatory Commission
NIST	National Institute of Standards and Technology
OCRWM	Office of Civilian Radioactive Waste Management
PQR	Procedure Qualification Record
PT	liquid penetrant examination
QA	quality assurance
QC	quality control
RT	radiographic examination
SCC	stress corrosion cracking
SDDR	supplier deviation disposition request
SOW	Statement of Work
UT	ultrasonic examination
VT	visual examination
WPQR	welder performance qualification record
WPS	welding procedure specification
YMP	Yucca Mountain Project

2. APPLICABLE DOCUMENTS

Equipment and services for the Work furnished in accordance with this Specification shall comply with applicable laws and with the following codes and standards to the extent referenced herein and on the drawings and within procurement documents. Unless otherwise noted, later Editions and Addenda of the ASME BPVC may be used if mutually consented to in writing between SUBCONTRACTOR and CONTRACTOR. Any conflicting requirements must be submitted to CONTRACTOR in writing for resolution before proceeding with any phase of the Work.

2.1 CODES AND STANDARDS

The materials, design, fabrication, testing, examination, and shipping of the Drip Shield shall meet the requirements of the following codes and standards as referenced herein. The codes and standards are applicable to the extent referenced in this Fabrication Specification and referenced Drawings however the ASME B&PVC requires the use of the latest edition and addenda for

Sections II and V. The sections shown in section A through G are for completeness and clarity in stating the requirements but the latest editions (at the time of subcontract execution) of such code sections shall be used.

- When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or referenced document, only those chapters, sections, parts or paragraphs of the document shall be applied.
 - For the codes and standards listed below, the specific revisions or effective date identified, as well as the specific revision or effective data of codes and standards that they incorporate by reference shall be followed.
 - In the case of conflict between this specification and referenced codes and standards, the more conservative requirements shall apply.
- A. 2001 ASME Boiler & Pressure Vessel Code, Section II, Materials.
- B. 2001 ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NC, Class 2 Components, 2001 Edition with the 2002 Addenda.
- C. 2001 ASME Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, Division 1, Subsection NCA 4000, General Requirements for Division 1 and Division 2, 2001 Edition with 2002 Addenda.
- D. 2001 ASME Boiler & Pressure Vessel Code, Section V, Nondestructive Examination, 2001 Edition with 2002 Addenda.
- E. 2001 ASME Boiler & Pressure Vessel Code, Section IX, Welding and Brazing Qualifications, 2001 Edition with 2002 Addenda.
- F. 2001 ASME Boiler & Pressure Vessel Code, Section II, Part C-Specifications for Welding Rods, Electrodes, and Filler Metal, 2001 Edition with 2002 Addenda.
- G. ASME Y14.5M-1994, “Dimensioning and Tolerancing,” Reaffirmed 2004.
- H. ASME Y14.36M, “Surface Texture Symbols,” 1996 Edition.
- I. ANSI/AWS A2.4-98-2007, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. ASME B46.1-2002, Surface Texture (Surface Roughness, Waviness, and Lay) 2003 Edition.
- K. 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 (for cleaning, packaging and shipping only).

L. 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.

M. ANSI/AWS A5.32/A5.32M-97 (R2007). 2007, Specification for Welding Shielding Gases.

2.2 DRAWINGS

The Engineering Drawings (Exhibit F) specified in the procurement documents are hereinafter referred to as drawings and set forth the extent of the Work to be performed under the Procurement documents. It is the responsibility of SUBCONTRACTOR to produce all drawings SUBCONTRACTOR will use to fabricate and test items produced to meet the requirements of this Specification. SUBCONTRACTOR'S drawings must be reviewed by CONTRACTOR before proceeding with any Work in response to this Specification.

3. DESIGN REQUIREMENTS

3.1 QUALITY LEVEL

The Drip Shield is classified as a NQA-1, Quality Level 1 item and requires the application of very stringent quality requirements, including the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III requirements. These are the same requirements applied to the fabrication and construction of nuclear power plants.

Materials, fabrication processes, and examination and testing shall comply with the requirements of this Specification. SUBCONTRACTOR shall accept complete responsibility for all the Work performed in compliance with this Specification. Review or acceptance of data or procedures by CONTRACTOR with regard to the Work performed to accomplish the requirements of this Specification does not constitute a release from conformance to the Statement of Work (SOW) established within this Specification. The requirements of this Specification must be met.

Alternative fabrication details proposed by SUBCONTRACTOR shall be submitted to CONTRACTOR in writing using Supplier Deviation Disposition Request (SDDR) as described in Appendix B. These alternative details shall not be incorporated in SUBCONTRACTOR'S fabrication drawings without CONTRACTOR'S prior written direction to proceed.

3.2 MATERIAL BACKGROUND

As a part of the ongoing effort at YMP, the design and fabrication of a Drip Shield has evolved over several years. The current design uses three different materials; Titanium Gr. 7, Titanium Gr. 29, and Alloy 22.

3.2.1 Suspect and Counterfeit Materials

Items furnished under this Subcontract are intended for use in a U.S. Government-owned facility. Items delivered under this Subcontract may not contain potentially suspect or counterfeit items or materials (i.e., fasteners, electrical components, mechanical devices, piping/piping system

components, and/or raw-stock metals). SUBCONTRACTOR and its lower tier subcontractors and suppliers shall maintain sufficient control to prevent the procurement, installation, use, and delivery of materials and equipment that contain or exhibit suspect or counterfeit item characteristics or conditions. Additional information and guidance, to include the DOE Suspect Headmark List, can be obtained at:

<http://www.pppl.gov/eshis/procedures/qa020.pdf#search='DOE%20Headmark%20List>

SUBCONTRACTOR is solely responsible for all costs associated with the discovery, removal, replacement, and impoundment of materials and equipment that contain or exhibit suspect or counterfeit item characteristics or conditions.

1. Unless otherwise specified, all materials and all material components and parts associated with manufactured equipment, including that permanently installed into systems, subsystems, and/or assemblies, shall be new and unused. New surplus, refurbished, rebuilt, or modified items are strictly prohibited unless specifically authorized in writing by CONTRACTOR.
2. Materials and equipment delivered under this Subcontract shall exhibit the Manufacturer's original labels and identification and will be inspected by CONTRACTOR for indications of suspect or counterfeit characteristics and/or conditions.
3. Materials, equipment, or assemblies that consist of or contain fasteners (e.g., grades 5, 8, 8.2, A325, and A490, internally/externally threaded and greater than 0.25 in. in diameter), shall exhibit both grade marks and the Manufacturer's identification symbol (headmark), in accordance with the applicable specification (i.e., ASTM, SAE, etc.). Fasteners with headmarkings identified on the DOE Headmark List are STRICTLY PROHIBITED. Materials, equipment, or assemblies consisting of or containing fasteners, which DO NOT exhibit both grade marks and the Manufacturer's identification symbol in accordance with the applicable fastener specification constitute a nonconformance with the Subcontract requirements.
4. Materials, equipment, or assemblies that consist of or contain electrical components shall exhibit as applicable, legible amperage and voltage ratings, operating parameters, and the product manufacturer's labels and identification. Electrical components shall exhibit as applicable to the item or component, Underwriters Laboratory (UL) or Factory Mutual (FM) labels.
5. Materials, equipment, or assemblies that consist of or contain mechanical, piping, and piping system components and/or parts, shall clearly exhibit all markings as required by the ordering data or specifications and the original Manufacturer's labels and identification.

The critical lift path of lift equipment (cranes, forklifts, manlifts, etc.) used at the Jobsite (rentals or owned) shall be inspected for inclusion of Suspect/Counterfeit items prior to use of the equipment.

Detection by CONTRACTOR of any suspect or counterfeit condition leading to evidence of deliberate misrepresentation of any supplied item may result in an investigation into the validity of certification, fraud, and/or forgery, by the U.S. Government.

3.3 SERVICE ENVIRONMENT

The environment within which the Drip Shield must perform is complex and is described in other OWNER documents that conclude that the humidity will be quite high and temperatures vary over a wide range for many thousands of years. The primary degradation mechanism of the waste package has been found to be stress corrosion cracking (SCC). SCC in the waste package is influenced by the presence of a solute (water containing a variety of soluble element), material microstructure, and residual stresses. The purpose of the Drip Shield is to provide protection of the waste package from water and rock falls.

3.4 DIMENSIONAL INTERFACES AND LIMITATIONS

Major Dimensions and tolerances identified on the drawings (Exhibit F) are mandatory for the finished product after welding, heat treating, and machining. Piece part tolerances are shown in paragraph 5.3.1.

3.5 DRIP SHIELD SURFACE CONDITION

The surface condition of the Drip Shield specified in the drawings contained in Exhibit F is mandatory for the functional performance of the Drip Shield. The performance is impacted directly by the surface roughness. Rolling or other mechanical methods may be used to produce the surface and all surfaces must be essentially identical. Machining to achieve the required dimensions can be used if necessary. Surface texture is the result of the processing method(s). For this reason the appearance in surface roughness, waviness, and lay for external parts must meet specified tolerances.

The outer surfaces of the Drip Shield shall meet the requirements of ASME B46.1-2002 and have a surface roughness of 125 μ inch (3.2 μ meter) or better, as described by Table 12-1 of ASME B-46.1. SUBCONTRACTOR shall conduct a final inspection of the Drip Shield surface condition and shall provide documentation attesting to the method(s) used and any related calibration information. Should visual inspection be performed using a micro finish comparator, visual acuity documentation of the individual performing the inspection shall be included as part of the documentation in addition to the inspection record.

3.6 DRIP SHIELD HANDLING

The drip shield shall be handled in a controlled manner to minimize defects; surface contamination; exposure to adverse substances; impacts during fabrication, handling, transport, and storage.

4. MATERIALS

4.1 GENERAL REQUIREMENTS

CMTRs for all materials of fabrication shall be provided to CONTRACTOR in the final documentation package. No materials may be substituted or changed without written direction by CONTRACTOR. SUBCONTRACTOR may propose alternative materials, components, or parts, other than those specified in this Specification, in accordance with the SDDR process described in paragraph 9.6 and Appendix B. SUBCONTRACTOR must substantiate in writing that any 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 BPVC requirements. All proposed substitutions shall be clearly defined by SUBCONTRACTOR, with a complete description including supporting data establishing equivalence to the specified item, and submitted fifteen (15) calendar days prior to material order.

A. Material Identification and Traceability Marking

Permanent marking shall be done by any permanent method that will not result in sharp discontinuities as identified in Section 5.4.2.1 and not be deleterious as noted elsewhere in this document. Marking of all materials shall be maintained in a manner that provides traceability to the associated material records.

Temporary marking(s) shall not result in sharp discontinuities on the material as identified in Section 5.4.2.1.

