



ISSUED BY  
RPP-WTP PDC

R11432794

**RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT**

**ENGINEERING SPECIFICATION  
FOR  
HLW System HDH Canister Rinse Bogie**

Content applicable to ALARA?

Yes  No

ADR No.  
24590-HLW-ADR-M-02-048

Rev  
001

Specification changes retroactive?

Yes  No  
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Quality Level

Q

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NOTE: Contents of this document are Dangerous Waste Permit affecting.

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**SPECIFICATION No.**  
24590-HLW-3PS-MQR0-T0002

**Rev**  
5

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

**Revision History**

Revision	Reason for Revision
0	Issued for Procurement
1	Issued for Purchase. Seismic requirements clarified. Appendix A updated. Appendix B & C added. Additional revisions indicated with revision bars.
2	Issued for Purchase. SCN 24590-HLW-3PN-MQR0-00002 & 24590-HLW-3PN-MQR0-00002 incorporated. Additional revisions indicated with revision bars.
3	Issued for Purchase. SCN's 24590-HLW-3PN-MQR0-00003, 24590-HLW-3PN-MQR0-00004, 24590-HLW-3PN-MQR0-00005, 24590-HLW-3PN-MQR0-00006, 24590-HLW-3PN-MQR0-00007 & 24590-HLW-3PN-MQR0-00008 incorporated. SDDR's 24590-WTP-SDDR-PROC-04-00857, 24590-WTP-SDDR-PROC-05-00041, 24590-WTP-SDDR-PROC-05-00180, 24590-WTP-SDDR-PROC-05-00551, & 24590-WTP-SDDR-PROC-05-00552 incorporated. Exclusions to general specifications identified in sections 5.1.6, 5.2.2.2, 5.2.2.17, 5.7.1, 5.7.8, 5.8.1.1, 6.1, 7.2, 8.2.3.1, and 8.5.1.
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5	Issued for purchase TCN's incorporated: 24590-QL-MRA-MQTS-00002-T0003, 24590-QL-MRA-MQTS-00002-T0004, and 24590-QL-MRA-MQTS-00002-T0005. SDDR's incorporated: 24590-WTP-SDDR-MH-10-00130, 24590-WTP-SDDR-MH-10-00131, 24590-WTP-SDDR-MH-11-00048, and 24590-WTP-SDDR-MH-11-00130 SDDR's incorporated by reference: 24590-WTP-SDDR-MH-07-00287, 24590-WTP-SDDR-MH-08-00174, 24590-WTP-SDDR-MH-08-00271, 24590-WTP-SDDR-MH-09-00227, 24590-WTP-SDDR-MH-11-00009, 24590-WTP-SDDR-MH-11-00018, 24590-WTP-SDDR-MH-11-00020, 24590-WTP-SDDR-MH-11-00039, and 24590-WTP-SDDR-MH-11-00056. E&NS signature is not required on the sign off sheet because they have previously reviewed and approved all the incorporated change documents for this revision.

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# 1 Scope

## 1.1 Project Description and Location

1.1.1 The Office of River Protection (ORP) and its contractors manage 177 underground radioactive waste storage tanks at the Hanford Site in Washington. These tanks contain approximately 55.5 million US gallons of radioactive waste. Bechtel National, Inc. (BNI) has entered into a contract with the US Department of Energy (DOE) to design, construct, and commission a Hanford Tank Waste Treatment and Immobilization Plant (WTP) to process and vitrify the waste into a stable form that is suitable for permanent storage. The WTP will be constructed in the 200 East Area of the Hanford Site, near Richland, Washington. The main facilities within the WTP complex will be the Pretreatment (PTF), Low-Activity Waste (LAW) and High-Level Waste (HLW) Facilities.

## 1.2 Equipment, Material, and Services Required

1.2.1 This engineering specification covers the equipment, materials and services required for the design and supply of the HLW Canister Decontamination Handling (HDH) System, Canister Rinse Bogie and associated equipment.

1.2.2 A bogie is a four (4) wheeled trolley that travels on a pair of parallel rails.

1.2.3 The Canister Rinse Bogie is used to transport Immobilized High-Level Waste (IHLW) Canisters containing radioactive material from one location to another during process activities. A vessel located on the bogie holds the canister and performs a pre-wash of the canister at an intermediate station. The bogie travels in a process tunnel during normal operation, but has the ability to leave the tunnel and enter an adjoining room for maintenance purposes. A shield door separates the process and maintenance areas, and provides radiological shielding.

1.2.4 This specification supports Material Requisition (MR) No. 24590-QL-MRA-MQTS-00002

1.2.5 The Seller shall design, fabricate, inspect and functionally test equipment as specified in this specification. The equipment shall be fabricated and assembled in compliance with this specification, referenced codes and standards, and detail drawings reviewed by the Buyer. The Seller is responsible for:

- Design
- Procurement of materials
- Fabrication
- Assembly
- Tagging equipment with a component tag number (CTN)
- Functional Testing
- Examination/inspection
- Packaging and preparation for shipping
- Loading of equipment on Buyer arranged conveyance
- Umbilical electric cable located in Bogie Maintenance Area, see Section 3

- Submittals as identified in the submittal requirements found in the Purchase Order (PO) and this specification
- Installation, Operation, and Maintenance Manuals
- Lists of recommended spare parts
- Field support for installation and testing

1.2.6 The Seller shall provide the following equipment and any other equipment as necessary to perform the requirements identified in this specification:

Plant Item Number 24590-HLW-	Description
MQ-HDH-TRLY-00003	Canister Rinse Bogie
MV-HDH-VSL-00001	Canister Rinse Bogie Decon Vessel
MH-HDH-RAIL-00002	Canister Rinse Bogie Rails
MH-HDH-RAIL-00004	Canister Rinse Bogie Seismic Rails
MH-HDH-MHAN-00016	Canister Rinse Vessel Service Track
MH-HDH-MHAN-00017	Canister Rinse Bogie Service Track
MH-HDH-RCVY-00009	Canister Rinse Bogie Recovery System
MH-HDH-MHAN-00011	Canister Rinse Bogie Spool Piece
MH-HDH-MHAN-00015	Canister Rinse Vessel Lid
MP-HDH-PMP-00001	Bogie Decon Canister Pump
JC-HDH-PNL-00001	Canister Rinse Bogie ASD Control Cabinet

- 1.2.7 The Seller shall provide any special lifting equipment and tools, for assembly (or disassembly), installation, or maintenance of the bogie and associated equipment.
- 1.2.8 The Buyer shall provide a “mock-up” canister for shop testing, see Section 8.2 of this specification.
- 1.2.9 The Seller shall verify the accuracy and applicability of design information to meet the requirements identified in this specification. The Seller is encouraged to propose design improvements, which could result in quality, performance, cost, or schedule benefits beyond those offered by the Design Proposal Drawings (DPDs), and Mechanical Data Sheets (MDSs) accompanying the Purchase Order.
- 1.2.10 All requests for substitutions, modifications, or relaxation of this specification or requirements specified in the referenced documents shall be identified in writing for the consideration of the Buyer. For DPDs and MDSs, the following shall be considered required elements: parameters indicated as bounding (“max”, “min”, “not-to-exceed”, or similar qualifier); information present on the DPDs and MDSs that includes the term “required”, “mandatory”, “shall”, or similar term; components or equipment identified as pre-selected or mandatory by the Buyer. The Seller shall document such changes in a Supplier Deviation Disposition Request (SDDR) in accordance with Section 2 of the Purchase Order.
- 1.2.11 The following items and services will be supplied by the Buyer and are not included in the Seller’s scope of work:
- Embed plates embedded in structural concrete to which equipment is anchored
  - Waste Neutralization Vessel (PI. No. 24590-HLW-MV-HDH-VSL-00003)

- Shipment from Seller's location to the Hanford receiving location
- Unloading at Hanford receiving location
- Field assembly, installation, erection and field testing of the bogie, vessel, and associated equipment
- Field startup, test, and run-in labor and materials
- Installation of conduit and wiring from the Seller provided control cabinets to the Buyer's Motor Control Center (MCC), Buyer's Controller, and Buyer's Remote I/O
- Mains electric power supply and connections
- Field touch-up painting
- Programming of the bogie control system
- Startup and commissioning
- Mock-up canister

### 1.3 Work by Others

- 1.3.1 The Seller may subcontract portions of the work, including any portion of the design, fabrication, manufacturing, or inspection, provided it meets the conditions of this specification and the Buyer's approval is obtained.
- 1.3.2 The Seller shall be ultimately responsible for the completeness and quality of all materials and services provided.

### 1.4 Definitions and Abbreviations

#### 1.4.1 Definitions

- 1.4.1.1 Buyer: Bechtel National, Inc. (BNI)
- 1.4.1.2 Offeror: The party submitting a proposal for the equipment and/or services described in this specification.
- 1.4.1.3 Seller: The party selected to provide the equipment and/or services described in this specification.
- 1.4.1.4 Shall: Indicates a mandatory requirement in order to comply
- 1.4.1.5 Should: Indicates a recommendation for compliance

#### 1.4.2 Abbreviations

ANSI	American National Standards Institute
AISC	American Institute of Steel Construction
API	American Petroleum Institute
ASD	Adjustable Speed Drive
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
BNI	Bechtel National, Inc.
CFR	Code of Federal Regulations
CM	Commercial Quality

CMAA	Crane Manufacturers Association of America
CTN	Component Tag Number
DOE	Department of Energy
DPD(s)	Design Proposal Drawing(s)
EMI	Electromagnetic Interface
HDH	HLW Canister Decontamination Handling
HLW	High-Level Waste
HMI	Human-Machine Interface
ICN	Integrated Control Network
ICS	Industrial Controls and Systems
IEEE	Institute of Electrical and Electronics Engineers
IHLW	Immobilized High-Level Waste
IJB	Instrument Junction Box
I/O	Input/Output
ISA	Instrumentation, Systems, and Automation Society
ITS	Important to Safety
LAW	Low-Activity Waste
LOI	Local Operator Interface
MCC	Motor Control Center
MDS(s)	Mechanical Data Sheet(s)
MHD(s)	Mechanical Handling Diagram(s)
MR	Material Requisition
MSDS	Material Safety Data Sheet
MTR(s)	Material Test Report(s)
NDE	Non-Destructive Examination
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Agency
NQA	Nuclear Quality Assurance
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
P&ID(s)	Piping and Instrumentation Diagram(s)
PO	Purchase Order
PTF	Pretreatment Facility
PTFE	Polytetrafluoroethylene
QAP	Quality Assurance Program
QL	Quality Level
RFI	Radio Frequency Interface
RIO	Remote I/O
SC	Seismic Category
SDC	Safety Design Class
SDDR	Supplier Deviation Disposition Request
SDS	Safety Design Significant
SSC(s)	Structures, Systems or Components
TEFC	Totally Enclosed Fan Cooled
TFE	Tetrafluoroethylene
UBC	Uniform Building Code
UL	Underwriters Laboratories
WNRF	Weld Neck Raised Face
WTP	Hanford Tank Waste Treatment and Immobilization Plant

## 1.5 Safety/Quality Classifications

### 1.5.1 Important to Safety

1.5.1.1 Structures, Systems, and Components (SSCs) that serve to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the workers and public are classified as Important to Safety (ITS). ITS encompasses the broad class of facility features addressed in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation and accident mitigation).

1.5.1.2 SSCs designated as ITS are classified as either Safety Design Class (SDC) or Safety Design Significant (SDS).

- The classification Safety Design Class (QL-1) is assigned to SSCs that prevent or mitigate offsite public, worker, or co-located worker radiological exposures that could exceed the standards.
- The classification Safety Design Significant (QL-2) is assigned to SSCs that ensure the that radiological standards for normal operation are not exceeded.

1.5.1.3 For Quality Assurance requirements of ITS SSCs refer to Section 10 of this specification.

### 1.5.2 Non Important to Safety

1.5.2.1 SSCs designated as Non-ITS, or Commercial Quality (CM), are those SSCs not classified as SDS, SDC, or Immobilized High-Level Waste (IHLW) product-quality affecting. Non-ITS items are manufactured using standard commercial practices as required by applicable industry standards, with the quality requirements identified in the Seller's Quality Assurance Program (QAP).

1.5.2.2 For Quality Assurance requirements of Non-ITS SSCs refer to Section 10 of this specification.

**1.5.3 Equipment Classifications**

1.5.3.1 The table below identifies equipment that have components designated as ITS.

Equipment	Components	Safety Classification (Quality Level)	Critical Characteristics
Canister Rinse Bogie	All components that maintain structural integrity (i.e. load path items) of the bogie and vessel support stand. These include but are not limited to, bogie chassis, vessel support stand, uplift restraints, bumpers, bogie rail end stops, and bolted/welded connections on the load path, including connections to bogie chassis.	SDS (QL-2)	Maintain vessel and canister on bogie and prevent bogie from derailing under normal operating conditions (following a wheel failure) or an SC-II design basis earthquake.
	All other components (including drive system and wheel modules)	Non-ITS	N/A
Canister Rinse Bogie Seismic Rails	All load path components that maintain the structural integrity, including bolted/welded connections.	SDS (QL-2)	Prevent bogie from derailing under normal operating conditions (following a wheel failure) or an SC-II design basis earthquake.
	All other components	Non-ITS	N/A

1.5.3.2 All other equipment identified in this specification are designated as Non-ITS. SSCs, identified as Non-ITS can include, but are not limited to, non-load path items and proprietary items such as motors, gearboxes and winches.

1.5.3.3 For seismic loading requirements, refer to Section 5.6.4 of this specification.

## 2 Applicable Documents

### 2.1 General

- 2.1.1 Work shall be carried out in accordance with, but not limited to, the applicable codes and standards listed in the following subsections. The specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference (daughter codes and standards) shall be followed. If a date or revision is not identified, the latest issue, including addenda, in effect at the date of contract award or later, shall be used. Deviation from the dated codes and standards shall only apply with the agreement of the Buyer, or when in accordance with Sections 6.5 and 6.6 of this specification.
- 2.1.2 The Seller shall refer to Section 2 of the Purchase Order for the appropriate revisions of the WTP project documents identified in Sections 2.3, 2.4 and 2.5 of this specification.
- 2.1.3 Any known or suspected conflicts between the specifications, drawings, and the applicable codes and standards, shall be brought to the attention of the Buyer, via a SDDR, for resolution prior to start of work.
- 2.1.4 Where requirements in this specification exceed code requirements, this specification shall govern.
- 2.1.5 Deleted

### 2.2 Codes and Standards

- 2.2.1 American Society of Mechanical Engineers (ASME)
- ASME NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facility Applications*
- ASME B&PV Section VIII Division 1, *Rules for Construction of Pressure Vessels DIVISION 1 Non-Interfiled (Boiler and Pressure Vessel Codes)*
- ASME B31.3 -1996, *Process Piping*
- ASME NOG-1-2002, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*
- ASME/ANSI B73.2M, *Specification for Vertical In-Line Centrifugal Pumps for Chemical Process*
- ASME B46.1, *Surface Texture (Surface Roughness, Waviness & Lay)*
- 2.2.2 American Welding Society (AWS)
- AWS D1.1 2002, *Structural Welding Code – Steel*
- AWS D1.6, *Structural Welding Code – Stainless Steel*

- 2.2.3 American Institute of Steel Construction (AISC)  
*AISC MO16, Manual of Steel Construction, Allowable Stress Design, 9th Edition*
- 2.2.4 Crane Manufacturers Association of America (CMAA)  
*CMAA 70-2000, Specification for Top Running Electric Overhead Traveling Cranes*
- 2.2.5 Department of Energy (DOE) Orders and Directives  
*DOE O 414.1A, Quality Assurance*
- 2.2.6 Instrumentation, Systems, and Automation Society (ISA)  
*ISA 5.1, Instrument Symbols and Identification*
- 2.2.7 National Electrical Manufacturers Association (NEMA)  
*NEMA, MG-1-1998, Motors and Generators*
- 2.2.8 Institute of Electrical and Electronics Engineers (IEEE)  
*IEEE Std 1023-1988, IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations*  
*IEEE Std 1205-2000, IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment used in Nuclear Power Generating Stations, Annex D*
- 2.2.9 Code of Federal Regulations (CFR)  
*FED-STD 595B-1994, Colors Used in Government Procurement*  
*10 CFR Part 830, Quality Assurance Criteria*
- 2.2.10 Uniform Building Code (UBC)  
*UBC-1997, Uniform Building Code*
- 2.2.11 Underwriters Laboratories (UL)  
*UL 508 -1999, Standard for Safety Industrial Control Equipment*
- 2.2.12 National Fire Protection Association (NFPA)  
*NFPA Volume 70, 1999 National Electric Code (NEC)*
- 2.2.13 Department of Defense and Energy Standards, Nuclear Regulations  
*MIL-STD-1472F Human Engineering*

DOE-HDBK-1140, 2001 of	Human Factors/Ergonomics Handbook for the Design for Ease Maintenance
NUREG-0700	Human System Interface Design Review Guidelines
NUREG-0711	Human Factors Engineering Program Review Model

2.2.14 American Society of Testing Materials (ASTM)

ASTM A554 Standard Specification for Welded Stainless Steel Mechanical Tubing.

2.2.15 EN 292-1 Safety of Machinery - Basic Concepts, General Principles of Design - Part 1;  
Basic Terminology, Methodology.

2.2.16 EN 292-2 Safety of Machinery - Basic Concepts, General Principles of Design - Part 2;  
Technical Principle and Specifications.

2.2.17 ISO 281:1990 Roller bearings - Dynamic load ratings and rating life.

2.2.18 AGMA 908 Geometry Factors for Determining Pitting Resistance and Bending Strength  
of Spur, Helical, and Herringbone Gear Teeth.

2.2.19 AGMA 2001 Fundamental Rating Factors and Calculation Methods for Involute Spur and  
Helical Gears.

### 2.3 WTP Project Specifications

2.3.1 24590-WTP-3PS-M000-T0002, Rev 0, *General Specification for Mechanical Handling  
Equipment Design and Manufacture*, Bechtel National, Inc., Richland, Washington. Sections  
which do not apply to this equipment: 3.5.8.1, 3.5.8.2, 3.5.8.5, 3.6, 3.7, 4.1.9, 4.1.10, 4.1.11,  
4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13.

2.3.2 24590-WTP-3PS-P000-T0001, Rev 4, *Engineering Specification for Piping Material Classes*,  
Bechtel National, Inc., Richland, Washington. Section which does not apply to this  
equipment: 16.

2.3.3 24590-WTP-3PS-EKP0-T0001, Rev 2, *Engineering Specification for Electrical Requirements  
for Packaged Equipment*, Bechtel National, Inc., Richland, Washington. Sections which do  
not apply to this equipment: 6.4.2.3, 6.4.3.1, 6.6.1, 6.6.3, and 6.8.

2.3.4 24590-WTP-3PS-JQ07-T0001, Rev 1, *Engineering Specification for Instrumentation for  
Package Systems*, Bechtel National, Inc., Richland, Washington. Sections which do not apply  
to this equipment: 3.4.5.1, 3.4.5.2.3, 3.4.5.4.4, 3.4.5.9, 3.4.5.10, 3.4.5.12, 3.4.5.13, 3.4.5.14,  
3.4.5.15, 3.4.5.16, 3.4.5.17, 3.7.1, 3.8.3, 3.8.4, 3.8.6, 3.8.7, and 3.8.8.1.

2.3.5 24590-WTP-3PS-MUMI-T0002, Rev 2, *Engineering Specification for Low Voltage Induction  
Motors*, Bechtel National, Inc., Richland, Washington. Sections which do not apply to this  
equipment: 5.1.1, 5.3, and 5.4.1.

- 2.3.6 24590-WTP-3PS-JD02-T0001, *Engineering Specification for Intelligent Drives for Packaged Equipment*, Bechtel National, Inc., Richland, Washington
- 2.3.7 Deleted.
- 2.3.8 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling, and Storage Requirements*, Bechtel National, Inc., Richland, Washington
- 2.3.9 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Bechtel National, Inc., Richland, Washington
- 2.3.10 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*, Bechtel National, Inc., Richland, Washington
- 2.3.11 24590-WTP-3PS-SS00-T0001, Rev 5, *Welding of Carbon Structural Steel*, Bechtel National, Inc., Richland, Washington. Section which does not apply to this equipment: 8.18.
- 2.3.12 24590-WTP-3PS-SS00-T0002, *Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*, Bechtel National, Inc., Richland, Washington
- 2.3.13 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, Bechtel National, Inc., Richland, Washington
- 2.3.14 24590-WTP-3PS-PV00-T0001, Rev 1, *Engineering Specification for Technical Supply Conditions for Valves*, Bechtel National, Inc., Richland, Washington. Section which does not apply to this equipment: 5.4.

## 2.4 WTP Design Documents

### 2.4.1 Design Proposal Drawings (DPDs)

Document Number	Document Description
24590-HLW-M0-HDH-00013	Canister Rinse Bogie Arrangement
24590-HLW-M0-HDH-00012001	Canister Rinse Bogie
24590-HLW-M0-HDH-00012002	Canister Rinse Bogie
24590-HLW-M0-HDH-00008	Canister Rinse Bogie Rails
24590-HLW-M0-HDH-00010	Canister Rinse Bogie Seismic Rails
24590-HLW-M0-HDH-00043	Canister Rinse Bogie Service Tracks
24590-HLW-M0-HDH-00029	Canister Rinse Bogie Recovery System

### 2.4.2 Mechanical Data Sheets (MDSs)

Document Number	Document Description
24590-HLW-M0D-HDH-00029	Canister Rinse Bogie Spool Piece

Document Number	Document Description
24590-HLW-M0D-HDH-00030	Canister Rinse Vessel Lid
24590-HLW-MPD-HDH-00001	HDH-PMP-00001 Canister Rinse Bogie Pump
24590-HLW-MVD-HDH-00009	HDH-VSL-00001 Canister Rinse Bogie Vessel

### 2.4.3 Reference Drawings and Data Sheets

Document Number	Document Description
24590-HLW-M6-HDH-00002	P&ID – HLW Canister Decontamination Handling System
24590-HLW-M0-HDH-00001001	DPD, Canister Rinse Bogie Decon/Maint Shield Door Arrangement
24590-HLW-M0-HDH-00001002	DPD, Canister Rinse Bogie Decon/Maint Shield Door Arrangement & Details
24590-HLW-M0-HDH-00002	DPD, Canister Rinse Bogie Decon/Maint Shield Door Embed Plates
24590-HLW-M0-30-00001001	HLW Test Canister Assembly
24590-HLW-M0D-HDH-00002	MDS, Canister Rinse Bogie Maint Crane 1
24590-HLW-M0D-HDH-00003	MDS, Canister Rinse Bogie Maint Crane 2

### 2.5 Other WTP Documents

- 2.5.1 24590-WTP-3PD-MQTS-00002, *Supplier Quality Assurance Program Requirements Data Sheet*, Bechtel National, Inc., Richland, Washington
- 2.5.2 24590-WTP-3PD-MQTS-00004, *Supplier Quality Assurance Program Requirements Data Sheet*, Bechtel National, Inc., Richland, Washington
- 2.5.3 24590-HLW-SOC-S15T-00009, Rev 0D, *HLW Vitrification Building Seismic Analysis - In-Structure Response Spectra (ISRS)*, Bechtel National, Inc., Richland, Washington.
- 2.5.4 24590-HLW-SOC-S15T-00039, Rev D, *HLW Vitrification Building Seismic Analysis - Enveloped In-Structure Response Spectra*, Bechtel National, Inc., Richland, Washington.

## 3 System Description

- 3.1 The Canister Rinse Bogie operates in the HLW Canister Decontamination Handling (HDH) System.
- 3.2 The Canister Rinse Bogie travels in the Canister Rinse Tunnel (Room H-B039B) during normal operations. The Canister Rinse Tunnel is classified as a C5/R5 and C3/R3 transition zone. Maintenance activities are performed in an adjoining Bogie Maintenance Area (Room H-B039A), separated by a shield door from the process area. The Bogie Maintenance Area is classified as C3/R3. For environmental conditions and definitions of the classification of areas refer to project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*.

- 3.3 Where dual classifications are identified on the DPDs, for example, C5/R5 and C3/R3, they indicate a transition zone where the room is designated as C5/R5 when a container is present and C3/R3 when a container is not present.
- 3.4 The Canister Rinse Bogie transfers glass filled IHLW Canisters from a position below the Canister Handling Cave (Room H-136) to a position below the Canister Decontamination, Swabbing and Monitoring Cave (Room H-133). A vessel located on the bogie holds the canister and performs a pre-wash of the canister at an intermediate station.
- 3.5 The purpose of the pre-wash is to perform a general rinse of the canister prior to transfer into the Canister Decontamination, Swabbing and Monitoring Cave.
- 3.6 The basic operations are as follows:
- Bogie and vessel positioned under the hatch located in the Canister Handling Cave
  - Canister lowered into vessel, through hatch, by overhead crane located in the Canister Handling Cave
  - Bogie, vessel and canister travel to the Canister Rinse Station
  - Canister rinse cycle, see Section 4.2 of this specification
  - Bogie, vessel and canister travel to a position under the hatch located in the Canister Decontamination, Swabbing, and Monitoring Cave
  - Canister removed from bogie after 30 minute drying period, through hatch, by overhead crane located in the Canister Decontamination, Swabbing, and Monitoring Cave
  - Bogie and vessel travel to a position under the hatch located in the Canister Handling Cave
- 3.7 Process and electrical services are provided to the bogie and vessel through service tracks (energy chains) located in the Canister Rinse Tunnel. When the bogie requires transferring from the process area to the maintenance area the service tracks and the service connections (process and electrical) are manually disconnected from the bogie at the shield door aperture and parked on a bracket located at the door aperture. A Seller provided umbilical electrical cable, located in the maintenance area, is manually connected to the bogie terminal box allowing the bogie to transfer into the maintenance area. The umbilical electrical cable provides the power and control to the bogie only. Once the bogie is located in the maintenance area the shield door is closed prior to any maintenance activities being performed.
- 3.8 An overflow line shall be placed on the rinse vessel at a height such that the level of the liquid in the vessel restricts the generation of Hydrogen (HPAV) if the system were to shut down with a canister on the rinse bogie for an extended period of time.

## 4 Equipment Description

### 4.1 Canister Rinse Bogie

- 4.1.1 The bogie is a motorized trolley used for transporting IHLW Canisters containing radioactive material from one location to another during process activities.

- 4.1.2 The bogie is driven by an on-board geared motor, and travels on a pair of floor-mounted rails.
- 4.1.3 Power and control are provided to the bogie through a service track.
- 4.1.4 The bogie control system uses bogie mounted proximity switches and the motor brake to control the process stopping positions of the bogie
- 4.1.5 The bogie control system uses a bogie mounted ultimate travel limit switch to prevent the bogie from impacting the rail end stops in the event of a proximity (positioning) switch failure.
- 4.1.6 A stand mounted to the bogie chassis supports the Canister Rinse Vessel.
- 4.1.7 Restraints mounted to the side of the vessel support stand, in conjunction with the seismic rails (see Section 4.4), prevent the bogie from overturning or derailing in the event of a wheel failure or a seismic event.

## 4.2 Canister Rinse Vessel

- 4.2.1 The vessel is mounted to a support frame located on the bogie chassis. The vessel locates the canister for transfer and provides the containment and associated services for canister washing.
- 4.2.2 An inflatable seal mounted to the top flange of the vessel provides the seal between the vessel and the spool piece (see Section 4.7) to provide containment of the water spray during the rinse cycle. Process air is supplied to the inflatable seal from the Buyer's plant utility system through a 1" pipe, and has a line pressure of 90 - 100 psig. The line pressure is reduced to 25 psig by a pressure regulator for the inflatable seal air supply.
- 4.2.3 A series of spray nozzles located in the vessel directs demineralized water to spray the entire surface of the canister. The proposal drawings provided with this specification show an upper and lower spray ring. This allows the canister to be sprayed in stages due to the limiting flow rate. Demineralized water is supplied to the vessel from the Buyer's plant utility system through a 2" pipe, and has a maximum flow rate of 90 gpm and pressure 60 psig.
- 4.2.4 The maximum batch transfer to the vessel is 360 gallons. Maximum batch transfer is defined as the maximum water volume transferred to the vessel during the rinse cycle.
- 4.2.5 Two (2) solenoid operated on/off control valves divert the water flow between the upper and lower spray rings while a centrifugal pump continually discharges the water from the vessel during the rinse cycle. Water is discharged from the vessel to the Buyer's Waste Neutralization Vessel through a 2" pipe.
- 4.2.6 A high-high level switch and continuous level instrument monitor the water levels in the vessel during the rinse cycle.
- 4.2.7 The following rinse cycle is based on the proposal drawings provided with this specification:
  - Pressurize the inflatable seal to make the seal between the vessel and the spool piece.

- Open the upper demineralized water line for the upper spray ring to begin the water wash.
- After the vessel has filled to 10 gallons, confirm that the vessel discharge pump has begun discharging the water at 80 gpm.
- After washing with 180 gallons of water in 2 minutes, close upper demineralized water line. After 2.5 minutes the vessel should be fully drained (check the level indicator on the vessel).
- Open the lower demineralized water line for the lower spray ring to finish the water wash.
- After the vessel has filled to 10 gallons, check that the vessel discharge pump has begun discharging the water at 80 gpm.
- After washing with 180 gallons of water in 2 minutes, close lower demineralized water line. After the vessel is emptied (2.5 minutes), ensure the vessel discharge pump is shut off.
- Depressurize the inflatable seal.

4.2.8 The pressurized demineralized water and plant process air are provided to, and removed from, the vessel through a dedicated process service track. Power and control are provided to the vessel equipment through the same service track that provides the electrical services to the bogie.

#### **4.3 Canister Rinse Bogie Rails**

4.3.1 The bogie rails run between the Canister Rinse Tunnel and the Bogie Maintenance Area. The rail supports are mounted on embeds located in the floor.

4.3.2 The rails guide the bogie between the process stations maintaining the relative position of the bogie to the process stations.

4.3.3 End-stops are located at the end of the rails to prevent bogie over-travel.

#### **4.4 Canister Rinse Bogie Seismic Rails**

4.4.1 The seismic rails are mounted on embeds located in the North and South walls of the Canister Rinse Tunnel.

4.4.2 The seismic rails, in conjunction with the bogie restraints, prevent the bogie from overturning or derailling in the event of a wheel failure or a seismic event.

#### **4.5 Canister Rinse Bogie Service Tracks**

4.5.1 Two (2) service tracks (energy chains) are located in the Canister Rinse Tunnel. One service track provides the routing for the electrical services to the bogie and the vessel, the other provides the routing for process services (water and air) to the vessel. The service tracks are dynamic tracks that allow movement of the bogie while maintaining fixed connections at the entry to and exit from the track for connection and routing of services.