B. Examination and Repair of Plate

No weld repairs on the plate shall be performed until CONTRACTOR has reviewed SUBCONTRACTOR'S written procedure. The weld repair shall be in accordance with Section 5.5.1.5 of this Specification.

Examination and repair of the Drip Shield Assembly shall be in accordance with the ASME BPVC, Section III, Division 1.

CONTRACTOR shall review requests for repairs, obtain resolution of comments, release any proposed repairs and release repair procedures for use prior to any repair work being performed.

C. Welding Materials

All welding filler metals shall conform to the requirements of the ASME B&PVC Section III, Division 1, NC-2400. Welding materials may be purchased in accordance with the Edition and Addenda of the ASME B&PVC effective at the time the material procurement documents are placed. Filler metals shall be tested as specified below. Actual CMTRs shall accompany each lot or heat of the material purchased.

1. UNS N06022

Bare welding electrodes and rods shall conform to ASME B&PVC Section II, Part C, SFA-5.14, Classification ERNiCrMo-10.

2. Titanium

Electrodes and rods shall conform to ASME B&PVC Section II, Part C, SFA-5.16, Classification ERTi-7 ELI for GR 7 to GR-7 welds.

Electrodes and rods shall conform to ASME B&PVC Section II, Part C, SFA-5.16, Classification ERTi-29 for GR 29 to GR-29 welds.

Electrodes and rods shall conform to ASME B&PVC Section II, Part C, SFA-5.16, Classification ERTi-28 for GR 7 to GR-29 welds.

3. Shielding Gases

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

4.1.1 Other Materials

Piece parts and standard products incorporated into the Drip Shields have been designated on the Drawings as American Society of Testing and Materials (ASTM) or ASME materials or by manufacturer's call-out, when applicable. CMTRs for all materials shall be provided in the final records package.

5. FABRICATION

All cutting, forming, machining, and fitting operations shall be performed in accordance with approved shop procedures, including drawings that incorporate the provisions of this Specification. All cutting, forming, machining, and fitting shall meet the requirements of ASME BPVC Section III, Division 1, NC-4000.

5.1 CUTTING

When practical, weld preparations shall be prepared using 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 6.1.D.1 for nondestructive examination (NDE) requirements for weld edge preparation surfaces.

5.2 MACHINING

Tooling used during machining shall be suitable for the task capable of producing the required dimensional control and surface finishes specified on the shop Drawings and by this Specification.

5.3 FITTING AND ALIGNING

The accuracy of fit-up for all parts shall be as required to meet the component and assembly tolerances contained on the Drawings included or produced in response to this Specification.

5.3.1 Piece Part Tolerance

When piece part tolerances are not shown on the Drawings, SUBCONTRACTOR shall establish piece part tolerances that provide a documented method to assure that the finished product meets the overall tolerances specified in the Drawings. All piece part tolerances shall be stated on the shop drawings.

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 required by this Specification.

SUBCONTRACTOR shall adjust dimensions as needed to perform all fabrication processes to accommodate shrinkage and distortion. Appropriate changes required, complying with the finished dimensions and tolerances, shall be documented on the Drawings. Adjustments shall be shown on the Drawings used.

5.3.2 Dimensional Verification

SUBCONTRACTOR shall prepare and submit In-Process Reports in accordance with this Specification. Measurement Reports shall be used to record the measured Major Dimensions necessary to certify the Major Dimensions of each assembly and component. This report shall contain the component serial number and Major Dimension label that shows compliance with Major Dimensions as shown on the Drawings. Verification of dimensions shall be performed with calibrated equipment. Drawing dimensions stated in decimal notation shall be checked with suitable calibrated equipment. Drawing dimensions stated in numeric fractions shall be checked with instruments appropriate to that measurement, however, normal fabrication measuring tools such as rules and tapes do not require calibration. The ambient temperature shall be recorded and reported for all precision measurements utilizing calibrated equipment.

5.4 ASSEMBLY

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 necessary to ensure that the overall tolerances are maintained. The manufacturing plan and schedule shall be submitted to CONTRACTOR for review forty-five (45) calendar days before fabrication. This review, resolution of comments, and release to proceed are required before fabrication can begin.

5.4.1 Assembly Requirements

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. Parts shall be cleaned in accordance with section 5.7 of this Specification prior to assembly.

5.4.2 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 Drip Shields shall be sequentially identified with a unique number per Section 5.4.2.1.D.

5.4.2.1 Drip Shield Marking

Each piece shall be uniquely identified. SUBCONTRACTOR shall produce a weld map, material map, and radiographic map for the Drip Shield. These 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 generated NDE reports and fabrication travelers. These maps shall be included in the final records package. Identification necessary to ensure traceability of materials is required.

- A. Method: Vibro-etching, direct engraving, laser marking, or photo engraving shall be used for identification. High stress die stamping or pin stamping is not permitted on any part.
- 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 text shall be upper case.
- C. Marking Text Height: Text height shall be a minimum of 5/8 inch and a maximum of one inch.
- 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 inch character size letters shall be 0.010 inch minimum. The impression depth shall not exceed 0.010 inch.

TABLE 5-1. DRIP SHIELD LABELING		
Item	Serial Number	Location and Orientation on Component
Top	DST-001	Outside surface, middle of cylinder
Sides	DSS-001, 002	Outside surface, middle of plate
Bulkheads	DSB-001, consecutively	Side
Foot	DSF-001, 002	Outside surface

5.5 WELDING

Temporary welded attachments during fabrication shall be avoided as much as possible. If they are used, every effort shall be made to place them in locations that would normally be discarded.

The area shall be examined by the liquid dye penetrant (PT) method in accordance with ASME B&PVC Section III, and Section 6.1.D of this Specification.

5.5.1 Welding Processes

Welding processes shall be qualified in accordance with ASME BPVC Section IX. Only the welding processes described in this Specification may be used.

5.5.1.1 Allowable Welding Processes

A. Gas Tungsten Arc

Gas tungsten arc welding may be used for titanium and nickel alloy weldments. An inert gas backing purge must be used for the first 3/16 inch of deposited weld metal thickness for full penetration welds having an open to the environment backside. The gas tungsten arc welding process may be either manual or automated. Either technical approach shall be qualified prior to use.

B. Gas Metal Arc

Gas Metal Arc Welding may be used for titanium and nickel alloy. This process shall not use the short-circuiting arc mode for welding of any component.

C. Alternative welding processes

Alternative welding processes may be proposed by SUBCONTRACTOR, subject to review and release to proceed by CONTRACTOR. The use of processes using coated electrodes or producing slag of any type is prohibited for use on the Drip Shield Assembly.

5.5.1.2 Welding Procedure Specifications and Procedure and Performance Qualifications

SUBCONTRACTOR shall prepare written Welding Procedure Specifications (WPSs).

Each WPS used for welding on any Drip Shield materials shall be prepared and qualified in accordance with the requirements of ASME BPVC Section III, NC-4000, ASME BPVC Section IX and this Specification. SUBCONTRACTOR shall qualify all welders used to make any weld in the Drip Shield. WPSs, Procedure Qualification Records (PQRs), and Welder Performance Qualification Records (WPQRs) shall be clear, sharp, reproducible documents and must include all applicable essential and nonessential variables listed in the ASME BPVC, Section IX.

Approved WPSs shall be identified on SUBCONTRACTOR'S shop drawings. SUBCONTRACTOR shall submit one copy of the WPS, corresponding procedure qualification record, qualification procedure for the welders, and WPQRs to CONTRACTOR for review, resolution of comments, and release to proceed thirty (30) calendar days before the start of welding operations. The welding and QC procedures shall include the requirement that no welder shall have in his possession more than one type of filler metal at any one time. All drip shield welding materials shall be verified and recorded immediately prior to use.

5.5.1.3 Preheat and Interpass Temperatures

- A. The maximum interpass temperature for welding UNS N06022 is 200°F. The minimum preheat temperature is 50°F. The maximum interpass temperature for welding titanium grades 7 and 29 is 350°F and the minimum preheat temperature is 50°F.
- B. Preheat and interpass temperatures shall be measured using temperature indication crayons, optical or contact pyrometers, or other suitable means accepted by CONTRACTOR. Temperature indication crayons that contain inorganic sulfate, halogens, or sulfur shall not be used on titanium or UNS N06022. The in-process documentation shall accommodate the recording of these temperatures.
- C. Interpass temperature requirements listed above shall apply to all welds.

5.5.1.4 Workmanship and Visual Weld Quality

The following workmanship criteria shall be applied to each weld, as applicable to the type of weld:

- A. 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.
- B. Fillet welds shall be of the specified size with full throat thickness. 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.
- C. 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 CONTRACTOR-released repair procedures shall be used.
- D. Precautions shall be taken to minimize weld spatter and arc strikes. If these occur, they shall be removed by procedures released by CONTRACTOR.
- E. 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.
- F. Welds shall be considered ground flush when they are within 1/8 inch of the base metal surface. Weld caps reinforcement on all shell seams shall be a maximum of 1/8 inch high. The weld reinforcement will be blended smoothly into base material to accommodate NDE. If grinding is required to maintain the maximum weld height, the finish shall be equivalent to a finish produced by 120 grit or finer abrasive media.
- G. Tack welds used to secure alignment shall be removed completely, or, when they have served their purpose, their stopping and starting ends shall be properly prepared to assure that they are satisfactorily incorporated into the final weld. Qualified welders using qualified welding procedures, in accordance with Section 5.5.1.2 of this Specification, shall make tack welds

and temporary attachment welds. Tack welds and temporary attachment welds shall be performed using welding processes and personnel qualified to the requirements of ASME BPVC Section IX for the process used.

5.5.1.5 Repair by Welding

A. Weld Repair of Defects in Base Material

Defects in plates used in the Drip Shield Assembly shall be repaired as specified in Section 5.5.1.5.B, Repair of Defects in Completed Welds, of this Specification. Repair welding shall be performed using welding procedures and welders qualified in accordance with ASME BPVC Section III and Section IX.

B. Repair of Defects in Completed Welds

Defects in welds in or on the Drip Shield Assembly shall be repaired in accordance with ASME BPVC Section III. Repairs to welds shall be examined in accordance with the requirements for examination of the welds in Section 6.1.

Repair welding shall be performed using welding procedures and welders qualified in accordance with Section 5.5.1.2 of this Specification. All repairs to completed welds are to be documented on a 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 9.6 when either the weld or base material defect exceeds two cycles for any individual repair.

5.6 HEAT TREATMENT

A. Heat treatment shall be accomplished by any suitable method of heating and cooling, provided the required heating and cooling rates, metal temperature uniformity, and temperature control are maintained. The heat treatment shall provide for heating of the entire Drip Shield with one heat treatment. This heat treatment shall be performed with calibrated thermocouples shielded from direct contact with the quenching media. The applicable heat treatment procedures shall document this process control.