4.5.2 The proposed design includes 4 cable systems: (1) mechanical handling power - bogie motor, (2) mechanical handling instrumentation - position sensors/limit switches, (3) process power - pumps and valves, (4) process instrumentation - level switches and transmitters.

- 4.5.3 The proposed design includes 3 process hoses: (1) water supply, (2) water discharge, and (3) air supply.
- 4.5.4 A Seller supplied bracket, at the shield door aperture, allows the service tracks to be parked in position prior to transferring the bogie into the maintenance area.

#### **4.6 Canister Rinse Bogie Recovery System**

- 4.6.1 The recovery system provides a means of recovering the bogie in the event of a component failure that would cause the bogie to become immobile.
- 4.6.2 In a recovery event the bogie is towed by a recovery block located at the West end of the bogie rail. The recovery block is connected, via a static cable, to a wall-mounted electric winch located in the maintenance area.
- 4.6.3 In a recovery event the canister is either removed from a position directly under the Canister Handling Cave (if the bogie has not moved from its park position), or the bogie is recovered to a position under the Canister Decontamination, Swabbing and Monitoring Cave where the canister is removed. The bogie is then recovered into the Bogie Maintenance Area where hands-on maintenance can be performed.

#### **4.7 Canister Rinse Bogie Spool Piece**

- 4.7.1 The spool piece is mounted to an embed located on the ceiling of the Canister Rinse Tunnel at the Canister Rinse Station. The spool piece provides the sealing surface for the vessel mounted inflatable seal.

#### **4.8 Canister Rinse Vessel Lid**

- 4.8.1 The vessel lid is placed over the top of the vessel while the bogie and vessel are located in the maintenance area. The vessel lid minimizes the potential for transfer of radioactive particulate (contamination) from inside the vessel while it is located in the maintenance area. The vessel lid is stored in the maintenance area.

## **5 Design Requirements**

### **5.1 General**

- 5.1.1 System components and equipment provided in accordance with this specification shall not exceed the bounding equipment envelope dimensions implied or explicitly indicated on the DPDs and MDSs referenced in Section 2.4 of this specification.
- 5.1.2 Equipment weights shall not exceed the bounding weights indicated on the DPDs and MDSs without Buyer authorization. The Seller shall be responsible for any analysis required to determine embed loadings for equipment weights exceeding the bounding weights indicated on the DPDs and MDS, and are subject to Buyer review.

5.1.3 System components and equipment provided in accordance with this specification shall utilize the facility concrete embedments as depicted in the DPDs and MDSs referenced in Section 2.4 of this specification. Equipment mountings shall be capable of accommodating embed plate placement and orientation tolerances specified in sections 5.1.3.1 and 5.1.3.2 of this specification.

5.1.3.1 Tolerances for concrete placement shall be in accordance with the Table for Concrete Placement Tolerances, unless noted otherwise on the project drawings.

Table for Concrete Placement Tolerances

Component	Category	Tolerance
Footings	Lateral Alignment – As cast to center of individual footing.	0.02 times width of footing in direction of misplacement but not more than 2 in.
	Horizontal dimension for unformed members cast against soil.	
	2 feet or less	+3 in. or –1/2 in
	Over 2 feet, but less than 6 feet	+6 in. or –1/2 in.
	Over 6 feet	+12 in. or –1/2 in.
	Level Alignment – Top of footings	+1/2 in. and –2 in.
	Cross-Sectional Dimensions – Horizontal dimension of formed members.	+2 in. and –1/2 in.
	Cross-Sectional Dimensions – Vertical dimension (thickness)	+5%
	Relative Alignment – Single footing side and top surface slope with respect to specified plane.	+1 in. within 10 feet
Cast-In-Place Concrete for Buildings	Vertical Alignment/Plumbness – (Lines, surfaces, and rises):	±1 in.
	Outside corner of exposed corner columns and control joint grooves in concrete exposed to view.	±1/2 in.
	Lateral Alignment: (Horizontal Location) Members	±1 in.
	Centerline location of openings 12 in. or smaller in slabs and edge location of larger openings.	±1/2 in.
	Sawcuts, joints, and weakened plane embeds.	±3/4 in.

	<b>Level Alignment:</b> Elevation of top of slabs and other formed surfaces before removal of shoring Elevation of lintels, sills, parapets, horizontal grooves, and other lines exposed to view Elevation of slabs on grade	±3/4 in. ±1/2 in. ±3/4 in.
	<b>Cross-Sectional Dimensions: Members such as columns, beams, piers, or walls with thickness:</b> 12 in. dimension or less More than 12 in. dimension but not over 3 ft dimension Over 3 ft dimension	+ 3/8 in. or -1/4 in. + 1/2 in. of -3/8 in. + 1 in. or -3/4 in.
	<b>Relative Alignment:</b> Vertical alignment of outside corner of exposed corner columns and control joint grooves in concrete exposed to view All other formed surfaces may slope in 10 ft with respect to the specified plane	±1/4 in. in 10 ft. ±3/8 in. in 10 ft.
	<b>Offset between adjacent pieces of formwork facing material shall not exceed:</b> Surfaces that receive special protective coatings- Class B See Section 3.1.4 for further clarifications. For a Class C surface	± 1/4 in. ±1/2 in.
	<b>Openings Through Members:</b> Cross-sectional size of openings Location of centerline of opening	-1/4 in. or +1 in. ±1/2 in.

5.1.3.2 Placement tolerances for embedded items shall be in accordance with the Table for Embedded Item Placement Tolerances, unless noted otherwise on the project drawings:

Table for Embedded Item Placement Tolerances

Conditions	Embed Type	Tolerance
Lateral alignment in both directions in the plane of the slab or wall. Level alignment through the slab or wall.	Standard Embeds per drawing 24590-WTP-DD-S13T-00002	±2 in.

5.1.4 Equipment standardization shall be employed throughout equipment designs where safety requirements and cost requirements can be satisfied. Items performing similar duties should,

as far as possible, be standardized so that one particular make, model and size can be used in all similar applications.

- 5.1.5 The design shall consider human factors engineering and ergonomic requirements to ensure good human factor principles, guidelines, and methods are integrated into equipment design in accordance with IEEE Std 1023-1988 *IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations*. The codes and standards identified in Appendix H, or buyer approved equal, shall be used to implement IEEE Std 1023. The specific human factor attributes applying to the equipment shall be invoked.
- 5.1.6 For general design requirements of mechanical handling equipment refer to project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, excluding sections 3.5.8.1, 3.5.8.2, 3.5.8.5, 3.6, 3.7, 4.1.9, 4.1.10, 4.1.11, 4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13.
- 5.1.7 Equipment that is not painted (or otherwise coated) and exposed to radiation that can cause surface contamination shall have decontaminable surface finishes of 63 microinches (or better) roughness average in accordance with ASME B46.1. Except when the equipment is infrequently handled or decontaminated, in which case it can have decontaminable surface finishes of 125 microinches (or better) roughness average in accordance with ASME B46.1.
- 5.1.8 Stainless steel items that are attached to Buyer supplied wall embeds shall have a carbon steel spacer between the stainless steel and the embed.

## 5.2 Mechanical Requirements

### 5.2.1 Canister Rinse Bogie

- 5.2.1.1 The bogie shall be designed to travel on stainless steel fabricated rails with rail centers of 82 inches, see Section 5.2.3.
- 5.2.1.2 The bogie shall be capable of transporting a glass filled IHLW Canister, weighing 9260 lbs (max), and the Canister Rinse Vessel including rinse water.
- 5.2.1.3 Special attention shall be paid to the bogie chassis, to ensure plain surfaces can be cleaned easily, and potential contamination traps are minimized. Tube sections should be used in preference to structural 'I' beams and channels. All tubing shall be sealed to prevent the ingress of contamination. Drain holes shall be provided wherever water may collect during wash down, except in sealed tubing.
- 5.2.1.4 The bogie chassis shall accommodate a support frame for the Canister Rinse Vessel. The support frame shall be capable of supporting the vessel while located on the bogie.
- 5.2.1.5 The bogie chassis and vessel support frame shall be fitted with appropriate lifting features to assist with maintenance activities, using an overhead crane, while the bogie is located in the maintenance area. The combined weight of the bogie chassis and the vessel support frame shall not exceed 10,000 lbs. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

- 5.2.1.6 The bogie chassis and vessel support frame should be fabricated from ASTM A36 steel. Proprietary items shall be “as supplied” providing they are suitable for the operating conditions.
- 5.2.1.7 The bogie chassis shall accommodate equipment associated with the Canister Rinse Vessel.
- 5.2.1.8 The vessel support frame shall have location features to aid in the alignment and set down of the Canister Rinse Vessel.
- 5.2.1.9 The bogie shall have two driven wheels.
- 5.2.1.10 The bogie shall be guided by two (2) double flanged wheels on one side of the bogie. The opposite two wheels shall be plain. The flanged wheels shall be located on the same rail as the recovery winch. The wheel flanges shall be of adequate size to withstand skew forces from track misalignment and forces imposed due to recovering the bogie with a seized drive system.
- 5.2.1.11 Clearances between wheel flanges and rail, accounting for manufacturing tolerances, shall be sufficient to allow free running of the bogie while achieving the required positional tolerances in accordance with Section 5.3.4 of this specification.
- 5.2.1.12 Seismic restraints shall be mounted to the vessel support frame, to prevent the bogie from derailing in the event of a flanged wheel failure under normal operation, or an SC-II design basis earthquake, in accordance with Sections 1.5.3 and 5.6 of this specification.
- 5.2.1.13 The drive system and wheel modules shall be designed for ease of maintenance and replacement.
- 5.2.1.14 The bogie shall have four (4) bumpers, one at each corner of the bogie; to prevent damage to the bogie, shield door, or rail end-stops. The bumpers shall be designed to absorb the impact of a fully laden bogie, traveling at full operating speed, with a closed shield door, such that the resulting force imparted on the shield door does not exceed 2500 lbf.
- 5.2.1.15 There shall be two (2) proximity switches mounted on the bogie chassis for operational positioning of the bogie.
- 5.2.1.16 There shall be one (1) ultimate-travel limit switch mounted on the bogie chassis to prevent over travel of the bogie in the event of a proximity switch failure. The limit switch shall be capable of operating with the bogie traveling in both directions.
- 5.2.1.17 Adjustable proximity switch targets and limit switch strikers shall be supplied with the bogie as required per the system drawings. The targets and strikers shall be designed to be adjustable for on-site installation.
- 5.2.1.18 A means of detecting a canister is present in the vessel shall be provided.
- 5.2.1.19 The bogie shall be designed to limit individual wheel loads during normal operation to less than 1/3 of the total laden bogie weight while traveling on rails installed per paragraph 5.2.3.5. This requirement can be demonstrated by analysis or test.

- 5.2.1.20 Gears and gearboxes, shall comply with AGMA Standards, or, EC Machinery Directive 98/37/EC, EN 292-1 & 292-2 *Safety of Machinery*, and ISO 281 - 1990 *Roller bearings, Dynamic load ratings and rating life*.
- 5.2.1.21 In addition to the requirement defined in 24590-WTP-3PS-M000-T0002, Rev 0, Section 4.10.6, gear cases can be split vertically provided that, in the event of a fluid leak, the fluid is contained in a drip tray. The drip tray shall have a minimum fluid capacity of 1.5 times greater than the fluid capacity of the gearbox.

## 5.2.2 Canister Rinse Vessel

- 5.2.2.1 The vessel shall be designed in accordance with ASME B&PV Section VIII, Division 1, except that code stamping is not required.
- 5.2.2.2 Process piping shall be designed in accordance with the applicable requirements identified in ASME B31.3 and project specification 24590-WTP-3PS-P000-T0001, *Engineering Specification for Piping Material Classes*, excluding section 16. The piping material class for interfacing to the Buyer provided piping shall be S11B.
- 5.2.2.3 The centrifugal discharge pump shall be in accordance with the requirements identified in ASME/ANSI B73.2M *Specification for Vertical In-Line Centrifugal Pumps for Chemical Process*.
- 5.2.2.4 The vessel shall have lifting features to allow the vertical removal of the vessel from the bogie, using an overhead crane, while located in the maintenance area. Pipe connections shall be configured such that vessel can be removed easily. The weight of the vessel and internal components shall not exceed 10,000 lbs. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.
- 5.2.2.5 The design of the spray system shall ensure that the spray pattern is generally in a downward direction, minimizing "back spray" within the vessel, and providing full coverage of the canister surface. The canister can be sprayed in stages due to the limit on flow rate. If the canister is sprayed in stages it shall be sprayed from top to bottom.
- 5.2.2.6 The Seller shall make every effort to minimize the volume of water used during the rinse cycle while achieving the full coverage of the canister.
- 5.2.2.7 The vessel shall contain guides and a pedestal for locating and seating the canister. The guides internal diameter shall be 27 inches  $\pm$  1/4 inch. This diameter takes into account misalignment, due to tolerance build-up, between the bogie and the overhead crane during loading and unloading of the canister. The guides shall be designed such that the potential for scratching of the canister surface is minimized during loading and unloading.
- 5.2.2.8 The container guides shall be configured such that spray coverage is not affected. Lifting features shall be located at the top of the guides to allow removal from the vessel, using an overhead crane, while the bogie is located in the maintenance area. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

- 5.2.2.9 The spray system shall be removable from the vessel without the requirement for hands on access to the internals of the vessel. Pipe connections shall be located at the top of the vessel and shall be arranged to allow manual disconnection and removal of the spray system, using an overhead crane, while the bogie is located in the maintenance area. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.
- 5.2.2.10 The vessel piping and internal components shall be designed to minimize contamination traps and maximize contamination removal through rinsing.
- 5.2.2.11 The inflatable seal shall be mounted to the top flange of the vessel. The seal shall be capable of containing the water spray in the vessel during the rinse cycle.
- 5.2.2.12 The centrifugal discharge pump shall be capable of discharging water from the vessel such that the static head of water does not contact the canister or compromise the spray nozzles.
- 5.2.2.13 The vessel shall have a high-high penetration point for a level switch to detect the maximum static head of water. The penetration shall be a 2" Weld Neck Raised Face (WNRF) flange. Initiation of the high-high level switch shall terminate the spray sequence.
- 5.2.2.14 The vessel shall have an external chamber located on the side of the vessel for a continuous level instrument. The external chamber shall have a minimum internal diameter of 2". The top of the chamber shall be flanged for device mounting. The bottom leg of the chamber shall interconnect to the vessel drain pipe at the bottom of the vessel. The top leg of the chamber shall penetrate the vessel at a point above the maximum static head of water such that the operating range of the level instrument places the maximum static head of water at the 50% - 75% point of the level instruments range. The continuous level instrument shall initiate the discharge of the rinse water at a set level.
- 5.2.2.15 Transmitters for both the level switch, and the continuous level instrument, will be mounted in the corridor adjacent to the transfer tunnel.
- 5.2.2.16 The vessel shall have a vent pipe located within the vessel for venting during the normal rinse cycle. The vent pipe shall exit from a point just below the top of the vessel. The design of the vent pipe shall prevent the release of mist carryover from the vessel during a normal rinse cycle. The Seller shall determine during shop tests the levels of mist carryover released from the vent pipe, see Section 8.2.3 of this specification.
- 5.2.2.17 The control valves shall be of the pneumatic operated actuator type. The control valves shall meet the applicable requirements identified in 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, and 24590-WTP-3PS-PV00-T0001, *Engineering Specification for Technical Supply Conditions for Valves*, excluding section 5.4.
- 5.2.2.18 The operating position of the control valves shall be monitored by position switches on the actuator. The actuator shall operate the valve to a "failed closed" condition in the event of power failure.
- 5.2.2.19 The vessel, and associated rigid piping supplying demineralized water to the vessel, shall be constructed from 316L stainless steel.