B. SUBCONTRACTOR shall prepare written Heat Treatment Procedure(s) meeting the ASME BPVC Section III, Division 1, NC-4600 and this Specification. This procedure shall include the number of thermocouples and show their locations. Heat Treatment Procedure(s) shall be clear, sharp, reproducible documents and shall be submitted thirty (30) calendar days before fabrication for CONTRACTOR'S review, resolution of comments, and release. Time-Temperature Recordings of all heat treatments shall be maintained and included in the document package.

C. Stress Relief of Drip Shield

The operation is an important operation. Particular attention must be paid to the method and planning to achieve the stress relief that meets the requirements below and prevent distortion. This process can require special tooling and this expense must be factored into the manufacturing plan.

The Drip Shield shall be stress relieved after completion of all required work. The Drip Shield shall not be machined after heat treatment.

The Drip Shield shall be furnace heated at a temperature of 1100°F+ 50°F/-50°F for 120 minutes minimum and then air cooled. To prevent pickup of hydrogen, a slightly oxidizing atmosphere shall be used. Temperature recordings shall be taken during this process sufficient to confirm time and temperatures within specified tolerances.

No repairs shall be performed on the Drip Shield after heat treatment.

5.7 CLEANING 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 surface roughness, or cleaning agents that have corrosive effects or alter the performance or the material, is prohibited.
- D. No materials or methods used during cleaning may contain halogens, sulfur, or other deleterious materials in concentrations greater than twenty-five (25) ppm. Copies of the halogen and sulfur content certification shall be included in the final records 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 CONTRACTOR for review, resolution of comments, and release thirty (30) calendar days before fabrication begins.
- F. Components shall be degreased before welding using a cleaning agent that does not contain more than twenty-five (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 records package.
- G. The inside and outside surfaces of all finished parts shall be free from mill scale, machining chips, grease, oil, weld spatter, arc strikes, or foreign matter. Cleaning shall be done before any heat treatment and verified by inspection after heat treatment.

- H. During fabrication, contact with clean carbon steel bedplates, cutting tables, lathes, boring mills, tooling, handling equipment, test equipment, and similar items is permitted. Polymer shims or coatings should be used between carbon steel and UNS N06022 or titanium where appropriate. Any of the above carbon steel surfaces shall be clean of any loose scale, rust, or steel particles that could become embedded in the titanium or UNS N06022.
- I. Grinding wheels shall be made of aluminum oxide and wire brushes shall be Type 300 series stainless steel. Grinding wheels and wire brushes shall only be used on one type of material. Nonferrous materials shall be isolated from grinding or welding of carbon steels to avoid cross contamination.
- J. Cutting oils, lubricants, inks, labels, or other means of marking fabrication progress, and other materials/chemicals used during the fabrication and examination (e.g., ultrasonic testing couplants) shall have a maximum halogen and sulfur content of two hundred and fifty (250) ppm. Certifications of halogen and sulfur content shall be included in the final document package. This requirement does not apply to the material suppliers for their in-process lubricants and fluids in the production of materials. These materials shall be clean and marked with agents that do not contain more than twenty-five (25) ppm halogens and sulfur. Certifications of halogen and sulfur content shall be included in the final documentation package.
- K. In-process lubricants and fluids that are required in the manufacture of raw materials (plate and bar) have no requirements for halogen and sulfur content. However, prior to shipment of raw material from sub-tier suppliers to SUBCONTRACTOR, the raw material will be cleaned with materials or methods that shall not contain halogens, sulfur, or other deleterious materials in concentrations greater than twenty-five (25) ppm. Copies of the halogen and sulfur content certification shall be included in the final records package.
- L. Caution should be exercised when planning machining operations on Alloy 22 material. This material does not machine like normal Inconel material. It requires much lower feeds and speeds to prevent tool damage. Long machining spans will be required.

6. EXAMINATION AND TESTING REQUIREMENTS

The Drip Shield shall receive the tests, examinations, and performance tests described herein. The purpose of these tests and examinations is to ensure the quality of workmanship and to assure that the Drip Shield meets the functional requirements specified herein. A test plan and a test schedule shall be provided by SUBCONTRACTOR forty-five (45) calendar days before fabrication for CONTRACTOR'S review and release. SUBCONTRACTOR shall furnish all examination and test facilities, materials, and labor necessary for performance of tests and examinations, or for any modifications resulting from the tests or examinations. SUBCONTRACTOR shall repair, in accordance with the requirements of this Specification, or replace all or any parts of the Work not in compliance with this Specification as determined by such examinations and tests.

CONTRACTOR and OWNER reserve the right to use a designated Representative of CONTRACTOR during tests and examinations including hold/witness point activities. The

presence of either CONTRACTOR or OWNER'S Representative during fabrication shall not relieve SUBCONTRACTOR from performing required in-house QC functions. SUBCONTRACTOR is responsible for first line examination and verification of items and services within the contractual Statement of Work (SOW). OWNER'S Representative shall be entitled to the same site access privileges as CONTRACTOR and provided all necessary documents and records necessary to perform CONTRACTOR'S inspection work and surveillance duties during hold and witness point activities.

SUBCONTRACTOR shall provide sufficient office space for CONTRACTOR'S on-site technical and quality representatives when present. Free access to all manufacturing areas containing CONTRACTOR'S equipment shall be granted.

SUBCONTRACTOR shall notify CONTRACTOR fifteen (15) or more calendar days in advance of hold or witness points. Hold points may not be waived without specific written consent of CONTRACTOR. Work may proceed past a designated witness point upon notification and written agreement from CONTRACTOR. Agreements may be in the form of e-mail and shall be included in the final records package.

For tests and examinations, SUBCONTRACTOR shall submit to CONTRACTOR documentation identifying SUBCONTRACTOR'S QA examination, test, and hold points to occur during manufacturing, assembly, and testing. This list will be used by CONTRACTOR to select the required surveillance hold and witness points stated in this Specification. The minimum hold and witness points are listed in Appendix C.

6.1 NONDESTRUCTIVE EXAMINATION (NDE)

A. General

NDE shall be performed after final machining, surfacing, or heat treatment, except that PT shall be performed prior to heat treatment. Level II or III NDE personnel shall examine welds in or on the Drip Shield Assembly in accordance with the requirements of the ASME BPVC Section III, NC-5200 and NC-5300. Welds that become inaccessible after assembly or heat treatment shall be examined prior to assembly or heat treatment.

SUBCONTRACTOR shall submit the following documentation for CONTRACTOR'S review:

1. SUBCONTRACTOR'S NDE personnel qualification and certification written practice.
2. 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 recertification and the dates of assignment to NDE.
3. SUBCONTRACTOR'S NDE method procedures for radiographic examination (RT), ultrasonic examination (UT), PT, and visual examination (VT) shall be submitted for CONTRACTOR review, resolution of comments, and release thirty (30) calendar days before fabrication.

B. Radiographic Examination (RT)

All UNS N06022 and titanium full penetration welds shall be radiographically examined in accordance with the requirements of the ASME BPVC Section III, NC-5320. As a supplemental requirement, the maximum acceptable indication length shall be 1/16 inch (1.6 millimeter) for all UNS N06022 and titanium full penetration welds.

The following additional requirements apply:

1. SUBCONTRACTOR shall use a National Institute of Standards and Technology (NIST) traceable, 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 CONTRACTOR. Film and reader sheets shall be marked or noted to show any condition other than normal (i.e., surface conditions or defects within acceptance standards) and reader sheets shall be marked to show the level of the qualification of the reader. Radiographic film shall be sent to CONTRACTOR as part of the final records package.

C. Ultrasonic Examination (UT)

All UNS N06022 and titanium full penetration welds shall be ultrasonically examined in accordance with the requirements of ASME BPVC Section III, NC-5330. As a supplemental requirement, the maximum acceptable indication length shall be 1/16 inch (1.6 millimeter) for all UNS N06022 and titanium full penetration welds. The following additional requirements apply:

1. Couplants used on titanium and nickel based alloys shall not contain more than two hundred and fifty (250) ppm of halides (chlorides plus fluorides) or sulfur.
2. A written report of each weld examined by UT 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, and examination results.

D. Liquid Penetrant Examination (PT)

Welds using ASME BPVC Section III, Subsection NC shall be examined by liquid penetrant methods in accordance with the requirements of the ASME BPVC Section III, NC-5350. Welds shall be examined prior to heat treatment. The acceptance criteria for PT shall be ASME BPVC Section III, NC-5352. The following requirements apply:

1. The weld preparation and adjacent base material for at least two (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 titanium and nickel-based alloys shall be analyzed for contaminant as specified in the ASME BPVC Section V, Article 6, T-640, and meet the proper limits. Copies of the analysis reports shall be included in the document package.
3. PT shall be by the solvent removable method.
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. At a minimum, the report shall include part or weld number, penetrant manufacturer, penetrant type, batch numbers, and results of examination.

E. Visual Examination (VT)

1. All welds shall be examined by the visual method, by Level II or III NDE personnel qualified in accordance with ASME BPVC, Section III, NC5200.
2. 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 three (3) inches, the permissible under length is 1/8 inch, and for welds 3 inches or longer, the permissible under length is 1/4 inch. Intermittent welds shall be spaced within one (1) inch of the specified location.
3. Arc strikes and associated blemishes on the weld or in the base-material shall be removed by grinding.
4. 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.

6.2 PRESSURE TESTING

Not required

6.3 PERFORMANCE TESTS

Empty Weight Measurement: SUBCONTRACTOR shall weigh the Drip Shield components and fully assembled Drip Shield and record the weights. The dry weight of the following components shall be supplied to CONTRACTOR:

1. Completed Drip Shield

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 CONTRACTOR.

7. PACKAGING AND SHIPPING REQUIREMENT

7.1 GENERAL REQUIREMENTS

- 7.1.1 Applicable Guidelines from the American Society of Mechanical Engineers and American National Standards Institute

Packaging and shipping shall be in accordance with ASME NQA-1-2000 Edition, Subpart 2.2, QA 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. SUBCONTRACTOR shall provide a packaging plan with details by component, ninety (90) calendar days before shipment, to CONTRACTOR for release.

- 7.1.2 Shipping Information

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

- 7.1.3 Supplier Liability for Shipping

SUBCONTRACTOR shall ensure that the as-fabricated, as-tested condition of the Drip Shield is maintained, and that distortion or creep during shipment is prevented. Any damage or distortion of the Drip Shield because of improper packaging, in-transit handling, or shipping, shall be repaired at the expense of SUBCONTRACTOR. CONTRACTOR'S release of these procedures does not relieve SUBCONTRACTOR of the responsibility for repair of the Drip Shield if damage or distortion occurs in-transit handling or shipping.

7.2 PACKAGING & SHIPPING REQUIREMENTS

SUBCONTRACTOR shall provide CONTRACTOR with the written procedures (including drawings or sketches as appropriate) for packaging, wrapping, labeling, and shipping the Drip

Shield. SUBCONTRACTOR shall obtain CONTRACTOR release of the packaging, labeling, and shipping procedures before shipment of the Drip Shield.