- 5.2.2.20 The canister shall not come into contact with any material other than stainless steel.
- 5.2.2.21 The vessel shall accommodate all static, dynamic, and seismic loads in accordance with Section 5.6 of this specification.
- 5.2.2.22 Thermowells and pipe supports are the same integrity/classification as the SSC that they are supporting ensuring waste or hydrogen does not leak into thermowells or pipe supports. NDE of welds associated with thermowells and pipe supports (pipe supports with the potential to trap waste or hydrogen) shall be in accordance with ASME B31.3.
- 5.2.2.23 The vessel shall have an overflow line exiting from a point between the high-high level switch and a maximum of 70 inches from the bottom of the vessel. The overflow line shall discharge vessel contents during an off normal rinse cycle. The design of the overflow line shall prevent the release of mist carryover from the vessel during a normal rinse cycle. The Seller shall determine during shop tests the levels of mist carryover release from the overflow line, see Section 8.2.3 of this specification. The overflow line shall be designed to prevent direct spray from entering the overflow line.

### 5.2.3 Canister Rinse Bogie Rails

- 5.2.3.1 The rail assembly shall be fabricated from a suitable grade stainless steel, with the running rail made from an age-hardened martensitic stainless steel.
- 5.2.3.2 The rail hardness shall be suitable for the intended application, but as a minimum shall be greater than that of the wheel. The rail and wheels should both be of similar high hardness to avoid unnecessary wear, and shall be of a dissimilar material such that galling does not take place.
- 5.2.3.3 End-stops shall be provided at the ends of each rail. The end-stops shall be capable of withstanding the impact of a fully laden bogie traveling at full operating speed, without exceeding allowable stresses.
- 5.2.3.4 The Seller shall provide shim packs for site adjustment to achieve the required installation tolerances. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.
- 5.2.3.5 The bogie rails shall be fabricated to achieve the following installation tolerances:

Rail Span	± 1/8 inch
Rail straightness	± 1/8 inch
Rail elevation	± 1/8 inch
Difference in rail heights	± 1/16 inch

### 5.2.4 Canister Rinse Bogie Seismic Rails

- 5.2.4.1 The seismic rails shall prevent the bogie from derailing in the event of a flanged wheel failure under normal operation, or an SC-II design basis earthquake, in accordance with Sections 1.5.3 and 5.6 of this specification.

- 5.2.4.2 The seismic rails shall be constructed from a suitable grade stainless steel.
- 5.2.4.3 The seismic rails shall accommodate the full process travel of the bogie.
- 5.2.4.4 The seismic rails shall be adjustable in both the vertical and the North-South directions for on-site setting. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.

## **5.2.5 Canister Rinse Bogie Service Tracks**

- 5.2.5.1 One (1) each service track shall be provided for electrical cables and process hoses associated with the operation of the Canister Rinse Bogie and Canister Rinse Vessel.
- 5.2.5.2 The service track for the process hoses shall be located on the South side of the bogie. The service track for the electrical cables shall be located on the North side of the bogie.
- 5.2.5.3 The service tracks shall be capable of operating over the full process movement of the bogie and have sufficient additional capacity to transfer the bogie to the shield door aperture.
- 5.2.5.4 The process service track shall be capable of accommodating the loads exerted when the process hoses (water and air) are pressurized.
- 5.2.5.5 The service tracks shall contain sufficient lengths of electrical cable and process hoses to allow for remaking of connections at the Buyer's facility to the Buyer provided cables and piping. The Buyer will provide to the Seller interface details prior to final design.
- 5.2.5.6 The service tracks, electrical cables and process hoses shall be capable of being manually disconnected and reconnected to the bogie at the shield door aperture.
- 5.2.5.7 The electrical cables and process hoses shall be capable of being easily disconnected and reconnected to the bogie using quick disconnect type connectors. The process hose connectors shall be of the non spill double shutoff type. The Seller shall consider the use of manifolds or multi-pin connectors to simplify the operation with the aim to minimize operator time while the shield door is in the open position.
- 5.2.5.8 The service tracks shall provide protection for the cable and hoses as the bogie moves to prevent them from becoming entangled or damaged.
- 5.2.5.9 The service tracks shall be constructed from a suitable grade stainless steel.
- 5.2.5.10 The tracks shall be of an open construction to allow for ease of decontamination and access to electrical cables and process hoses for inspection.

## **5.2.6 Canister Rinse Bogie Recovery System**

- 5.2.6.1 The bogie recovery system shall be capable of recovering a fully laden bogie with a seized drive system, as a minimum.
- 5.2.6.2 The wire rope shall be polyethylene sheathed for ease of decontamination.

- 5.2.6.3 The design shall ensure that proper fleet angles are maintained between the winch and the pulley to ensure correct cable winding during recovery.
- 5.2.6.4 The Seller shall provide all support structures required for mounting of the recovery winches to the embeds identified on the DPDs.
- 5.2.6.5 The gearbox shall be capable of being decoupled from the winch drum to allow periodic maintenance. The decoupling process shall be a simple procedure with minimal effort by maintenance personnel.
- 5.2.6.6 The recovery block shall be capable of being pushed along the rails by the bogie to its park position.

### **5.2.7 Canister Rinse Bogie Spool Piece**

- 5.2.7.1 The spool piece shall provide the sealing surface for the vessel mounted inflatable seal.
- 5.2.7.2 The spool piece shall include features to allow on-site adjustment of the sealing face to accommodate the inflatable seal operating parameters and installation tolerances. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.
- 5.2.7.3 The spool piece shall be constructed from a suitable grade stainless steel.

### **5.2.8 Canister Rinse Vessel Lid**

- 5.2.8.1 The vessel lid shall be fitted with appropriate lifting features to assist with handling, using an overhead crane located in the maintenance area. The Seller shall provide any special lifting equipment. The Buyer will provide to the Seller details of the crane hook prior to final design.
- 5.2.8.2 The lid shall contain guide features to assist with the location of the lid over the vessel.
- 5.2.8.3 The lid shall not interfere with the inflatable seal.
- 5.2.8.4 The lid shall be constructed from a suitable grade stainless steel.

## **5.3 Performance**

### **5.3.1 Design Life**

- 5.3.1.1 All equipment shall be designed to operate over a plant life of 40 years and in accordance with the duty cycles identified in Section 5.3.2 of this specification.
- 5.3.1.2 It is recognized that some commercially available components may not have a design life of 40 years. These components shall be configured and incorporate features to allow hands-on maintenance and replacement.

**5.3.2 Duty Cycles**

5.3.2.1 A cycle consists of the complete movement of a bogie from its starting position to its final destination and back to its starting position, including all process activities between.

5.3.2.2 The Canister Rinse Bogie is subject to the following duty cycles:

Duty Cycles (per year)		Duty Cycles (per day)
Min	Max	Max
180	730	2

**5.3.3 Speeds**

5.3.3.1 The Canister Rinse Bogie shall travel between process stations at a nominal speed of 10 ft per minute (normal) and shall ramp down when approaching a station to a suitable creep speed which maintains throughput and positional accuracy. The Seller shall determine and document the creep speed during testing.

5.3.3.2 After each process stop, the bogie shall ramp up to the normal operating speed. The Seller shall confirm the suitability of the acceleration and deceleration rates during the shop tests, to ensure smooth starting and stopping of the bogie.

5.3.3.3 The Canister Rinse Bogie shall be recovered at an appropriate speed to ensure smooth movement of the bogie during the full recovery travel. The proposal drawings show the recovery speed at 1 ft per minute. However, the Seller shall determine the most appropriate speed whether identical to the proposal or otherwise.

**5.3.4 Positional Accuracy**

5.3.4.1 The Canister Rinse Bogie shall be capable of repeatable positioning to within  $\pm 1/8$  inch in all directions. The accuracy is required to minimize misalignment, due to tolerance build-up, between the bogie and the overhead crane used to load/unload the canister.

**5.4 Design Conditions**

5.4.1 For general design conditions refer to Section 3.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*.

**5.5 Environmental Conditions**

5.5.1 For Hanford Site Climatological Data refer to Section 1 of the Purchase Order, *Information and Instructions to Bidders*.

5.5.2 For general facility internal conditions refer to Section 3.4 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*.

- 5.5.3 The bogie, vessel, and associated equipment may be subject to decontamination prior to hands-on maintenance being performed. This could include wiping equipment with wet rags and washing with water or dilute nitric acid.
- 5.5.4 The Canister Rinse Tunnel will be subject to periodic washdown with demineralized water, from a fixed spray system, to maintain general cleanliness of the tunnel.

## 5.6 Design Loads

### 5.6.1 General

- 5.6.1.1 The equipment identified in this specification shall accommodate all static, dynamic, and seismic loads, in accordance with this section and the requirements identified in Sections 1.5.3 and 5.2.
- 5.6.1.2 For normal service conditions a bogie shall be treated as a crane trolley and shall be evaluated in accordance with the applicable requirements identified in CMAA 70.
- 5.6.1.3 The bogie and bogie components, SC-I and SC-II SSCs, shall be seismically qualified to not fail during all operating conditions, including the design basis earthquake, and shall be in accordance with the requirements of ASME NOG-1-2002, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*, Sections 4150 and 5481. Extraordinary loadings, in addition to the loadings identified in CMAA 70, Section 3.3.2, shall include seismic acceleration loads identified in Section 5.6.4, and test loads (125%) applied during load test. The permissible stresses for seismic conditions shall be in accordance with CMAA 70, Section 3.4.3. Stress Level and Case 3.
- 5.6.1.4 Design of SC-III and SC-IV SSCs shall be governed by the provisions of AISC MO16, *Manual of Steel Construction, Allowable Stress Design, 9th Edition*.
- 5.6.1.5 ITS (load path) items shall be designed in accordance with ASME NOG-1-2002, Sections 4130, 4200, 4300, 4400, 5100, 5300, 5456 and 5458, as applicable.
- 5.6.1.6 For SC-II SSCs, loads shall be combined in accordance with ASME NOG-1-2002. For SC-III and SC-IV SSCs, loads shall be combined in accordance with the Uniform Building Code (UBC) Section 1612.3.2.

### 5.6.2 Static Loads

- 5.6.2.1 The bogie shall be capable of transporting a glass filled IHLW Canister, weighing 9260-lbs (max), and the canister rinse vessel during normal operation under the duty cycles identified in Section 5.3.2 of this specification.
- 5.6.2.2 Canister dimensions:
  - Diameter: 24.12 inches (maximum)  
24 inches (nominal)
  - Height: 177.165 inches (maximum)  
176.75 inches (nominal)

**5.6.3 Dynamic loads**

- 5.6.3.1 The bogie, vessel, and bogie rails shall be capable of withstanding impact loads from the canister under normal service conditions. Under normal service conditions the crane hoist operating speed at point of impact will be 5 feet per minute maximum.
- 5.6.3.2 The bogie and bogie rails shall be capable of withstanding all loads associated with impacts to the rail end-stops by the bogie (with load) traveling at full operating speed.

**5.6.4 Seismic Loads**

- 5.6.4.1 The following table identifies equipment requiring seismic protection and their associated Seismic Category (SC). Definitions of the seismic categories:

Seismic Category I (SC-I):  
 SSC important to safety and which has a seismic safety function.

Seismic Category II (SC-II):  
 SSC important to safety, whose failure during a seismic event could prevent a Seismic Category I SSC from performing its seismic safety function.

Seismic Category III (SC-III):  
 (a) SSC important to safety, but without seismic safety function.  
 (b) SSC not important to safety, but which has an inventory of radioactive or hazardous material in an amount less than that which would lead to an “important to safety” designation.

Seismic Category IV (SC-IV):  
 SSC not important to safety and without an inventory of radioactive or hazardous material, but requiring seismic protection.

Plant Item Number 24590-HLW-	Description	Seismic Category
MQ-HDH-TRLY-00003	Canister Rinse Bogie	SC-II
MV-HDH-VSL-00001	Canister Rinse Bogie Decon Vessel	SC-III
MH-HDH-RAIL-00002	Canister Rinse Bogie Rails	SC-III
MH-HDH-RAIL-00004	Canister Rinse Bogie Seismic Rails	SC-II
MH-HDH-MHAN-00016	Canister Rinse Vessel Service Track	SC-III
MH-HDH-MHAN-00017	Canister Rinse Bogie Service Track	SC-IV
MH-HDH-RCVY-00009	Canister Rinse Bogie Recovery System	SC-IV
MH-HDH-MHAN-00011	Canister Rinse Bogie Spool Piece	SC-IV
MP-HDH-PMP-00001	Bogie Decon Canister Pump	SC-III

5.6.4.2 Where specific seismic requirements are identified in Section 1.5.3, for the Canister Rinse Bogie and the Canister Rinse Bogie Seismic Rails, the applicable components shall be designed to SC-II. All other components shall be designed to SC-III.

5.6.4.3 SSCs designated SC-II, see Section 1.5.3 of this specification, the seismic loads imparted on the equipment shall be evaluated in accordance with the response spectra identified in the table below. A damping value of 7% shall be used.

Equipment	Seismic Response Spectra Reference
Canister Rinse Bogie  (24590-HLW-MQ-HDH-TRLY-00003, and associated equipment)	See 24590-HLW-S0C-S15T-00009 Rev 0D Fig. 10 Seismic Response at -31 ft and -21 ft Elevation, East-West (attached) Fig. 11 Seismic Response at -31 ft and -21 ft Elevation, North-South (attached) Fig. 12 Seismic Response at -31 ft and -21 ft Elevation, Vertical (attached)
Canister Rinse Bogie Seismic Rails  (24590-HLW-MH-HDH-RAIL-00004, and associated equipment)	See 24590-HLW-S0C-S15T-00039 Rev D Sheet No. B-9, Fig. B-7 Seismic Response, East-West (attached) Sheet No. B-10, Fig. B-8 Seismic Response, North-South (attached) Sheet No. B-11, Fig. B-9 Seismic Response, Vertical (attached)

5.6.4.4 For SSCs designated as SC-III, the seismic loads shall be evaluated in accordance with the Uniform Building Code (UBC), Section 1632, using the following parameters:

$I_p = 1.5$

$C_a = 0.24$

$h_r = 91$

$h_x = \text{rail elevation}$

5.6.4.5 For all other SSCs, the seismic loads imparted on the equipment shall be evaluated in accordance with the Uniform Building Code (UBC), Section 1632, using the parameters above with an  $I_p$  of 1.0.

5.6.4.6 The 200 East Area of the Hanford Site is located in Seismic Zone 2B.

## 5.7 Electrical Requirements

5.7.1 The requirements in 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment*, excluding sections 6.4.2.3, 6.4.3.1, 6.6.1, 6.6.3, and 6.8, shall apply to this specification. Where there is a conflict between this specification and 24590-WTP-3PS-EKP0-T0001, the Seller shall report all conflicts to the Buyer. At such time, all conflicts shall be resolved.

- 5.7.2 All electrical equipment and material, including industrial control panels and cabinets that are assemblies of industrial control devices, shall be suitable for installation and use in conformity with the provisions of NFPA 70. Suitability of equipment shall be evidenced by listing or labeling as a completed assembly by Underwriters Laboratories (UL). Equipment and assemblies not listed or labeled shall be required to bear a UL "Field Evaluated Product" mark. Equipment and materials listed, labeled or field evaluated by other nationally recognized testing laboratories (NRTLs) as recognized by OSHA, may be accepted only after receipt of prior written approval from the Buyer.
- 5.7.3 The Seller shall provide all cables and multi-conductor cable systems from the bogie and associated equipment to the Buyer's designated interface point, see Section 5.8.2. The Seller shall recommend connector types at the Buyer's interface for connection to the Buyer-provided cabling.
- 5.7.4 All cables shall be evaluated for radiation tolerance by addressing IEEE Std 1205-2000, *IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment used in Nuclear Power Generating Stations, Annex D* for acceptable insulation for radiation environments. Generally Tetrafluoroethylene (TFE) and Polytetrafluoroethylene (PTFE) should be avoided in radiation areas.
- 5.7.5 The Seller shall provide details of the electrical cable end connections (at bogie terminal box) to the Buyer for interfacing of the Seller provided umbilical electrical cable, located in the maintenance area. Unique pin arrangements and/or color coding shall be provided for the electrical connectors to prevent incorrect engagement.
- 5.7.6 The Seller shall specify within the proposal the full load amp and voltage rating for the bogie and associated electrically powered equipment.
- 5.7.7 When more than one motor is powered from a single control cabinet the Seller shall specify the ampere rating for the main over current device serving the cabinet.
- 5.7.8 Induction motors shall meet the requirements of 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*, excluding sections 5.1.1, 5.3, and 5.4.1, and shall be of a Totally Enclosed Fan Cooled (TEFC) type. Deviation from the specifications shall be submitted, on an SDDR form, to the Buyer and may be accepted based on the application and technical requirements. When deviating from the specifications, the motors shall comply with the equivalent International Electrotechnical Commission standard (IEC). The Seller shall provide certification that the manufacturer satisfactorily performed standard and routine tests on electric motors.
- 5.7.9 Flux Vector or Servo Drives shall meet the requirements of 24590-WTP-3PS-JD02-T0001, *Engineering Specification for Intelligent Drives for Packaged Equipment*.
- 5.7.10 All electrical equipment and electrical cables shall be suitable for the environment in which they will operate.
- 5.7.11 Separate disconnects shall be provided from the control cabinet for each major component. Seller shall provide all necessary schematics, wiring diagrams and details necessary to facilitate installation and connection to Buyer's system.

- 5.7.12 All conductors shall be numbered on both ends for ease of identification.
- 5.7.13 Cable design and construction shall take account of Electromagnetic Interface (EMI) and Radio Frequency Interface (RFI).
- 5.7.14 Individual and overall shields shall be provided, as appropriate, to ensure that circuits are not subjected to or affected by interference. The shields shall be terminated at individual slip rings/brush gears. The Buyer will then make arrangements to terminate them at a suitable ground point. All special grounding design requirements are the responsibility of the Seller.
- 5.7.15 The Seller shall be responsible for assuring operability of the cable system under all design conditions.
- 5.7.16 In addition to tagging requirements defined in Engineering Specification for Instrumentation for Packaged Systems, 24590-WTP-3PS-JQ07-T0001 Rev 1, and Engineering Specification for Electrical Requirements for Packaged Equipment, 24590-WTP-3PS-EKP0-T0001 Rev 2. Tags subject to high radiation environments, stainless steel is preferred.

## 5.8 Instrumentation and Control Requirements

### 5.8.1 General

- 5.8.1.1 The requirements in project specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*, excluding sections 3.4.5.1, 3.4.5.2.3, 3.4.5.4.4, 3.4.5.9, 3.4.5.10, 3.4.5.12, 3.4.5.13, 3.4.5.14, 3.4.5.15, 3.4.5.16, 3.4.5.17, 3.7.1, 3.8.3, 3.8.4, 3.8.6, 3.8.7, and 3.8.8.1, shall apply to this specification. Where there is a conflict between this specification and 24590-WTP-3PS-JQ07-T0001, the Seller shall report all conflicts to the Buyer. At such time, all conflicts shall be resolved.
- 5.8.1.2 Control panels, including Supplier Packaged Equipment panels, shall be provided with an Alarm Test function such as a “push to test” button that verifies that alarm indicating functions operate satisfactorily. In order to maintain consistent operation between equipment items, this requirement shall apply to all alarm indicating lights, including LED’s. This requirement is limited to alarm indications and is not applicable to other indications.
- 5.8.1.3 The Seller shall be responsible for the final determination of the required level and type of controls and instrumentation necessary for the proper operation and monitoring of the Seller’s proposed system. Any changes to the required control and monitoring features shall be reflected in the Seller’s submittals for control and instrumentation (as required by this specification and the G321-E form) and shall be subject to Buyer authorization. The Seller’s submittals that necessitate changes to the control and instrumentation shall not generally require that an SDDR be submitted. An SDDR shall be submitted if the Seller’s control and instrumentation submittals fail to reflect incorporation of any functional requirement of the supplied equipment (as described in this specification, DPDs, or Arrangement).
- 5.8.1.4 The Seller shall provide, as early as practicable in the design process (but no later than as required by the submittal schedule), required control and instrumentation submittals necessary to support the Buyer’s revisions to their Mechanical Handling Diagrams (MHDs).

These submittals are required in order to finalize the relevant facility interfaces (e.g., wall penetrations, conduit, and Integrated Control Network interfacing) to suit the Buyer's construction schedules.

- 5.8.1.5 To ensure commonality across project equipment, 24590-WTP-3PS-JQ07-T0001 identifies preferred instrument vendors for some components. Components not included in the specification are selected at the Seller's discretion with review and permission to proceed from the Buyer unless otherwise specifically stated within this specification.
- 5.8.1.6 The Seller shall provide all limit switches and proximity switches as required in the design of the bogie system, and shall meet the requirements of sections 3.4.5.7 and 3.4.5.8 of 24590-WTP-3PS-JQ07-T0001.
- 5.8.1.7 The bogie control systems shall utilize the Integrated Control Network (ICN) platform described in 24590-WTP-3PS-JQ07-T0001.
- 5.8.1.8 Instrumentation for control and positioning is defined on the DPDs. The instrument tag numbers on the DPDs shall be used to tag instruments. Additional instruments provided by the Seller shall be tagged using ISA 5.1, and sequence numbers provided by the Buyer.
- 5.8.1.9 The Seller shall provide to the Buyer control logic diagrams and a structured description of the control requirements, procedures, interlocks, and sequences of operation necessary to perform the basic functions of the bogie, vessel, and associated equipment. Documentation of the control requirements shall conform to the requirements of 24590-WTP-3PS-JQ07-T0001, Section 3.5, *Control Software*.
- 5.8.1.10 The Buyer will develop the application software that controls the bogie, vessel, and associated equipment identified in this specification. All Human Machine Interfaces (HMI), including facility control room HMI, Local Operator Interfaces (LOI), and Bogie Maintenance Areas, will be interfaced to and controlled by the Buyer-developed Intergrated Control Network (ICN). The Buyer's software shall be tested during the Seller's Factory Acceptance Tests (FAT).
- 5.8.1.11 Motor drives and other 'intelligent' devices as applicable shall have Profibus DP<sup>®</sup> capability where feasible.
- 5.8.1.12 Where integral brake motors are used on adjustable speed drives the brake shall be wired independently from the motor winding. All brakes shall be "fail-on" in the event of loss of power.
- 5.8.1.13 All instrumentation and instrument cables shall be suitable for the environment in which they will operate.
- 5.8.1.14 The Seller shall provide a phase monitor relay to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage of the 3Ph 480 voltage feed to Seller's equipment.

## 5.8.2 Interfaces Between Buyer and Seller

### 5.8.2.1 General

- 5.8.2.1.1 This specification identifies equipment that is classified as a “Type B-Option 1” package. A “Type B” package is one in which the Seller provides the starters/drives and shall have the equipment located near the Seller’s equipment in a Seller provided control cabinet.

### 5.8.2.2 Type B Package

- 5.8.2.2.1 Appendix A, Figure 1, shows a pictorial representation of a “Type B-Option 1” package definition that the Seller shall comply with. This Type B package shall include Seller provided equipment control cabinets that include Seller provided starters/drives, control transformers, Profibus DP<sup>®</sup> interface(s), Fiber Optic cable interfaces, control wiring interface, etc. The Buyer will be responsible for the Profibus DP<sup>®</sup> cable from the Buyer Controller, the control signal wiring from the Remote I/O (RIO), a single 480 VAC, 3 phase power supply from the Buyer’s MCC to the Seller’s equipment control cabinets. The Buyer will also be responsible for all cabling between the Seller’s equipment control cabinet and the Seller’s equipment “skid” with the exception of specialty cable. Specialty cable is defined as cable assemblies normally part of the equipment package such as drag chains and festoon or cable that is not included in the Buyer’s standard cable list. For the purpose of this specification, a “skid” is defined as the part of a Seller’s package which is shipped pre-assembled and pre-wired.

## 5.8.3 Bogie Positioning Control

- 5.8.3.1 Bogie shall have a minimum of two proximity switches mounted to the bogie chassis used for operational positioning of the bogie. Both switches shall provide a signal under normal operating conditions.
- 5.8.3.2 The bogie utilizes two (2) or three (3) targets for each stopping position as required per the system drawings. The first target, approached from a specific direction (two targets required if approaching stopping position from two directions), is used to slow the bogie to creep speed; the second target stops the bogie. To achieve positional accuracy, the bogie may require to be stopped by approaching the target from one direction only. In this case the bogie will proceed past the stopping point then reverse to approach the position target from the designated stopping direction.
- 5.8.3.3 Under a recovery event the bogie mounted proximity switches are also used to position the bogie, in conjunction with the proximity switch targets, at the appropriate process station for canister removal.
- 5.8.3.4 The recovery winch drive shall include a Profibus DP<sup>®</sup> interface to enable operation from the Buyer’s LOI.

## 5.8.4 Communication Network Interface

The Buyer has selected the Industrial<sup>IT</sup> platform from ABB, Inc. as the primary control system for the WTP Facility. A Profibus DP<sup>®</sup> communication network will be used to communicate

to drives and intelligent positioning instruments. The Seller shall provide the following components for a fiber optic cable interface:

#### 5.8.4.1 Profibus DP Communication Interface

5.8.4.1.1 The Seller shall provide a native Profibus DP<sup>®</sup> slave interface for the control panel or instrument and the associated drivers (GSD files) for communication with the Buyer's control system. The interface should support communication speeds up to 12 Mbit/sec over the Profibus DP<sup>®</sup> network.

#### 5.8.4.2 Fiber Optic Connections

5.8.4.2.1 The Seller shall provide a fiber optic connection external to the control panel or instrument per the following requirements:

- a) The Seller shall install a Hirschmann OZD Profi 12M G12 fiber optic converter within the control panel or near the instrument for each communication network.
- b) The Seller shall patch the Hirschmann fiber optic converter(s) to a fiber optic patch plate where the Buyer will terminate the Buyer's fiber optic cable(s). The patch plate shall utilize MT-RJ multimode fiber optic connectors.
- c) The Seller shall use multimode 62.5/125 glass fiber in the patch cable with appropriate connectors on each end of the patch cable to connect between the fiber optic converter and the patch plate. Any unused fiber optic connections shall be fitted with protective caps to guard against extraneous light and dirt.
- d) The Seller shall derive the appropriate power for the fiber optic converter(s) from the control panel. A separate power supply shall be provided for each communication network.

#### 5.8.4.3 Alternate Communication Interface

5.8.4.3.1 If a native Profibus DP<sup>®</sup> interface is not available, then the Seller may propose an alternate communication interface or network that is compatible with the Buyer's control system for Buyer review.

If an alternate communication interface is proposed:

- a) The Seller shall provide all necessary interfaces or converters required to provide the Buyer's control system with the appropriate communications.
- b) The Seller shall provide any required drivers, software, and protocol conversion information to the Buyer for design, development, testing, and maintenance of the supplied networks and interfaces for the period of performance of the contract, including software or firmware upgrades or revisions.

## 6 Materials

6.1 For general material requirements refer to Section 4 of 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, and applicable requirements identified in the project specifications referenced in this document. Sections 4.1.9,

4.1.10, 4.1.11, 4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13 of 24590-WTP-3PS-M000-T0002 do not apply.

- 6.2 The Seller may use cast iron for the bogie wheels and wheel housings provided they meet the design requirements identified in Section 5 of this specification.
- 6.3 For specific material requirements refer to Section 5 of this specification.
- 6.4 Welded stainless steel mechanical tubing, conforming to ASTM A554, is acceptable for use, in the manufacture of structural members and support brackets.
- 6.5 All material supplied to ASTM standards, pertaining to QL or ITS equipment, shall be in accordance with the codes and standards identified in Section 2 of this specification, otherwise an SDDR shall be submitted to the Buyer, to obtain a material equivalency. Equivalency of materials shall, as a minimum, consider physical and chemical properties.
- 6.6 All material supplied to ASTM standards, pertaining to CM, Non-ITS equipment, shall be in accordance with any year of the standard.

## 7 Fabrication

- 7.1 For general fabrication requirements refer to Section 5 of 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, and applicable requirements identified in the project specifications referenced in this document.
- 7.2 Welding shall be in accordance with the applicable requirements identified in project specification 24590-WTP-3PS-SS00-T0001, *Specification for Welding of Carbon Structural Steel*, excluding section 8.18, and in accordance with 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*.
- 7.3 The vessel shall be fabricated in accordance with ASME B&PV Section VIII, Division 1, except that code stamping is not required.
- 7.4 Process piping shall be fabricated in accordance with the applicable requirements identified in ASME B31.3, Category D Fluid Service.
- 7.5 All vessel components that come into contact with the canister shall have a surface finish of 125 micro inches or better. This includes all canister guides and canister set down pads.

## 8 Tests and Inspections

### 8.1 General

- 8.1.1 Test and inspections shall be performed in accordance with the requirements identified in this section and the project specifications referenced in this document.

8.1.2 The Seller shall be responsible for performing and documenting all inspections and testing necessary to demonstrate compliance with all relevant specifications, drawings, and related standards.

8.1.3 Shop tests identified in section 8.2 are defined as Factory Acceptance Tests (FAT). A FAT procedure shall be submitted to the Buyer along with the Inspection and Test Plan. FAT reports shall also be submitted to the Buyer.

## **8.2 Shop Tests**

### **8.2.1 General**

8.2.1.1 The Seller shall perform, in-house, full-scale, Buyer-witnessed, functional testing of the bogie, vessel, and associated equipment, to demonstrate, as a minimum, the requirements identified in this section.

8.2.1.2 The Seller may combine some of the tests providing each requirement can be verified.

8.2.1.3 The tests and demonstrations identified in this specification are not limiting, and shall not relieve the Seller of their responsibilities to fully test and demonstrate the performance of the bogie, vessel, and associated equipment, to the satisfaction of Buyer, in accordance with the Buyer-reviewed Inspection and Test Plan.

8.2.1.4 Where maintenance tests are identified they shall be performed wearing appropriate personnel protective clothing (e.g. gloves, coveralls) to simulate in-cell maintenance conditions. The Buyer will provide, to the Seller, the appropriate personnel protective clothing prior to performing the maintenance tests. The tests shall be video taped, timed, and recorded in the maintenance procedures.

8.2.1.5 The bogie control and instrumentation shall be tested in accordance with a defined schedule. All steps shall be taken to ensure that tests are realistic and representative of the bogie operating sequences. Operation of switches and contacts shall be via movement of the bogie and not by the shorting or open circuit action of terminals.

8.2.1.6 The Seller shall provide all wiring, electrical feeds, power supplies, transformers, operator panels, test equipment, and connections for shop testing of the bogie and associated equipment.

8.2.1.7 The Seller shall be responsible for any alterations to the Seller's facility that may be required to perform the tests, and any additional equipment and materials required.