7.3 DELIVERY

Truck or other conveyance unloading will be the responsibility of CONTRACTOR. The truck or other conveyance may be unloaded within OWNER'S protected area at a location designated by CONTRACTOR. CONTRACTOR'S representative shall be given at least twenty-four (24) hours' notice of truck or other conveyance prior to arrival at CONTRACTOR'S location.

8. DOCUMENT AND RECORD SUBMITTAL REQUIREMENTS

This section contains the requirements for document and record submittals that are listed in the List of Supplier Submittals. Appendix E summarizes the required documents to be submitted for review and release for use, and the required records to be submitted at the time of shipment. The engineering document requirements are defined in Appendix E, and the quality verification document requirements are defined in Appendix F. All submissions are to be to CONTRACTOR'S document control.

8.1 DOCUMENTS

8.1.1 Shop Drawings

SUBCONTRACTOR shall prepare shop drawings as necessary for normal shop practice for all assembly, sub-assembly, and piece parts associated with the Drip Shield. SUBCONTRACTOR shall prepare and submit, thirty (30) calendar days before fabrication, one print of all shop drawings to CONTRACTOR for review and release. If shop drawings are prepared using a computer-aided design (CAD) system, only paper copies are submitted for review/comment and release to CONTRACTOR. When final drawings are completed and are records, the electronic files shall become records and be submitted with the final records package. SUBCONTRACTOR shall provide the format of the files and the name and version of the application used to create them.

The shop drawings are to be full-sized (D size) 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 and/or endpoints at terminations.

The shop drawings will be reviewed and, if satisfactory, will be released by CONTRACTOR. CONTRACTOR must release the shop drawings before fabrication begins. If not satisfactory, SUBCONTRACTOR will be notified of the items requiring further explanation or correction. 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 release. CONTRACTOR'S release for use of shop drawings shall not be construed as a complete check. CONTRACTOR'S release for use of shop drawings will not relieve SUBCONTRACTOR of the responsibility for any error that may exist on the shop drawings. CONTRACTOR'S release for use of the shop drawings does not relieve SUBCONTRACTOR of the responsibility for meeting CONTRACTOR'S Engineering Sketch requirements that are part of this specification.

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

8.1.2 Drawing Standards

Weld symbols shall be in accordance with the requirements of ANSI/AWS A2.4-98. Surface texture symbols shall be in accordance with ASME Y14.36M-96.

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.

8.2 GENERAL REQUIREMENTS FOR FINAL RECORDS PACKAGES

Each final records package shall comply with the following requirements:

- A. Each package shall have a Table of Contents.
- B. Each page of the document package is to be consecutively numbered and marked with the unique Drip Shield serial number. Consecutive numbering by section is acceptable provided the final records package clearly identifies the total number of pages for each section and that each page identifies the page and section number.
- C. All records must be legible and reproducible, including signatures (signatures must be legible and typed or printed), inspection stamps, page numbers, and similar items. When assigned initials are allowed, a log containing the printed name, signature, and initials shall be provided. Copies of records will not be acceptable if legibility or reproducibility is in question.
- D. Inspection records shall include M&TE traceability, M&TE serial number and calibration due date.

- E. All recorded information shall be typed or recorded neatly in reproducible ink.
- F. Corrections to records shall be made by one of the following methods:
 1. Draw a single line through the changed or incorrect information (without obliterating incorrect information) and, if applicable, inserting the new or correct information in close proximity.
 2. Transcribe or enhance faint characters.
 3. Insert new information.
 4. Obtain a legible copy.

The authorized SUBCONTRACTOR'S individual shall date and initial, stamp, or sign the corrected information so it is clear what corrections are being made.

- G. SUBCONTRACTOR, at SUBCONTRACTOR'S expense, shall replace, in an expedited manner, unacceptable records found during review by CONTRACTOR.
- H. The document package shall include, but is not limited to, the items identified in Appendix E and Appendix F. CONTRACTOR shall review package content and acceptance.
- I. SUBCONTRACTOR shall prepare and submit the document package Table of Contents for release by CONTRACTOR. The Table of Contents shall include the documents identified in Appendix E and F, as well as any documents used by SUBCONTRACTOR'S QA Program to trace the record to the equipment used during fabrication and inspection.
- J. SUBCONTRACTOR shall compare test results and reports to the acceptance criteria. These reports shall contain the signature of the authorized representative or the agency performing the tests. The reports are for CONTRACTOR'S review and acceptance, prior to release for shipment.
- K. Following satisfactory completion of all examinations and tests, SUBCONTRACTOR shall prepare a complete set of as-built dimension documentation. All dimensions shall be verified to be within the drawings tolerances specified. This may be accomplished by including them on the as-built drawings. Major Dimensions, as specified in Section 5.3.2 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.
- L. Records shall be maintained as required by ASME BPVC Section III, NCA-4134.17.

9. QUALITY ASSURANCE PROGRAM REQUIREMENTS

9.1 ACCEPTANCE OF SUBCONTRACTOR'S QUALITY ASSURANCE PROGRAM

- A. As evidence that SUBCONTRACTOR has a QA program, SUBCONTRACTOR shall submit evidence indicating the portions of their QA program that satisfies the quality criteria in ASME BPVC Section III, Subsection NCA; CONTRACTOR'S procurement documents; elements of OWNER'S QA program and SUBCONTRACTOR'S ASME Certificate of Authorization. CONTRACTOR reserves the right to perform a survey of SUBCONTRACTOR'S or sub-tier supplier's facility to verify implementation of SUBCONTRACTOR'S QA program. Any conditions adverse to quality identified during a survey shall be documented by CONTRACTOR in the Survey Report and forwarded to SUBCONTRACTOR or sub-tier supplier for resolution. CONTRACTOR may accept, or accept with comments, the QA program. SUBCONTRACTOR may not proceed with activities related to the QA program until acceptable changes to their QA program documents have been agreed to by CONTRACTOR. All changes must be submitted to CONTRACTOR for final acceptance.
- B. Acceptance of a Supplier's QA program by CONTRACTOR does not relieve SUBCONTRACTOR of the obligation to comply with the requirements of the procurement documents. If the QA program is subsequently determined by CONTRACTOR to be ineffective or inadequate in providing acceptable quality, CONTRACTOR reserves the right to impose restrictions as necessary to bring SUBCONTRACTOR in compliance with the procurement requirements. All proposed QA program revisions shall be submitted to CONTRACTOR for review and acceptance prior to implementation of the revision.

9.2 SUBCONTRACTOR'S SUB-TIER SUPPLIER REQUIREMENTS

All materials shall conform to the drawings and requirements of this Specification. CMTRs shall be provided for each heat (lot) used and the actual CMTRs (not typical CMTRs) must be included in the document package.

9.2.1 Sub-tier Supplier Selection Requirement

- A. SUBCONTRACTOR shall select sub-tier supplier(s) based on formal audit and evaluation of the sub-tier supplier's capability to provide items and services in accordance with CONTRACTOR'S procurement documents and placement of the sub-tier supplier on SUBCONTRACTOR'S Qualified Supplier List or other similar internal document. Measures for evaluating, selecting, and reevaluating procurement sources shall be based on one or more of the following:
1. For all materials and fabrication, 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 CONTRACTOR'S QA program requirements specified in CONTRACTOR'S procurement documents. In addition, 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 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.

9.2.2 Application of Quality Assurance and Technical Requirements to Sub-tier Suppliers.

SUBCONTRACTOR is responsible for assuring the performance of all CONTRACTOR QA and Technical Requirements by their sub-tier suppliers. Required appropriate QA and technical requirements of CONTRACTOR'S procurement documents shall be documented in sub-tier supplier's procurement documents describing those requirements as stated below:

- A. The following items do not apply to sub-tier suppliers of any class:

1. ASME NQA-1-2000 Edition, Subpart 2.1 – cleaning to meet this specification applies to the completed Drip Shield only.
2. ASME NQA-1-2000 Edition, Subpart 2.2 – packaging and shipping to meet this Specification applies to the completed Drip Shield only.
3. Section 7 – Packaging and Shipping as described in this section applies to the finished Drip Shield only.
4. Section 8 – Documentation, as described in this section applies to the finished Drip Shield only.

- B. QA and Technical Requirements for Raw Materials (Plate and Bar) are as follows:

1. Section 4.1 – Definitions of material type, including product restrictions, are appropriate.
2. Sections 3.4 through 3.5 – Dimensional Interfaces and Limitations and Surface Finish are not appropriate – these requirements apply to the finished Drip Shield and no raw material is incorporated into the finished Drip Shield without forming or machining.
3. Section 4.1 – Material requirements are appropriate.
4. Section 5.1 – Restrictions on thermal cutting are appropriate.
5. Section 5.3.2 – Dimensional Verification is not appropriate – these requirements apply to the finished Drip Shield and no raw material will be used in the finished Drip Shield without being formed or machined.
6. Section 5.5 – Welding is not appropriate – weld repair of raw material is forbidden.
7. Section 5.7 – Cleaning requirements are appropriate or not appropriate as follows:
 - a Sections that concern cleaning, marking, and fabrication materials and chemicals are appropriate.

- b Sections that concern ASME NQA-1 2000 Edition, welding, surface roughness, assembly, and fabrication are not appropriate.
 - 8. Section 6 – Examination and Testing, as described in this section, applies to the finished Drip Shield and are not appropriate.
 - 9. Section 9.2 – Demonstration of sub-tier supplier QA systems to meet this paragraph and the above requirements are appropriate.
 - 10. Sections 1.6.1 and 9.5– Requirements to supply manufacturing plans, procedures, and access are appropriate.
 - 11. Section 9.10 – Calibration records are not appropriate – providing the material under the QA systems in Section 4.1 is sufficient.
 - a. The dimensions conform to the requirements of manufacturer’s published product description and the drawings.
 - b. The material test reports were received and the material complies with the manufacturer’s published product requirements, the drawings, and the specification.
 - 2. Section 9.2.1 and 9.5 – Auditing of the sub-tier supplier to verify implementation of cleaning and handling requirements is appropriate.
- C. QA and Technical Requirements for Forming and Pre-Machining are as follows:
- 1. All forming and pre-machining operations fall in the category Piece Part Tolerances (Section 5.3.1). All dimensions specified to the sub-tier supplier are those as determined by SUBCONTRACTOR to support compliance with the finished dimensions, but are not the finished dimensions. References to Dimensional Verification (Section 5.3.2) and Calibration Records (Section 9.10) are not appropriate.
 - 2. Section 5.7 – Cleaning requirements are appropriate or not appropriate as follows:
 - a Sections that concern cleaning, marking, and fabrication materials and chemicals are appropriate.
 - b Sections that concern surface roughness and fabrication are appropriate.
 - c Sections that concern ASME NQA-1 2000 Edition, welding and assembly are not appropriate.
 - 3. Section 5.7 – Auditing of the sub-tier supplier to verify implementation of cleaning and handling requirements is appropriate.
- D. QA and Technical Requirements for Finish-Machining are as follows:

1. All finish-machining operations are controlled by Sections 5.2. All required dimensions, limitations, and surface finishes are to be communicated to the sub-tier supplier.
2. References to Dimensional Verification (Section 3.4) and Calibration Records (Section 9.10) are appropriate.
3. Section 5.7 – Cleaning requirements are appropriate or not appropriate as follows:
 - a Sections that concern cleaning, marking, and fabrication materials and chemicals are appropriate.
 - b Sections that concern surface roughness and fabrication are appropriate.
 - c Sections that concern ASME NQA-1 2000 Edition, welding and assembly are not appropriate.
4. Section 5.7, 9.5 and 9.10 – Auditing of the sub-tier supplier to verify implementation of cleaning, handling and calibration requirements is appropriate.

E. QA and Technical Requirements for Heat Treating are as follows:

1. The heat-treating of the Drip Shield Assembly is to be performed in accordance with Section 5.6.C. All technical requirements in this section are to be communicated to the sub-tier supplier.
2. Calibration Records (Section 9.10) for thermocouples is appropriate.
3. Section 5.7 – Cleaning requirements are appropriate or not appropriate as follows:
 - a Sections that concern cleaning, marking, and fabrication materials and chemicals are appropriate.
 - b Sections that concern surface roughness and fabrication are appropriate.
 - c Sections that concern ASME NQA-1 2000 Edition, welding and assembly are not appropriate.
4. Section 5.7, 9.5 and 9.10 – Auditing of the sub-tier supplier to verify implementation of cleaning, handling and calibration requirements is appropriate.

SUBCONTRACTOR shall forward an un-priced copy of their procurement documents to CONTRACTOR thirty (30) calendar days before procurement and shall maintain records to substantiate the evaluation and acceptance of the sub-tier supplier's technical capabilities and QA program as appropriate.

9.3 EXAMINATION POINTS

SUBCONTRACTOR'S manufacturing plan shall include a listing of all SUBCONTRACTOR witness points and hold points.

9.4 SUBCONTRACTOR QUALITY CONTROL PROCEDURES

SUBCONTRACTOR'S and SUBCONTRACTOR'S sub-tier supplier's 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, hold points, and sign offs. The traveler shall provide a method to ensure the accumulation of signatures attesting to the completion of a sequence.

9.5 ACCESS TO FACILITIES FOR QUALITY ASSURANCE AND QUALITY CONTROL

- A. CONTRACTOR, OWNER, or their representative(s) shall be given free access to SUBCONTRACTOR'S and SUBCONTRACTOR'S 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 CONTRACTOR, OWNER, or their representative(s).
- C. All phases of the specified work performed by SUBCONTRACTOR and sub-tier suppliers may be subjected to audit, surveillance, or verification at CONTRACTOR'S or OWNER's discretion.
- D. OWNER's QA program requires that SUBCONTRACTOR be audited a minimum of every three years on site at SUBCONTRACTOR'S facility. CONTRACTOR performs an annual evaluation of SUBCONTRACTOR'S QA program. Based on the results of this annual evaluation, additional audits or surveillance may be necessary. Any conditions adverse to quality identified because of the audits, surveillance, or annual evaluations will be reported on the appropriate form and communicated to SUBCONTRACTOR for timely resolution.
- E. SUBCONTRACTOR shall provide a safe work environment for all CONTRACTOR inspectors. Should there be a question about the safety of the work environment, work shall not proceed until the safety question is resolved. SUBCONTRACTOR shall ensure that all safety rules are followed by the CONTRACTORS' on site work force.

9.6 NONCONFORMANCE AND CORRECTIVE ACTION

- A. SUBCONTRACTOR shall prepare a Supplier Deviation Disposition Request (SDDR) form in accordance with Appendix B and the instructions provided in the procurement documents for each reportable condition adverse to quality as defined below. Alternatively, SUBCONTRACTOR may attach their nonconformance or corrective action report to the SDDR and submit to CONTRACTOR prior to offering the service for acceptance. 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 CONTRACTOR, SUBCONTRACTOR shall notify 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 SUBCONTRACTOR documents released for use by CONTRACTOR is violated.
 3. The item/service for CONTRACTOR does not conform to the original CONTRACTOR requirement(s) even though the item can be restored to a condition such that the item's capability 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 except for weld repairs that are not in excess of the number of cycles allowed in Section 5.5.1.5C.
- C. CONTRACTOR shall evaluate and release for use, in writing, SUBCONTRACTOR proposed dispositions of "use-as-is" or "repair to other than original," 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 or rendered indeterminate.
 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 trunnion collar.
- E. All conditions adverse to quality shall be resolved between SUBCONTRACTOR and CONTRACTOR before the item may be offered for acceptance in the manner specified in the procurement documents.
- F. SUBCONTRACTOR shall respond to all CONTRACTOR-initiated supplier condition 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 vessel to rework surface defects and meet specifications.) SUBCONTRACTOR shall keep a record (in the form of a map) of all locations where rework or repair has been performed on the Drip Shield.
- H. SUBCONTRACTOR shall report any nonconformance discovered after delivery of the Drip Shield in writing to CONTRACTOR within fifteen (15) calendar days of discovery.

9.7 SERIAL AND LOT TRACEABILITY RECORDS

SUBCONTRACTOR shall prepare and maintain serial and lot traceability records and provide these to 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, 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.

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. 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.

9.8 QUALITY REQUIREMENTS FOR SHIPPING RELEASE

The Drip Shield shall not be shipped until the following requirements are met:

- A. All tests, examinations, and final inspection have been performed with acceptable results obtained.
- B. The Drip Shield document package is complete and reviewed by CONTRACTOR'S Technical and Quality representatives. SUBCONTRACTOR shall notify CONTRACTOR fifteen (15) calendar days before his intended shipping date and allow CONTRACTOR sufficient time prior to shipment to review the document package as described in Section 8.2. The document package shall be complete and final before it is submitted for review.

9.9 CERTIFICATE OF CONFORMANCE

SUBCONTRACTOR shall submit to CONTRACTOR, Quality Verification Document requirements (Manufacturer's Data Report) (Appendix D) that shall be signed by the Authorized Nuclear Inspector for Drip Shield Assembly with the documentation package.

9.10 CALIBRATION RECORDS

SUBCONTRACTOR shall provide Certificates of Calibration attesting to the validity of the results.

SUBCONTRACTOR Certificates of Calibration shall include:

- A. Procurement document number
- B. 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 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 documents requirements.
- H. Identification of the requirements used in the calibration (i.e., codes, standards, procedures, inspection or test methods specifications, and any approved changes, waivers, or deviations). Include document title or number and revision level.
- I. Identification of SUBCONTRACTOR'S QA Program including revision level that was used to provide the calibration service.
- J. Calibration data, next calibration date, and calibration interval.
- K. 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 result that identifies the extent of the error(s) over a specified range.
- L. Environmental condition that could affect any measurement.

SUBCONTRACTOR will complete, for the Drip Shield, a Manufacturer's Data Report, Manufacturer's Data Report for Drip Shield Assembly (Appendix D). SUBCONTRACTOR and his Authorized Inspector shall sign this Report.

APPENDIX A – Drawings

Drawings are included as part of the material requisition and are contained in the procurement documents (Exhibit F in the procurement documents)

APPENDIX B – Supplier Deviation Disposition Request (SDDR)

The SDDR Form is used by SUBCONTRACTOR to communicate needed changes and/or deviant conditions to CONTRACTOR. The SDDR is the primary means of communication with the CONTRACTOR. It should be viewed as a positive process because it provides the ability to make necessary changes in an expedited manner. The SDDR is not viewed by CONTRACTOR as a negative, nor can it be used to modify cost, however, it does demonstrate SUBCONTRACTOR'S dedication to resolving problems and implement effective communication.

INSTRUCTIONS FOR COMPLETING THE SDDR FORM

This form is to be used by a Supplier to:

- a) Notify BSC when manufactured product or service does not meet established design and control contract requirements and to document the Supplier's proposed disposition with their technical (and where appropriate, Cost/Schedule) justification.
- b) Notify BSC when the Supplier wants to propose changes to the contract documents, which establish design and control requirements unanticipated at time of award.
- c) Record BSC disposition of the SDDR.
- d) Identify the supplier NCR number, when applicable.

The supplier may use the version of this form that is attached to the Buyer's order or may use a subsequent version as provided by the Buyer.

A deviation is any departure from the requirements of the procuring documents that the Supplier has incorporated or proposes to incorporate in the completed item or service provided. The SDDR form is not to be used after shipment release. Deviation disposition can be classified as Use-As-Is, Repair, or Modify BSC Requirement. Any deviation shall be considered unacceptable until accepted by BSC in writing. Additionally, Suppliers are required for deviations, which occur after work has reached a completion state (e.g., base metal repair, incorrect drilled hole), to generate and disposition a nonconformance report (NCR). In other words, the Supplier is required to have an internal NCR procedure requiring disposition as reject, repair, rework, or use-as-is. The Supplier shall generate and disposition an NCR when appropriate and submit a copy of their NCR employing use-as-is or repair disposition (Section 4a of the SDDR form).

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though the item may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal disposition, chemical processing, etc. The SDDR form is not to be used for cases where BSC has previously provided authorization to proceed using an accepted repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

Supplier shall make changes on their engineering documents to reflect changed conditions and resubmit engineering documents in accordance with purchase order document submittal requirements. The Supplier shall include a copy of each BSC accepted SDDR in the quality verification documentation package for each applicable item.

Acceptance of the SDDR by BSC does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents, nor does it constitute a waiver of the right to renegotiate the terms of the procuring documents.

SUPPLIER INSTRUCTIONS

Block No.

Entry Information

1. Supplier's name and address - city, state, and zip. List same information for lower tier Suppliers, if applicable.
2. Supplier's order number if one has been assigned.
3. BSC Purchase Order or Subcontract Number and Revision Number.
4. Describe the deviating characteristics and define the extent of the out-of-specification condition for each identified piece affected. Include quantities and serial, lot, batch, heat, or other numbers as appropriate. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach reproducible-quality extra sheets, sketches, photographs, etc., as necessary. When proposing a change in either Supplier or BSC documents, describe the change and identify the documents completely, including title or subject, date and revision, and where appropriate, attach a copy of areas in question. Identify an associated NCR in Box 4a, when applicable.
5. State proposed disposition.
6. Enter cost impact, including cost savings, that would result from proposed changes and which will be reflected in appropriate procurement documents. An approximate cost impact is acceptable.
7. Enter delivery schedule impact that would result from proposed changes.
8. Describe the proposed disposition and provide technical (and where appropriate Cost/Schedule) justification for BSC evaluation. Attach reproducible-quality copies when required. If the deviation is correctable by repair, submit a detailed repair procedure or reference the procedure previously submitted and approved by BSC for use in similar situations. Provide control number, Supplier control number, and procedure title. For documents, provide suggested corrective wording, procedure, documents, etc. Provide a copy of each SDDR attachment to the BSC Source Verification Representative (SVR) at the Supplier's location, if applicable.
9. Enter the name (typed or printed) and title of the Supplier representative authorizing the disposition request and appropriate signature and date signed.