8.2.1.8 The Buyer shall provide a "mock-up" canister, fabricated from a cylindrical tube, replicating the canister envelope dimensions, key features, and weight, for performing the shop tests.

8.2.1.9 The Seller shall notify the Buyer of any failed tests or defective components following testing. All corrective actions suggested by the Seller shall be reviewed by the Buyer prior to implementation and subsequent re-testing.

## 8.2.2 Canister Rinse Bogie

8.2.2.1 The Seller shall replicate normal service design load conditions (with and without canister), and operating speeds, as required, to represent the normal operating conditions of the bogie.

8.2.2.2 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.1 of this specification:

- Smooth and free running of the drive shaft, gearbox, and wheels, through the full operating travel of the bogie.
- Running clearances between interfacing equipment through the full operating travel of the bogie.
- Bogie operating speeds in accordance with Sections 5.3.3 and 5.8.3 of this specification.
- Positional accuracy of the bogie in accordance with Sections 5.3.4 and 5.8.3 of this specification.
- Operation of the ultimate-travel limit switch.
- Maximum buffer impact load.
- Proof load test the bogie and rails to 1.25 times rated load capacity.
- Lubrication points are accessible without major disassembly.
- Removal and replacement of maintainable and modular components.

## 8.2.3 Canister Rinse Vessel

8.2.3.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.2 of this specification:

- Perform a hydrostatic leak test of the vessel, pump and associated piping by filling the vessel with water to the top of overflow line and holding for a minimum of one (1) hour, after which, run the pump until all water is discharged from the vessel.
- Inspection and testing of the vessel, pump and associated piping as required by the applicable requirements identified in ASME B&PV Section VIII Division 1, ANSI B73.2M, and ASME B31.3.
- Functional testing of the spray system using the “mock-up” canister. The spray test shall be performed such that full visual observation of the spray coverage and “back spray” can be achieved by eye and with a video camera. Part of the test should be performed using food coloring or dye to aid in visualization.
- Level of mist carryover released from the vent tube during the rinse cycle.
- Operation of the inflatable seal and the sealing interface with the spool piece.
- Inspect and test the control valves in accordance with the applicable requirements identified in 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, and 24590-WTP-3PS-PV00-T0001, *Engineering Specification for Technical Supply Conditions for Valves*, excluding section 5.4.
- Performance of the level switch and continuous level instrument.
- Canister set-down at nominal handling speed of 5 feet per minute.
- Disconnection of the vessel services and removal of the vessel from the bogie.
- Mounting of vessel on the bogie and reconnection of the vessel services.

- Removal and installation of the canister guides and spray rings.

#### **8.2.4 Canister Rinse Bogie Rails**

8.2.4.1 During performance and maintenance testing, the Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.3 of this specification.

- Assemble rail sections and verify rail alignment to drawing tolerances and CMAA 70.

#### **8.2.5 Canister Rinse Bogie Service Tracks**

8.2.5.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.5 of this specification:

- Service tracks are moved freely by the bogie through the full operating travel.
- Replicate on-site shield door aperture interfaces and demonstrate the disconnection and reconnection of the electrical and process services and service tracks.

#### **8.2.6 Canister Rinse Bogie Recovery System**

8.2.6.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.6 of this specification:

- Proof load test the cable connection to the recovery block to 1.25 times the winch rating.
- Recovery of the bogie (with load), with a seized drive system, over the full operating travel of the bogie.
- Monitor and record the bogie recovery forces at incremental positions as the bogie moves along the rails. The recovery block, rails and cable shall be inspected following the test. The results shall be documented in the Inspection and Test Report.
- During the recovery test stop the bogie at a proximity switch target to demonstrate the stopping accuracy.
- Repositioning of the recovery block at the end of the rail using the bogie to push the recovery block into position.
- Decoupling of the recovery winch gearbox from the winch drum.

### **8.3 Temporary Structures**

8.3.1 The Seller shall supply a test rig, as required, in the form of temporary structures that simulate the site conditions for the bogie and associated equipment. This shall include replicating key facility interfaces to verify equipment clearances.

8.3.2 The plant installation relationship between the bogie and associated equipment shall be maintained for the shop tests.

8.3.3 The structures provided shall be designed to allow safe access for viewing at equipment levels.

- 8.3.4 For in-cell equipment, which may lack conventional guarding, the Seller shall apply, as a minimum, the OSHA requirements to protect personnel from the danger of moving equipment during shop tests.

#### **8.4 Cyclic Tests**

- 8.4.1 Following satisfactory completion in all specific shop tests, cyclic testing shall be conducted on the bogie over the full operating travel. As a minimum requirement, 5 consecutive full cycles shall be completed within a period that shall not exceed 120% of the predicted nominal duration for such a program, subject to all duty restrictions.
- 8.4.2 The cyclic tests shall follow the on-site sequence of operations, with exception of the rinse cycle, as defined in Section 3 of this specification. For the rinse cycle the Seller shall demonstrate the operation of the inflatable seal and incorporate an appropriate time delay to replicate the rinse cycle. The “mock-up” canister shall be used to replicate normal service design load conditions.
- 8.4.3 Following completion of the cyclic tests a general visual inspection shall be performed on the equipment with results from the inspection being documented in the Inspection and Test Report.

#### **8.5 Weld Inspections**

- 8.5.1 Weld inspections and Non-Destructive Examinations (NDE) shall be performed in accordance with project specification 24590-WTP-3PS-SS00-T0001, excluding section 8.18, and in accordance with 24590-WTP-3PS-SS00-T0002, and welding standards AWS D1.1 and AWS D1.6, unless specified otherwise.
- 8.5.2 All welds shall be visually inspected.
- 8.5.3 As a minimum, all load-bearing welds shall be non-destructively examined by either liquid penetrant or magnetic particle examination as appropriate to the material and configuration.
- 8.5.4 All welds that maintain the structural integrity of the bogie in accordance with the Important to Safety (ITS) requirements identified in section 1.5.3 of this specification shall be non-destructively examined. Full penetration welds shall be examined by either radiographic or ultrasonic examination as appropriate to the material and configuration. Partial penetration and fillet welds shall be examined by magnetic particle or liquid penetrant examination, as appropriate to the material and configuration.
- 8.5.5 The Seller shall perform 100% radiographic examination of the vessel and associated piping in accordance with the applicable requirements identified in ASME B&PV Section VIII, Division 1 and ASME B31.3.

## 9 Preparation for Shipment

### 9.1 General

- 9.1.1 Packaging, shipping, handling, and storage shall be performed in accordance with Project Specification 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling and Storage Requirements*, and Section 7 of the Purchase Order.

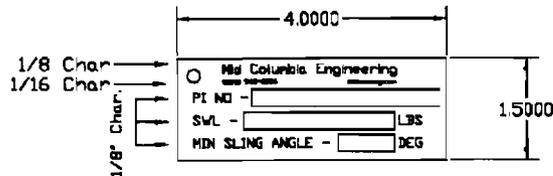
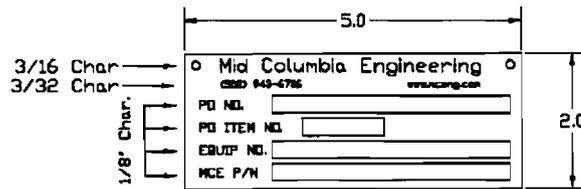
### 9.2 Cleaning and Coating

- 9.2.1 Surfaces shall be cleaned and coated in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*. The paint system to be used for the bogie and associated equipment shall be in accordance with System Code T as identified in 24590-WTP-3PS-AFPS-T0001.
- 9.2.2 The final paint color for all equipment as applicable shall be in accordance with Appendix E of 24590-WTP-3PS-AFPS-T0001.
- 9.2.3 All Manufacturers Standard Coating (Mfg. Std) must be identified on Appendix H of 24590-WTP-3PS-AFPS-T0001, and be submitted to the Buyer, along with technical data sheets and Material Safety Data Sheets (MSDS).
- 9.2.4 Stainless Steel shall not be coated.

### 9.3 Tagging

- 9.3.1 The equipment shall be tagged in accordance with the following:
- A separate stainless steel nameplate shall be provided to include the Buyer's plant item number (identification number) and purchase order number.
  - The separate stainless steel nameplate shall have the information impressed, stamped, or etched directly on the stainless steel surface with characters at least 1/8" inch high. The nameplate, where physically possible, shall be secured to the body of the equipment by corrosion resistant screws tapped into a low stress area of the assembly, or welded, so the structural integrity and functional capability of the assembly are not impaired. If it is not physically possible to secure the nameplate to the body of the equipment, then the nameplate shall be attached using a stainless steel wire.
  - Instruments shall be tagged according to *Specification for Instrumentation for Package Systems*, 24590-WTP-3PS-JQ07-T0001, Rev 1, Section 8.

(Example)



## 10 Quality Assurance

### 10.1 QA requirements specific to item(s) or service

- 10.1.1 The Seller's Quality Assurance Program (QAP) requirements are specified in 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*, and in the Supplier Quality Assurance Program Requirements Data Sheet(s) included in the procurement documents.
- 10.1.2 The Seller's QAP Manual shall be submitted to Buyer for review in accordance with 24590-WTP-3PS-G000-T0001.
- 10.1.3 For SSCs indicated in this specification as ITS, the Seller shall have and maintain a Buyer approved Quality Assurance Program meeting the applicable sections of ASME NQA-1-1989, as per 24590-WTP-3PS-G000-T0001, and the Supplier Quality Assurance Program Requirements Data Sheet, 24590-WTP-3PD-MQTS-00002.
- 10.1.4 For SSCs indicated in this specification as Non-ITS, or Commercial Quality, the Seller shall have and maintain a Buyer approved Quality Assurance Program meeting the applicable sections of DOE Order O 414.1A, as per 24590-WTP-3PS-G000-T0001, and the Supplier Quality Assurance Program Requirements Data Sheet, 24590-WTP-3PD-MQTS-00004.
- 10.1.5 The Seller, including all sub-tier suppliers providing items or services, that affect, or may affect, nuclear safety of DOE nuclear facilities shall, as a minimum, have a quality assurance program in place that complies with the requirements of 10 CFR Part 830.122.
- 10.1.6 Should any portion of the work defined within this specification be subcontracted, these requirements shall be passed on to the sub-contractor as applicable to the work being performed.

## 10.2 Program QA Elements

- 10.2.1 The Seller's QAP as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements Data Sheets listed in Section 2 of the Purchase Order.

# 11 Documentation and Submittals

## 11.1 General

- 11.1.1 Documentation shall be submitted to the Buyer in accordance with this specification, and as summarized on the G321-E and G321-V forms in section 3 of the Purchase Order. The G321-V form lists all the documents required for quality verification and the G321-E form lists those engineering documents required.
- 11.1.2 General requirements and submittal procedures are also covered in Section 3 of the Purchase Order. Each document to be submitted must be listed on the "Seller's Index/Schedule" (Form 15EX). This form tracks the scheduled and actual delivery of each submittal.

## 11.2 Quality Assurance Manual

- 11.2.1 The Offeror's Quality Assurance Manual shall be submitted to the Buyer with the Offeror's proposal in accordance with the G321-E form.

## 11.3 Deleted

- 11.3.1 Deleted
- 11.3.2 Deleted
- 11.3.3 Deleted

## 11.4 Safety Equipment List

- 11.4.1 The Safety Equipment List shall identify which components of the supplied equipment are to be provided as Important to Safety (ITS) or Commercial Quality (CM).
- 11.4.2 The Safety Equipment List shall be based on the requirements identified in Sections 1.5.3 and 10.1 of this specification.
- 11.4.3 The Offeror shall provide a Safety Equipment List with the Offeror's proposal that communicates the Offeror's understanding of which components of the equipment identified in this specification are to be provided as ITS and which components are to be provided as CM. The list shall be a detailed listing of components for the supplied equipment along with the designation of each item in the list as either CM or ITS.
- 11.4.4 The Safety Equipment List, or specific components of the Safety Equipment List, shall be submitted to the Buyer for review and permission to proceed prior to procurement of

materials. The document shall be submitted with the 50% design review package as a preliminary document and at the 90% design review as a final document.

## 11.5 Software Requirements Document

- 11.5.1 The Seller shall develop a Software Requirements Document that describes the protocols and requirements for programming the bogie control system. The document shall be submitted with the 50% and 90% design review package as a preliminary document and as a final document following shop tests.

## 11.6 Drawings

### 11.6.1 General

- 11.6.1.1 The Seller shall prepare and submit drawings per Section 3 of the MR, Drawings and Data Requirements.
- 11.6.1.2 The Seller shall prepare drawings in accordance with American Society of Mechanical Engineers (ASME) Y14 series, Engineering Drawing and Related Document Practice. The drawings shall be assigned a unique number in accordance with Section 3 of the MR, Drawings and Data Requirements.
- 11.6.1.3 SELLER shall specify all dimensions, tolerances, materials, surface finishes, weld symbols, special filler material used, torque values, set points and special fabrication instructions on drawings supplied to BUYER.
- 11.6.1.4 SELLER drawings shall show critical interface dimensions and their tolerances as specified by BUYER on DPDs or MDSs. This information shall be identified by using an asterisk or another method and note shall be included that explains how to distinguish these dimensions.
- 11.6.1.5 Seller drawings shall include as a minimum, but not be limited to, the following:
- Descriptive title blocks that are relevant to the information on the drawing
  - Notes that will clarify all vague or obscure details that would not otherwise be understandable without a note
  - A drawing cross-reference section that will cross-reference other drawings/documents that are relevant to make drawings more complete or more understandable
  - A bill of material that will list all items shown on an assembly drawing
  - Legend of symbols. Symbols shall be used consistently throughout all drawings related to weld systems
- 11.6.1.6 Sufficient information shall be included on these drawings to permit manufacture of any replacement parts in the event that the original Seller is not able to supply parts at the time future needs may arise. All drawings shall be specific to the system addressed in this

specification and shall be exact up to the time of delivery. The final set of drawings are to be “as-built” drawings. Drawings that are “typical” shall not be provided.

11.6.1.7 Where required, the Seller shall prepare MDSs on data sheets furnished by the Buyer.

#### **11.6.2 Arrangement Drawings:**

11.6.2.1 An arrangement drawing shall be submitted at all the design reviews for each piece of equipment. These drawings shall show all major dimensions, supports, arrangements, interfaces, and component identification numbers where appropriate. These drawings shall also show weight(s) and center of gravity (CG) location(s) for installation.

#### **11.6.3 Assembly Drawings:**

11.6.3.1 An assembly drawing shall be submitted at the formal, final design closeout meeting for each piece of equipment. These drawings shall show the arrangement of the equipment’s components, junction boxes, and interfaces with existing systems/structures. These drawings shall identify utilities required to be supplied by the facility.

11.6.3.2 General assembly drawings shall identify sub-assemblies and drawings.

11.6.3.3 Bill of Materials shall contain the minimum following information:

- an item number for each individual part or material,
- quantity of an item or part,
- description of an item or part,
- reference code (ASTM, ANSI) of an item or part,
- material callout or SELLER part number.

11.6.3.4 Component identification numbers shall be included on drawings where appropriate.

#### **11.6.4 Shop Fabrication/Detail Drawings:**

11.6.4.1 Shop Fabrication/Detail drawings of all designed components shall be submitted for the formal, final design closeout meeting. Component identification numbers shall be included on drawings where appropriate.

11.6.4.2 All nameplates and labels shall be shown.

#### **11.6.5 Installation Drawings:**

11.6.5.1 An installation drawing shall be submitted for the formal, final design closeout meeting for each piece of equipment. These drawings shall detail modifications required to accommodate equipment installation. Component identification numbers shall be included on drawings where appropriate.