Transmittal of SDDR to BSC:

INSTRUCTIONS FOR COMPLETING THE SDDR FORM

(continued)

BSC ENGINEERING INSTRUCTIONS:

RE identifies the records designator (QA:N/A or QA:QA) based on the designator(s) of the Purchase Order or Subcontract.

10. Indicate BSC disposition.
11. Provide appropriate justification for the BSC action(s) indicated in Block 10, including identification of any interface resolution, affected documents, license or permit revision, authorization basis review, PCSA review, or client approval that is required.
12. RE/STR - Signature of the responsible engineer or Subcontract Technical Representative and the printed name.

DEM/PE - Signature of the responsible DEM/PE accepting the Engineering action and the date signed.

QA - Signature of the authorized BSC Quality Assurance representative and the date signed (only if classified QL-1 or quality level is changed).

Procurement - Signature of the authorized Procurement representative (when required), the date signed and the printed name.

PCSA – Signature of the authorized PCSA representative (when required), the date signed.

Client - Signature of the authorized Customer representative and the date signed (when required by Project procedure).

Project Manager. - Signature of the Project Manager and the date signed (when required by Project procedure).
13. Signature of the Supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished and the date signed.
14. Signature of the BSC SVR, when source verification is required, and date. This signature indicates that the accepted disposition was correctly implemented and verified.

APPENDIX C – Engineering Hold and Witness Points

Hold Points are as follows:

1. Initial Organizational Meeting between CONTRACTOR and SUBCONTRACTOR
2. Start of manufacturing
3. Heat treatment of Drip Shield
4. Final inspection of the Drip Shield
5. Prior to shipment
6. Prior to shipment documentation verification
7. Material Receipt
8. First welding of each WPS

Witness Points are as follows:

1. Final machining of Drip Shield
2. Empty Weight Measurements

APPENDIX D — YMP-1 Manufacturer's Data Report for Drip Shield Assembly

YMP-1 Manufacturer's Data Report for Drip Shield Assembly

Manufactured and certified by: _____

(Name and Address of Manufacturer)

Manufactured for: United States Department of Energy Yucca Mountain Project

Manufacturer's Serial Number: _____ Year built: _____

Fabrication Specification Number and Revision: _____

Dimensions: _____

(overall length) (height) (width)

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that this Drip Shield 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 drop shield described in this Data Report on _____, and state that to the best of my knowledge and belief, the Manufacturer has constructed this Drip Shield 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 Drip Shield 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. (including endorsements) and State No.)

APPENDIX E – Engineering Document Requirements – Form G-321-E

Engineering Document Requirements

QA: QA

BSC

Form G-321-E

Complete only applicable items.

Project Entity (Name): Yucca Mountain Project - Drip Shield Fabrication Specification

1. Document Category Number	2. Specification Paragraph Reference	3. Document Description	4. Permission to Proceed Required	5. Submittal Schedule	6. Quantity Required		7. Kind of Copies	8. Remarks
					Initial	Final		
1.0	8.2	Drawings (as built)	No	S	1	1	O	30 days before shipment
1.2, 1.3	8.1	Assembly and Shop Drawings	Yes	F	3	3	O,R,E	30 days before fabrication
5.0	1.5	Schedule (manufacturing and test)	Yes	F	1	1	O	45 days before fabrication
5.0, 6.0, 6.1	1.5.1	Manufacturing & Test Plans	Yes	F	1	1	O	45 days before fabrication
5.0, 6.0, 6.1	3.1, 5.5	Alternate fabrication process	Yes	U	1	1	O	Prior to implementation
6.0	9.0	Procurement documents, ASME Certs, QA manual	Yes	U	1	1	R	30 days before procurement
11.0	1.5.1, 4.1	CMTR's	Yes	U	1	1	O	Upon receipt
12.0	5.5.1.2	Welding Procedures and Qualifications (WPS & PQR's)	Yes	F	1	1	O	30 days prior to welding
14.0	5.5.1.5	Repair procedures	Yes	U	1	1	O	Prior to implementation
15.0	5.7	Cleaning procedures	Yes	F	1	1	O	30 days before fabrication
16.0	5.6	Heat treatment procedures	Yes	U	1	1	O	30 days before use
19.0	6.1.A	UT procedures	Yes	U	1	1	O	30 days before use
20.0	6.1.A	RT procedures	Yes	U	1	1	O	30 days prior to use
22.0	6.1.A	PT procedures	Yes	U	1	1	O	30 days before use
25.0	6.1.A	VT procedures	Yes	U	1	1	O	30 days before use
26.0	6.3	Weight measurement	No	S	1	1	O	Final Records Package
28.0	6.1.A	Personnel Qualifications (NDE)	Yes	U	1	1	O	30 days prior to use
28.0	5.5.1.2	Personnel Qualifications (WPQR's)	Yes	U	1	1	O	30 days prior to use
29.0	7.1.1, 7.1.2	Supplier Shipping Procedure (information)	No	S	1	1	O	Day of shipment
30.0	9.6, Appendix E	Comp data sheets (SDDR)	Yes	U	1	1	O	Prior to implementation
10.1.	8.0	List of supplier submittals	Yes	F	1	1	O	45 days before fabrication
31.0	4.1	Material Substitution	Yes	U	1	1	O	15 days before material order

9. Requisition Title:

10. Job No.:	11. Requisition No.:	12. Rev. No.:
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BSC

Engineering Document Requirements Form G-321-E

QA:QA

Page 2 of 4

Complete only applicable items.

ENGINEERING DOCUMENT CATEGORY DEFINITIONS G-321-E - SUP A

(E) Engineering Documents. This term comprises procedures, drawings, specifications, QA plans, prototype qualification test reports, and other similar documents that require BSC permission to proceed prior to fabrication or prior to use of the document on the design, fabrication, installation, or other work progress. The term is also applied to price lists, instructions for erection/installation, operation, maintenance, and site storage and handling.

A. DEFINITION OF TERMS

(Note: Standard abbreviated titles follow the category definitions.)

Supplier – This is a comprehensive term and includes seller, vendor, contractor, subcontractor, subsupplier, etc.

Original – The initial document of which copies are made, i.e., handwritten copy, typed copy, printed matter, tracings or drawings, and photographs.

Reproducible – A master copy that can be legibly duplicated by either microreproduction, diazo, or electrostatic process. Diazo sepias may be submitted only if they meet and satisfy BSC imaging requirements.

Electronic – Electronic media formatted as specified in the Purchase Order. Seller should contact BSC for formatting requirements if not clearly specified or if not clear.

Permission to Proceed Required – BSC review required prior to use of documents in the design, fabrication, installation, or other work process.

Initial – The first submittal of a document in accordance with the schedule mutually agreed to by BSC and the supplier.

Final – The submittal that reflects the required resolution of review comments or the complete submittal required. Drawings submitted as final shall show BSC job title, job number, procurement document number, line, equipment, tag or code number, and the manufacturer's serial number(s).

B. SUBMITTAL

In column 5 BSC Engineering places the following codes where applicable:

F - Before Fabrication	I - Before Installation	W - With Shipment
S - Before Shipment	P - Before Final Payment	D - Before Design
U - Before Use		

or

Expressed in calendar days after notice of award.

In column 7, BSC Engineering to place the following letter as applicable:

E - Electronic
R - Reproducible
O - Original
P - Print

In column 8, BSC Engineering provides any further explanation or comments.

C. DISTRIBUTION

Items and/or documents required to be provided by the **G-321-E** shall be forwarded to BSC as identified in Section 3 of the MR/Purchase Order.

D. DOCUMENT CATEGORY NUMBERS AND ABBREVIATED DESCRIPTIONS

Engineering Documents are identified and defined as follows:

- 1.0 SUPPLIER'S INDEX/SCHEDULE – The Supplier shall list all drawings and documents, including submittal dates. The supplier shall identify exactly how data requested on the **G-321-E** and **G-321-V** forms will be submitted and shall identify and agree to the schedule dates for the submittal of documents.
- 1.1 OUTLINE DIMENSIONS, SERVICES, FOUNDATIONS, AND MOUNTING DETAILS (OUTLINE DIM, SERVICES, AND FDN/MTG DETS) – Drawing providing external envelope, including lugs, centerline(s), location and size for electrical cable, conduit, fluid, and other service connections, isometrics, and details related to foundations and mountings.
- 1.2 ASSEMBLY DRAWINGS (ASSEMBLY DWGS) – Detailed drawings indicating sufficient information to facilitate assembly of the component parts of an equipment item.
- 1.3 SHOP DETAIL DRAWINGS (SHOP DET DWGS) – Drawings that provide sufficient detail to facilitate fabrication, manufacture, or installation. This includes pipe spool drawings, internal piping and wiring details, cross-section details, and structural and architectural details.
- 1.4 WIRING DIAGRAMS (WIRING DIAGS) – Drawings that show schematic diagrams, equipment internal wiring diagrams, interconnection wiring diagrams for electrical items, and the security program.
- 1.5 CONTROL LOGIC DIAGRAMS (CONT LOGIC DIAGS) – Drawings that show paths that input signals must follow to accomplish the required responses.
- 1.6 PIPING AND INSTRUMENTATION DIAGRAMS (P&IDs) – Drawings that show piping system scheme and control elements.

EG-PRO-3DP-G04B-00058.3-r2

Engineering Document Requirements Form G-321-E

Complete only applicable items.

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- 2.0 PARTS LIST AND COST – Sectional view with identified parts, detailed parts description (material, size, etc.), Original Equipment Manufacturer and vendor part number, lead time, and recommended spare parts and source information for operations, testing, and maintenance activities with unit cost. When available, update information for replacement parts for newer models or equipment. When referring to gaskets, seals, etc., identify material type (i.e., Viton, EPDM, BUNA-N, etc.). For fasteners, identify grade, material, length, diameter, thread, etc.
- 3.0 COMPLETED BSC DATA SHEETS AND SPREADSHEETS (COMP DATA SHT) – Information provided by a supplier on data sheets (e.g., QA data sheet, design data sheet, Design Verification data sheet) furnished by BSC.
- 4.1 ERECTION/INSTALLATION INSTRUCTIONS (EREC/INSTL INST) – Detailed written procedures, instructions, and drawings required to erect or install material or equipment.
- 4.2 OPERATING INSTRUCTIONS – Detailed written instructions describing how an item or system should be operated. Operation manuals for systems, subsystems, and equipment that include system descriptions and controls, operating standards and codes, recommended personal protective equipment, operating procedures, operating logs, wiring diagrams, control diagrams, instrument and piping diagrams, precautions and licensing requirements. Operation and maintenance documentation directory that includes lists of documents, systems, equipment, components, and a table of contents. The general manual layout includes title page, table of contents, manual contents, and vendor contact information (such as telephone and fax numbers, and e-mail address).
- 4.3 MAINTENANCE INSTRUCTIONS – Detailed written instructions required to disassemble, reassemble, and maintain items or systems in an operating condition. Maintenance manuals for the care and maintenance of products, materials, finishes, systems, and equipment that include content divided into sections for each system/subsystem and individual products outside of a system, source information, product information, maintenance procedures, repair materials, lubricants [API (American Petroleum Institute) or SAE (Society of Automotive Engineers) service standard and at least 3 substitutions], and sources including vendor service representative contact information, maintenance and service schedules, maintenance and service contracts, and warranties and bonds, special tools (including measurement and test equipment), and related certificate of compliance or calibration. The general manual layout includes title page, table of contents, manual contents, and vendor contact information (such as telephone and fax numbers, and e-mail address). Photographs could be provided under this category. Schedule for submittal shall be 90 days prior to shipment.
- 4.4 SITE STORAGE AND HANDLING INSTRUCTIONS (SITE STOR & HDLG) – Detailed written instructions which define the requirements and time period for lubrication, rotation, heating, lifting, packaging, cure date for elastometrics (e.g., gaskets, seals, o-rings, etc.) or other handling requirements to prevent damage or deterioration during long or short term storage (i.e., ANSI A, B, C, D) and handling at jobsite. This includes return shipping instructions. Schedule for submittal shall be 90 days prior to shipment.
- 4.5 EMERGENCY MANUALS – Emergency manuals that include the type of emergency, emergency instructions, emergency procedures, and emergency call-out personnel and contact numbers. The general manual layout includes title page, table of contents, manual contents and vendor contact information (such as telephone and fax numbers, and e-mail address).
- 4.6 TRAINING MATERIALS – If available, Training materials or media (such as videotapes, compact disks) that include information or instruction (courses) from the manufacturers to use in training personnel to properly operate and maintain the equipment and systems.
- 5.0 SCHEDULES: ENGINEERING AND FABRICATION/ERECTION (SCHED) (ENGRG & FAB EREC) – Bar charts or critical path method diagrams which detail the chronological sequence of activities. (See Section 6 of the MR/Purchase Order.)
- 6.0 QUALITY ASSURANCE MANUAL/PROCEDURES (QA MNL/PROC) – The document(s) that describe(s) the planned and systematic measures that are used to assure that structures, systems, and components will meet the requirements of the procurement documents.
- 6.1 INSPECTION AND TEST PLAN – Detailed description of the inspections and tests planned during the receipt, manufacturing, and conformance verification activities. Includes identification of BSC and supplier witness and hold points.
- 7.0 SEISMIC DATA REPORT – The analytical or test data that provides data and demonstrates suitability of material, component, or system in relation to the conditions imposed by the stated seismic criteria. Includes seismic qualification test program and weight and center of gravity report.
- 8.0 ANALYSIS, CALCULATION, AND DESIGN REPORT (ANAL & DSGN RPRT) – The analytical data (stress, electrical loading, fluid dynamics, thermal, chemical, fatigue, structural, radiation tolerance, code, etc.) that demonstrates that an item satisfies specified requirements. Include calculations for detailed design, code, nozzle load, etc.
- 9.0 ACOUSTIC DATA REPORT (ACST DATA RPRT) – The noise, sound, and other acoustic vibration data required by the procurement document.
- 10.0 SAMPLES – Physical such as weld samples, surface finish, coatings, or linings.
- 10.1 TYPICAL QUALITY VERIFICATION DOCUMENTS (TYP QUAL VERIF DOC) – A representative data package that will be submitted for the items furnished as required in the procurement documents and **G-321-V**.
- 10.2 TYPICAL MATERIAL USED (TYP MAT USED) – A representative example of the material to be used.
- 11.0 MATERIAL DESCRIPTION (MAT DESCRIPT) – The technical data describing a material that a supplier proposes to use. This also applies to architectural items and manufacturer's data, e.g., metal siding, decking, doors, paints, and coatings. Material safety data sheets will be provided for all hazardous material including gaskets, lubricants, paints, coatings, etc.
- 12.0 WELDING PROCEDURES AND QUALIFICATIONS (WLDG PROC & QUALF) – The welding procedure, specification, and supporting qualification records required for welding, hard facing, overlay, brazing, and soldering.
- 13.0 MATERIAL CONTROL PROCEDURES (MATERIAL CONT PROC) – The procedures for controlling issuance, handling, storage, and traceability of materials such as weld rod, production items, or Government Owned Materials.

EG-PRO-3DP-G04B-00058.3-r2

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Engineering Document Requirements Form G-321-E

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Page 4 of 4

Complete only applicable items.

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- 14.0 REPAIR PROCEDURES (REPAIR PROC) – The procedures for controlling material removal and replacement by welding, brazing, etc., subsequent thermal treatments, and final acceptance inspection.
 - 15.0 CLEANING AND COATING PROCEDURES (CLNG & CTG PROC) – The procedures for removal of dirt, grease, or other surface contamination and preparation and application of protective coatings.
 - 16.0 HEAT TREATMENT PROCEDURES (HEAT TR PROC) – The procedures for controlling temperature and time at temperature as a function of thickness, furnace atmosphere, cooling rate and method, etc. This includes a Descaling Procedure, if applicable.
 - 19.0 UT – ULTRASONIC EXAMINATION PROCEDURES (UT PROC) – Procedures for detection of presence and certain characteristics of discontinuities and inclusions in materials by the use of high frequency acoustic energy.
 - 20.0 RT – RADIOGRAPHIC EXAMINATION PROCEDURES (RT PROC) – Procedures for detection of presence and certain characteristics of discontinuities and inclusions in materials by x-ray or gamma ray exposure of photographic film.
 - 20.1 RT FILM – RADIOGRAPHIC FILM WITH TECHNIQUE AND READER SHEETS (RT FILM) – Original set of radiographic film with associated radiographic technique sheets and film reader sheets.
 - 21.0 MT – MAGNETIC PARTICLE EXAMINATION PROCEDURES (MT PROC) – Procedures for detection of surface (or near surface) discontinuities in magnetic materials by distortion of an applied magnetic field.
 - 22.0 PT – LIQUID PENETRANT EXAMINATION PROCEDURES (PT PROC) – Procedures for detection of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable developing techniques.
 - 23.0 EDDY CURRENT EXAMINATION PROCEDURES (EDDY CUR EXAM PROC) – Procedures for detection of discontinuities in materials by distortion of an applied electromagnetic field.
 - 24.0 PRESSURE TEST – HYDRO, AIR, LEAD, BUBBLE OR VACUUM TEST PROCEDURES (PRESS TEST – HYDRO, AIR, BUBBLE – VAC TEST PROC) – Procedures for performing hydrostatic or pneumatic structural integrity and leakage tests.
 - 25.0 INSPECTION PROCEDURES (INSPECT PROC) – Organized process followed for the purpose of determining that specified requirements (dimensions, properties, performance results, etc.) are met. Includes procedures for dimensional inspection, hardness testing, and wall thickness.
 - 26.1 MECHANICAL TEST PROCEDURE (MECH TEST PROC) – Tests performed to demonstrate that functional design and operational parameters are met, e.g., pump performance data, valve stroking, load, temperature rise, calibration, environment, remote handling, load test, pipe bending, etc.
 - 26.2 ELECTRICAL TEST PROCEDURE (ELEC TEST PROC) – Tests performed to demonstrate that functional design and operational parameters are met, e.g., impulse, overload, continuity, voltage, temperature rise, calibration, saturation loss, etc.
 - 27.0 PROTOTYPE TEST REPORT (PROTO TYP TEST REPORT) – Report of a test which is performed on a standard or typical example of equipment or item, and is not required for each item produced in order to substantiate the acceptability of equal items. This may include tests that result in damage to the item(s) tested and failure data reports.
 - 28.0 PERSONNEL QUALIFICATION PROCEDURES (PERSONL QUAL PROC) – Procedures for qualifying welders, inspectors, and other special process personnel.
 - 29.0 SUPPLIER SHIPPING PREPARATION PROCEDURE (SPLR SHPNG PREP PROC) – The procedure used by a supplier to prepare finished materials or equipment for shipment from its facility to the jobsite.
 - 30.0 SUPPLIER DEVIATION DISPOSITION REQUEST (SDDR) – Form required to document deviation requests from supplier.
 - 31.0 POSITIVE MATERIAL IDENTIFICATION PROCEDURE (PMI) – The procedure for performing PME testing of materials.
 - 32.0 SOFTWARE DOCUMENTATION – Required documentation that is needed to utilize supplier provided software.
 - 33.0 COMMERCIAL GRADE DEDICATION DOCUMENTATION – Required documentation to support Commercial Grade Dedication activities.
 - 34.0 FACTORY ACCEPTANCE TEST (FAT) – This applies to factory acceptance tests conducted at the supplier's facility.

Note: Where additional space is needed to provide requested information, attach additional pages. All pages must be identified and traceable to the applicable form (G-321-E).

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**Quality Verification Document Requirements
Form G-321-V**

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Complete only applicable items.