- 11.6.5.2 The installation drawings shall clearly indicate lifting and rigging points and safe lifting load at each for initial installation and any other lifting evolutions.
- 11.6.6 Any proposed changes to required elements identified on the Buyer's DPDs, as defined in Section 1.2 of this specification, shall be submitted to the Buyer via SDDR in accordance with Section 2 of the Purchase Order.

## 11.7 Calculations

- 11.7.1 Calculations shall be submitted to the Buyer to document engineering analysis performed to verify the adequacy of the supplied equipment designs, including calculations for stress, deflection, and fatigue, for seismic and normal service conditions, electrical loads and machine component selection (e.g., motors, bearings, gears, and drive shafts).
- 11.7.2 The Seller shall submit, as early as practical in the design process (but no later than as required by the Buyer approved schedule), an analysis of the reaction loads at all embeds and other support locations.
- 11.7.3 Stress reports and additional calculations affecting ITS components (including calculations for Non-ITS components that may affect ability of the ITS related component to perform the associated ITS function) shall be subject to the requirements of the applicable sections of ASME NQA-1-1989.
- 11.7.4 If commercial off the shelf computer software is used in performing calculations, it shall be validated before use in the documents it supports. The validation test report shall be provided to the Buyer and shall meet, as a minimum, the following requirements:
- Validation testing shall be performed to a Seller approved procedure
  - The testing shall validate the functions and requirements relevant to calculations that it supports
  - The test environment conditions shall be described
  - Testing shall be performed on the same computer platform that the calculations will be performed.
- 11.7.5 Spreadsheet and mathematical program calculations shall be treated like hand calculations. Each equation used in the spreadsheet or program shall be presented in the calculation so the result can be reproduced by hand calculations. The title and version of the program shall also be provided. Evidence of hand calculation reproduction at all key steps in the spreadsheet or program shall be presented in the calculation.
- 11.7.6 English system units of measure shall be used.
- 11.7.7 Calculations and analyses shall be validated, checked, and approved by qualified personnel independent of the preparer. All calculations shall be provided as part of the design report. Independent reviewers shall be qualified in the subject area and shall not have participated in the calculations and analysis under review. Check review comments are subject to audit.

- 11.7.8 Seismic calculations and analyses shall be validated, checked, and approved by qualified personnel independent of the preparer. Evidence shall be provided that both the preparer, the checker, and the independent reviewer are fully qualified including a minimum of 10 years experience in structural seismic analysis. Preliminary seismic calculations shall be provided at the 50 % design review. Final seismic calculations shall be provided at the 90 % design review.
- 11.7.9 The Seller shall ensure that independent checking of critical calculations that bear on long-term performance and reliability are performed.
- 11.7.10 References shall be provided for all physical properties and/or derived physical quantity data and used as input to calculations or analysis.
- 11.7.11 References shall be provided for all formulas or references extracted from applicable codes and standards.
- 11.7.12 Checking shall be performed to confirm the accuracy of the calculations. The checker shall be capable of originating the document. The checker shall not be the originator. Calculations shall be checked and approved prior to use for design or other calculation input.
- 11.7.13 All calculations shall include headers (on all pages) with the following information:
- Calculation number
  - Project name
  - Revision
  - Author
  - Date Subject
  - Pagination
- 11.7.14 All calculations shall include the following sections:
- Objective
  - Inputs
  - Background
  - Applicable codes and standards
  - Methodology
  - Assumptions
  - Calculations
  - Results and discussions
  - References
  - Attachments
- 11.7.15 Attachments to calculations shall include the following information (on every page):
- Calculation number
  - Revision
  - Page numbering

## 11.8 Design Reviews

### 11.8.1 Contract Award Kick-Off Meeting

- 11.8.1.1 The contract award kick-off meeting will be an informal discussion conducted at the Seller's facility to ensure the newly awarded contract is clear and concise, and that the Seller has a clear understanding of the scope of the contract.
- 11.8.1.2 The Seller shall provide to the Buyer, a minimum of five (5) working days prior to the scheduled meeting, copies of documentation or information that is expected to be discussed and/or presented in the meeting. Documentation may be provided as either hard copies or as electronic files via email.

### 11.8.2 20% Design Review

- 11.8.2.1 The first interim review will be an informal review conducted at the Buyer's facility after approximately 20% of the design is completed. Preliminary design media, including arrangement and assembly drawings, calculations and analyses will be reviewed by the Buyer. The Seller shall be prepared to discuss any Seller recommended changes to the approaches indicated on the Buyer's proposal drawings and identify any conflicts with equipment envelope dimensions. The Seller shall participate in the design review and shall be prepared to discuss any comments.
- 11.8.2.2 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

### 11.8.3 50% Design Review

- 11.8.3.1 The second interim review will be an informal review conducted at the Buyer's facility after approximately 50% of the design is completed. Preliminary design media, including arrangement and assembly drawings, calculations and analyses, Software Requirements Document, and Safety Equipment List shall be provided to the Buyer for review. The preliminary design media shall be provided to the Buyer at a mutually agreed time prior to the scheduled meeting. The Seller shall participate in the design review and shall be prepared to discuss any comments.
- 11.8.3.2 Upon buyer's approval, Seller may be authorized to procure (at Buyer's risk) "specific long-lead items", upon satisfactory completion of 50% design review of these items. The Seller shall transmit a detailed list of the "specific long-lead items" that require procurement prior to obtaining code [1] status on the formal drawing submittal. The Seller shall provide sufficient reference documentation for the Buyer to review and authorize the early procurement of these "specific long-lead items".
- 11.8.3.3 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

### 11.8.4 90% Design Review

- 11.8.4.1 At the conclusion of definitive design, a formal 90% design review will be conducted at the Buyer's facility in accordance with WTP procedures. The (draft) final design report,

including all design media, supporting calculations and analyses, Software Requirements Document, Safety Equipment List, and other required submittals that document the design, shall be provided to the Buyer.

- 11.8.4.2 The Seller is encouraged to provide to the Buyer copies of documentation or information that is expected to be discussed and presented at the design review approximately 5 working days prior to the scheduled meeting (if not previously submitted in accordance with the submittal schedule).
- 11.8.4.3 The Seller shall participate in the design review and present the design, including discussion of the provided submittals.
- 11.8.4.4 Following the design review meeting, the Buyer will formally transmit comments or other requests on the design submittals. The Seller is required to provide response/resolution to the Buyer's comments in accordance with the submittal schedule, or request deviation from the Buyer's requirements through use of the Buyer's SDDR form.
- 11.8.4.5 The resolved/corrected submittals shall be provided in the final design report in accordance with the submittal schedule.
- 11.8.4.6 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

## 11.9 Deleted

- 11.9.1 Deleted.
- 11.9.2 Deleted.

## 11.10 Material Test Reports

- 11.10.1 The Seller shall submit to the Buyer, a complete package of Material Test Reports (MTRs) for all stock steel used for components designated as ITS in Section 1.5.3 of this specification, and as required per the applicable codes and standards referenced in this specification, validating critical parameters as applicable. Where a Material Test Report (MTR) for ITS materials is not available, a Certificate of Compliance (C ofC) shall be provided to Buyer for approval via a SDDR.

## 11.11 Spare Parts List

- 11.11.1 The Seller shall provide to the Buyer a recommended spare parts list for all equipment within the Seller's scope of supply for the preventive maintenance of three distinct classifications of spare parts. The Seller's recommendations are to address a startup and warranty period, operational spare parts, and capital spare parts. The recommendations shall also include intervals of replacement based on the operating life of the equipment subject to the duty cycles identified in this specification.
  - Startup and warranty spare parts are those parts that may be required at any time during equipment installation, startup, testing, and unit operation through the warranty period.

- The operational spare parts are those parts that require replacement at regular intervals to maintain continuous operation of the supplied equipment and/or system.
- Capital spare parts are major parts or equipment that provide reliable equipment operation throughout the plant life and having a significant lead time for manufacture and delivery.

11.11.2 The spare parts list shall include names of manufacturers with appropriate model numbers and special ordering instructions (if applicable) for replaceable parts. The spare parts list shall also include pricing and delivery information valid for one year after delivery of the equipment.

### 11.12 Inspection and Test Plan

11.12.1 The Seller shall prepare a detailed Inspection and Test Plan including insertion of Buyer-designated source inspection/witness notification points in accordance with Section 5 of the Purchase Order.

11.12.2 Prior to starting work, the plan shall be submitted to the Buyer for review.

11.12.3 The plan shall include, but not be limited to, the following:

- Equipment to be inspected and tested
- Description of inspection and tests to be performed
- Sequential points for inspection and tests to be performed
- Each characteristic or attribute to be evaluated
- The inspection and test report form to be used
- Other requirements as required by Codes, Standards, or Purchase Order
- Surface finish inspected as stated in Section 7.5.

11.12.4 The plan shall include provisions for increased hold and notification points as the project progresses.

11.12.5 The results of the inspections and tests shall be documented in the Inspection and Test Report.

11.12.6 The Seller shall provide an inspection and test procedure documenting the process followed for determining that specified requirements (dimensions, properties, performance results, etc.) are met.

### 11.13 Manuals

11.13.1 The Seller shall provide a clearly written instruction manual(s). The manual(s) shall include:

- Storage maintenance instructions
- Rigging instructions
- Installation instructions
- Spare parts list
- General description of the equipment identifying as applicable, significant technical characteristics, test and adjustment information, and safety and warning notices

- Instructions for equipment operation (start-up, shut down, normal, and abnormal), referencing drawings and diagrams as appropriate
- General maintenance instructions
- Recommended inspection points if any, with procedures and period for inspection
- Maintenance instructions for any required lubrication

**11.14 Design Changes Incorporated by Reference**

24590-WTP-SDDR-PROC-05-00180	Material Equivalency
24590-WTP-SDDR-M-05-00117	Material Equivalency of QL materials for the Canister Rinse Bogie equipment.
24590-WTP-SDDR-MH-07-00110	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 -Wire Insulation Colors
24590-WTP-SDDR-MH-07-00111	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 - Wire Splicing
24590-WTP-SDDR-MH-07-00114	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 - Nameplates
24590-WTP-SDDR-MH-07-00117	MR25 Canister Rinse Bogie -Shim Packs
24590-WTP-SDDR-MH-07-00118	MR25 Canister Rinse Bogie - Factory Acceptance Cycle Testing & Recovery Positional Accuracy

Design changes incorporated by reference in revision 5

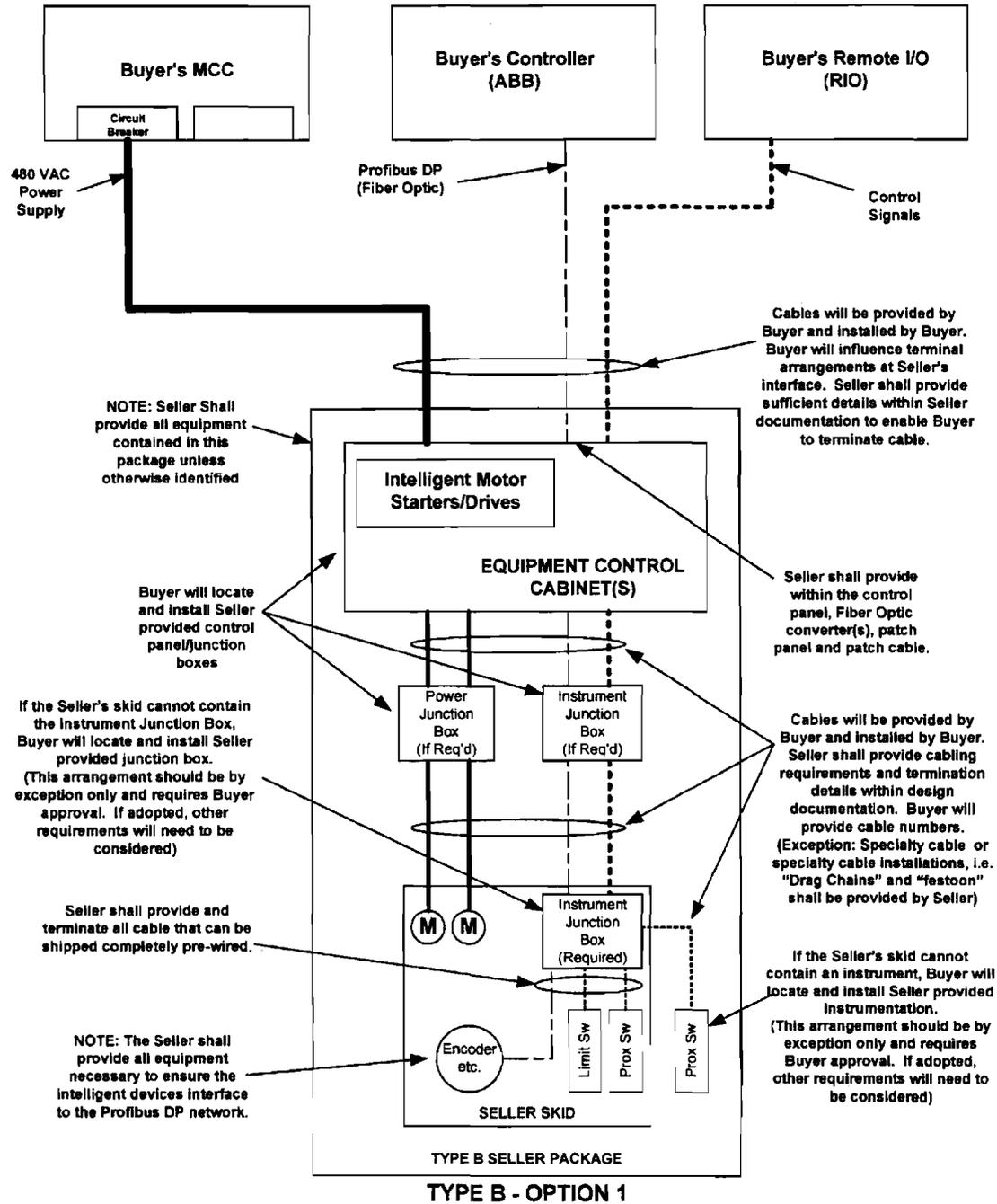
24590-WTP-SDDR-MH-07-00287	Acceptance of Versions 01 and 03a of ASTM A36
24590-WTP-SDDR-MH-08-00174	Wright Industries (MR 25) - Years for ASTM material standards
24590-WTP-SDDR-MH-08-00271	Materials not certified to the correct revision levels
24590-WTP-SDDR-MH-09-00227	MR MH025 Pump Coating
24590-WTP-SDDR-MH-11-00009	MR 25 Reduction of RT Exam Requirements
24590-WTP-SDDR-MH-11-00018	MR 25 Resolution of AWS Code Years
24590-WTP-SDDR-MH-11-00020	MR 25 Material Equivalency of QL Materials for the Canister Rinse Bogie Equipment
24590-WTP-SDDR-MH-11-00039	MR 25 Reduction of RT Exam Requirements
24590-WTP-SDDR-MH-11-00056	MR 56 Material Selection for ASME NOG-1, CMAA 70, and AISC MO16