Project Entity (Name): Yucca Mountain Project – Drip Shield Fabrication Specification						
1. Document Category Number	2. Specification Paragraph Reference	3. Document Description	4. BSC Release	5. Field Receipt Inspection Check-In	6. Remarks	7. Document Supplier Page Count
12.0	5.5.1.2	Weld & Qualification Verification Doc	Yes	Yes		
13.0	5.5.1.5.B, 9.6 Item G	Repair Map	Yes	Yes		
15.0	5.7	Cleaning Verification Report	Yes	Yes		
16.0	5.6	Heat Treatment Verification Report	Yes	Yes		
17.1	1.5.1.C, 4.1	Material Properties Report (CMTR)	Yes	Yes		
19.0	1.5.1, 6.1	UT- Report (Final)	No	Yes		
20.0	1.5.1, 6.1	RT- Report (Final)	No	Yes		
22.0	1.5.1, 6.1	PT- Report (Final)	No	Yes		
25.0	1.5.1, 5.3.2, 9.10	Inspection and Verification Reports (Dimensional/Calibration)	No	Yes		
25.0	1.5.1, 6.1	VT- Reports	No	Yes		
25.0	9.9, Appendix D	Manufacturer's Data Report	No	Yes		
25.0	2.1, 5.4	Weld, Material, and Radiographic Maps	No	Yes		
25.0	6.0, Appendix C	E-Mail Notification for Hold/Witness Points	Yes	Yes		
25.0	9.7	Inspection & Verification Reports (Serial & Lot Traceability)	No	Yes		
25.0	1.5.1	Inspection & Verification Reports (Travelers and/or Checklists – whichever is used)	Yes	Yes		
25.0	9.6, Appendix B	Inspection & Verification Reports (SDDR's)	Yes	Yes		
34.0	8.2	Open (Table of Contents)	No	Yes		
35.0	5.5.1.2	Personnel Qualification Records (WPQR's)	Yes	Yes		
35.0	6.1	Personnel Qualification Records (NDE)	Yes	Yes		
8. Supplier's Order No.:		9. Supplier's Part No.:		10. Supplier's Part Name:		11. Quantity:
12. BSC PO No.:		13. BSC Tag or Equipment No.:		14. BSC Part Name:		15. PO Item No.:
16. SUPPLIERS CONFORMANCE STATEMENT: We certify that the work and required documents meet the requirements of the procuring documents.			Authorized Supplier Signature:		Title:	Date:
17. BSC QUALITY REPRESENTATIVE AT PLANT: Work was released based on satisfactory completion of quality surveillance and review of documentation.			<input type="checkbox"/> With authorized deviations noted in Column 6 <input type="checkbox"/> No deviations		Signature of BSC SVR:	
18. 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 BSC Field Inspector:			Date:
19. FORWARD COPIES TO:			SPECIAL INSTRUCTIONS: Each page on the documentation package shall be identified with the applicable Document Category Number (column 1) listed above. Documents should not be tabulated (column 7) in more than one category. Mail the complete package to BSC Field Procurements Manager within 3 days. One complete copy of the package to be sent with the shipment within 3 days after shipment.			
20. Requisition Title:				21. Requisition No.: (MR No.)		22. MR Rev. No.:

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**Quality Verification Document Requirements
Form G-321-V**

QA:QA

Page 2 of 3

Complete only applicable items.

**INSTRUCTIONS FOR THE PREPARATION OF
FORM G-321-V**

- A. PURPOSE: Form G-321-V is initially prepared by BSC Engineering and completed by the supplier when providing Quality Verification Documents to BSC in support of the work. This is a multi-purpose form to:
 - (1) Transmit quality verification documents from the supplier.
 - (2) Provide a Certificate of Conformance from the supplier.
 - (3) Evidence SQR release of documentation and/or work.
 - (4) Provide evidence of a Field Inspection check of the quality verification documentation received at the installation site.
- B. GENERAL INFORMATION: Instructions for filling out form G-321-V are found in Sections E & F. Detailed quality verification document categories and definitions are found in Section G.
- C. DISTRIBUTION: Quality verification documents required to be provided by form G-321-V shall be forwarded to the group(s) and destination(s) designated under entry #19, "Forward copies to." For the PO Item number(s) being released (Entry 15), the supplier shall provide the completed G-321-V forms and the supporting Quality Verification Documents.
- D. DEFINITIONS OF TERMS: (Also see document category definitions in Section G).
 - Supplier - This is a seller, vendor, contractor, subcontractor, sub-supplier, etc.
 - Reproducible - A master copy which can be legibly duplicated by either micro-reproduction, diazo, or electrostatic process. Diazo sepias may be submitted only if they meet and satisfy BSC imaging requirements.
 - Electronic - Electronic data submitted in formats identified in the Drawing and Data Requirements Form or as directed by BSC.
 - Drawings submitted as final show title, job number, purchase order number, line, equipment, tag or code number, and the manufacturer's serial number.
- E. BSC ENTRY INSTRUCTIONS

Entry No.	Information Required
1.	Enter Document Category Number as shown in Section G.
2.	Enter Specification Paragraph Reference which address the subject document.
3.	Enter Description or Abbreviated Description corresponding to the Document Category Number.
4.	When BSC Source Verification is required as noted on the PO cover sheet, the SQR or Authorized Representative will initial upon satisfactory review of the document(s).
5.	BSC Field Inspection at the jobsite will complete upon satisfactory checks of the document(s).
6.	Enter "Remarks" as appropriate. When a deviation has occurred, reference the deviation(s) and Authorization Document(s) in this column and include the authorization document(s) in the verification package.

Entry No.	Information Required
17.	Upon satisfactory review of the Quality Verification Document Package and Associated Deviations, if any, the SQR or BSC's Authorized Representative signs and dates this block denoting release for shipment.
18.	Upon receipt of the Quality Verification Documentation Package at the jobsite, the Field Inspector will review the documents and the appropriate hardware and found to be satisfactory, signs and dates this block. Missing, incomplete, or deficient items will be brought to the attention of the supplier by BSC Field Procurement personnel.
19.	Enter the name and address to which items or documents are to be forwarded.
20.	Description as stated on the Material Requisition.
21.	MR Number.
22.	MR Revision Number.

F. SUPPLIER ENTRY INSTRUCTIONS

Entry No.	Information Required
7.	Enter the number of pages of Quality Verification Document being submitted, corresponding to the unit being released. Sign Entry 16.
8, 9, 10	Enter information required.
11.	Enter the quantity of units covered by the Quality Verification Documents being submitted with this form.
12, 13, 14	Enter information required.

Entry No.	Information Required
15.	Enter the BSC PO Item Number(s) that apply to the item(s) being shipped.
16.	Supplier - Signature, title, and date of the person responsible for the prime supplier's QA function and whose function and position are described in the prime supplier's QA program.
19.	Upon Inspection Release, Entry 17, the completed Quality Verification Documents are forwarded by the supplier to the address(es) shown.

Note: Where additional space is needed to provide requested information, attach additional pages. All pages must be identified and traceable to the applicable form G-321-V.

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Quality Verification Document Requirements Form G-321-V

QA:QA

Page 3 of 3

Complete only applicable items.

- G. DOCUMENT CATEGORY NUMBERS AND DETAILED DESCRIPTIONS - Quality Verification Documents. This term comprises material test reports, heat treatment charts, welding records, NDE results, performance test reports, and similar document(s), which demonstrate or certify conformance to the technical or inspection requirements of the procurement documents.
- 12.0 WELDING QUALIFICATION VERIFICATION REPORTS – A verification report of welds performed including the identification of the qualified weld(s), and certification that the weld(s) were qualified.
 - 13.0 MATERIAL VERIFICATION REPORTS – Reports relative to materials that confirm, substantiate or assure that an activity or condition has been implemented in conformance with code and material specifications imposed by the procurement documents.
 - 14.0 MAJOR REPAIR VERIFICATION REPORTS – Verification reports may include weld repair locations (maps), material test reports for filler material, pre- and post-weld heat treatment records, NDE records, etc. The resolution of whether a repair is major or not is a BSC responsibility.
 - 15.0 CLEANING AND COATING VERIFICATION REPORTS – Verification reports include certification of visual examination for surface preparation, surface profile, materials, etc., humidity data and coating thickness data as required by the procurement documents.
 - 16.0 HEAT TREATMENT REPORTS – Verification reports normally include furnace charts or similar records, that identify and certify the item(s) treated, the procedures used, furnace atmospheres, time at temperature, cooling rate, etc.
 - 17.1 MATERIAL TEST REPORTS (MTR) – These reports include all chemical, physical, mechanical, and electrical property test data required by material specification and applicable codes. This also includes corrosion testing or other Buyer specified material testing. This is applicable to cement, concrete, metals, cable jacket materials, rebar, rebar splices, etc.
 - 17.2 IMPACT TEST DATA – Results of Charpy or drop weight tests including specimen configuration, test temperature and fracture data.
 - 17.3 FERRITE DATA – Report of the ferrite percentage for stainless steel materials used, including castings and welding filler metals as deposited.
 - 17.4 MATERIAL CERTIFICATE OF COMPLIANCE – Verification document that certifies conformance to the requirements of the applicable material specification.
 - 17.5 ELECTRICAL PROPERTY REPORTS – Reports of electrical characteristics, e.g., dielectric, impedance, resistance, flame tests, corona, etc.
 - 18.0 CODE COMPLIANCE – Verifying documents (such as Forms U-1, N-1, State, etc.), that are prepared by the manufacturer or installer and certified by the Authorized Code Inspector.
 - 19.0 UT – ULTRASONIC EXAMINATION AND VERIFICATION REPORTS – Examination results of presence and certain characteristics of discontinuities and inclusions in material by the use of high-frequency acoustic energy.
 - 20.0 RT – RADIOGRAPHIC EXAMINATION AND VERIFICATION REPORTS – Examination results of presence and certain characteristics of discontinuities and inclusions in materials by x-ray or gamma ray exposure of photographic film.
 - 21.0 MT – MAGNETIC PARTICLE EXAMINATION AND VERIFICATION REPORTS – Examination results of surface (or near surface) discontinuities in magnetic materials by distortion of an applied magnetic field.
 - 22.0 PT – LIQUID PENETRANT EXAMINATION AND VERIFICATION REPORTS – Examination results of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable developing techniques.
 - 23.0 EDDY CURRENT EXAMINATION AND VERIFICATION REPORTS – Examination results of discontinuities in materials by distortion of an applied electromagnetic field.
 - 24.0 PRESSURE TEST – HYDRO, AIR, LEAD, BUBBLE, OR VACUUM TEST AND VERIFICATION REPORTS – Results of hydrostatic or pneumatic structural integrity and leakage tests.
 - 25.0 INSPECTION AND VERIFICATION REPORTS – Documented findings resulting from an inspection.
 - 26.1 MECHANICAL TEST REPORTS – For pump performance data, valve stroking, load, temperature rise, calibration, environment, etc.
 - 26.2 ELECTRICAL TEST REPORTS – For load, impulse, overload, continuity, voltage, temperature rise, calibration, saturation loss, etc.
 - 27.0 PROTOTYPE TEST REPORT – Report of a test that is performed on a standard or typical example of equipment, material, or item and is not required for each item produced in order to substantiate the acceptability of equal items. This normally includes tests, that may, or could be expected to, result in damage to the item(s) tested.
 - 30.0 SUPPLIER DEVIATION DISPOSITION REQUEST – Completed and approved form documenting supplier deviations to the order.
 - 31.0 POSITIVE MATERIAL IDENTIFICATION (PMI) RESULTS – Documentation of PMI showing chemical properties and material classification.
 - 33.0 COMMERCIAL GRADE DEDICATION DOCUMENTATION – Required documentation to support Commercial Grade Dedication activities.
 - 34.0 FACTORY ACCEPTANCE TEST (FAT) – System test(s) conducted at the supplier's facility to demonstrate item or equipment performance meets specified requirements.

EG-PRO-3DP-G04B-00058.4-r0