## Appendix A

### Instrumentation and Control Interfaces

# Appendix A Instrumentation and Control Interfaces

Figure 1 "Type B" Package



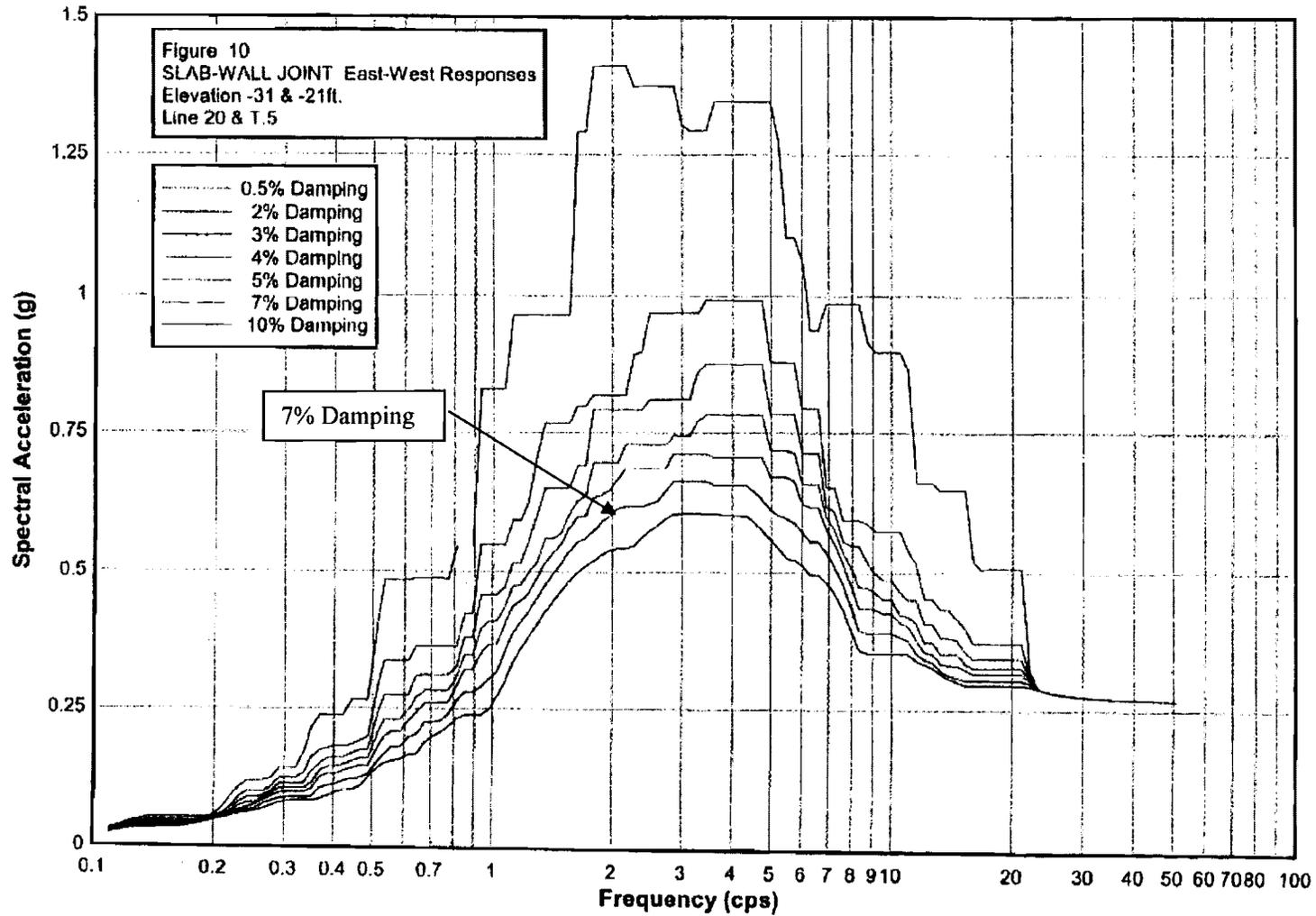
DATE	REV.
05/06/03	D

## Appendix B

### Seismic Response Spectra

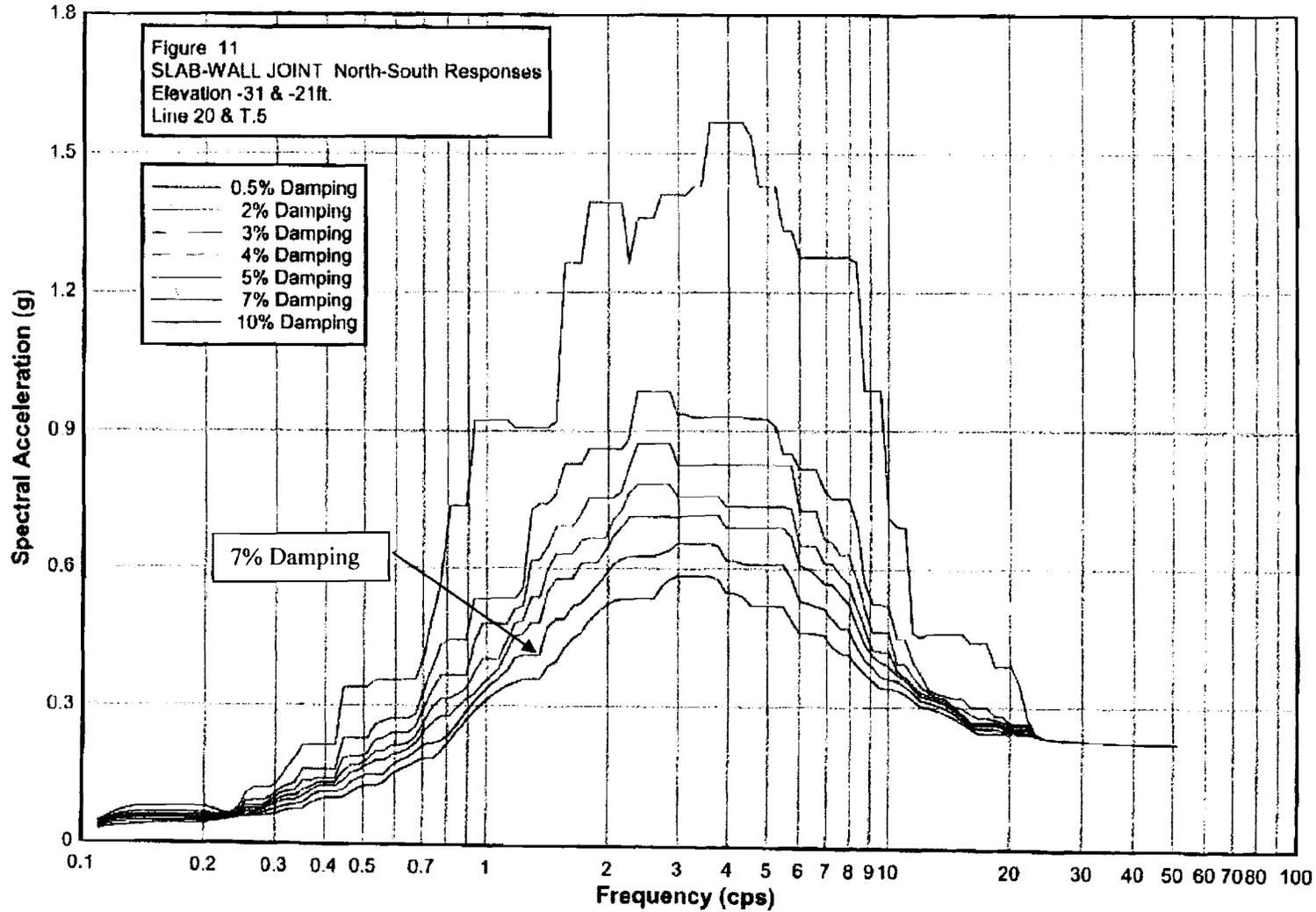
### RPP-WTP HLW Vitrification Facility ISRS

Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0D



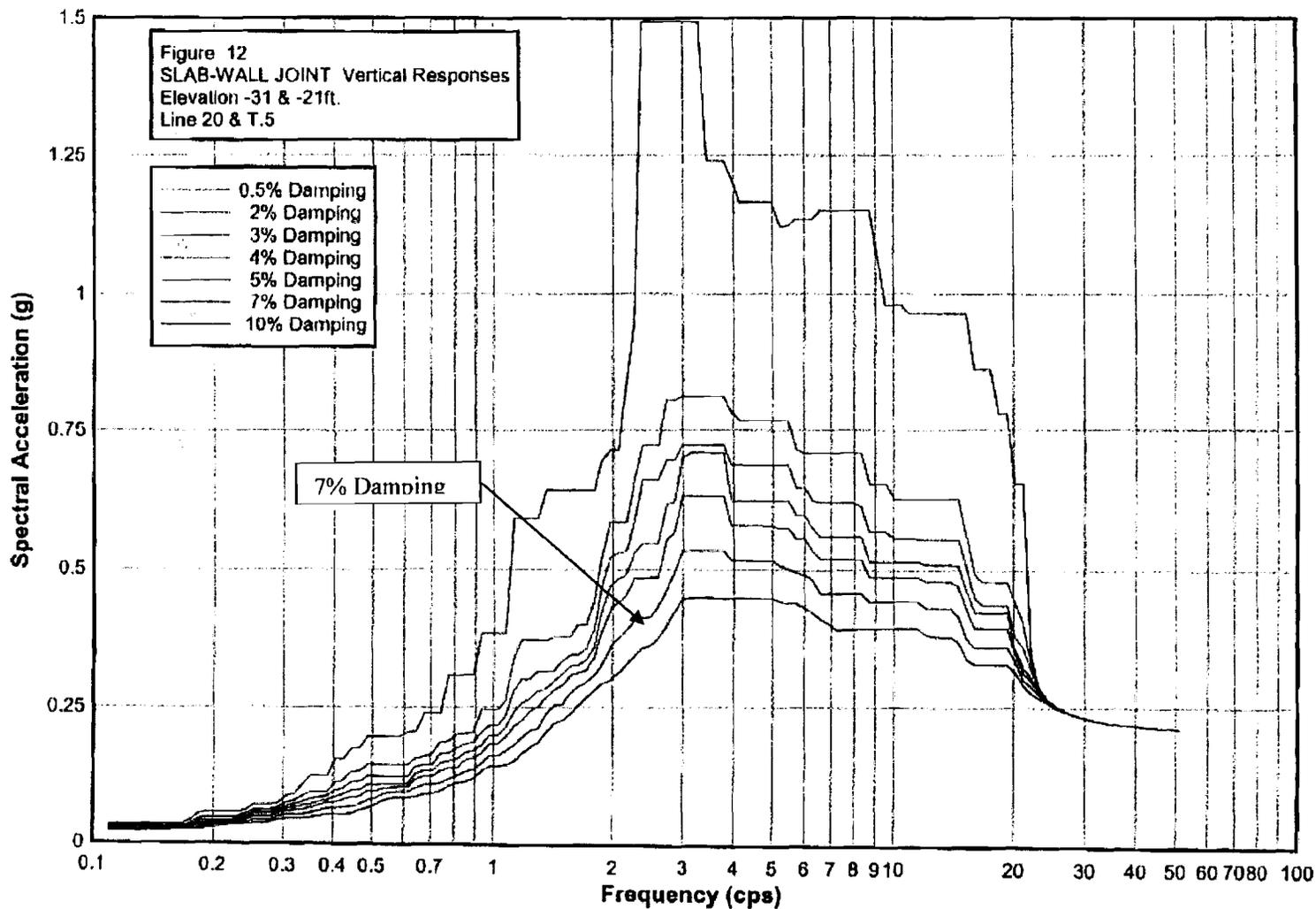
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Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0D



### RPP-WTP HLW Vitrification Facility ISRS

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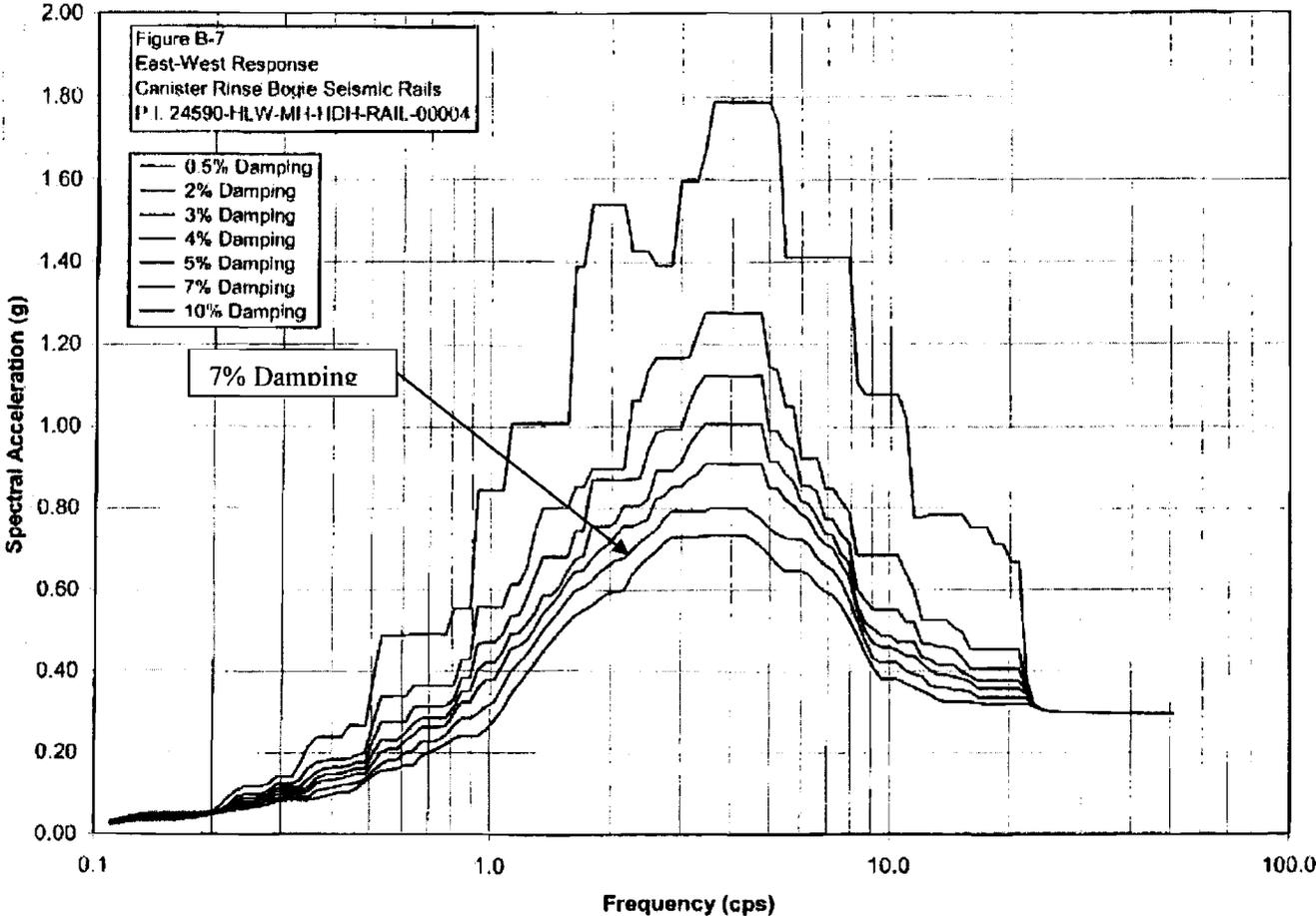


CALCULATION SHEET

BY: Ed Uile  
DATE: 8/19/05

PROJECT: RPP-WTP  
JOB NO.: 24590  
CALC NO.: 24590-HLW-30C-S15T-00039  
SHEET REV: D  
SHEET NO.: B-9

SUBJECT: HLW Vitrification Building Seismic Analysis - Enveloped In-Structure Response Spectra

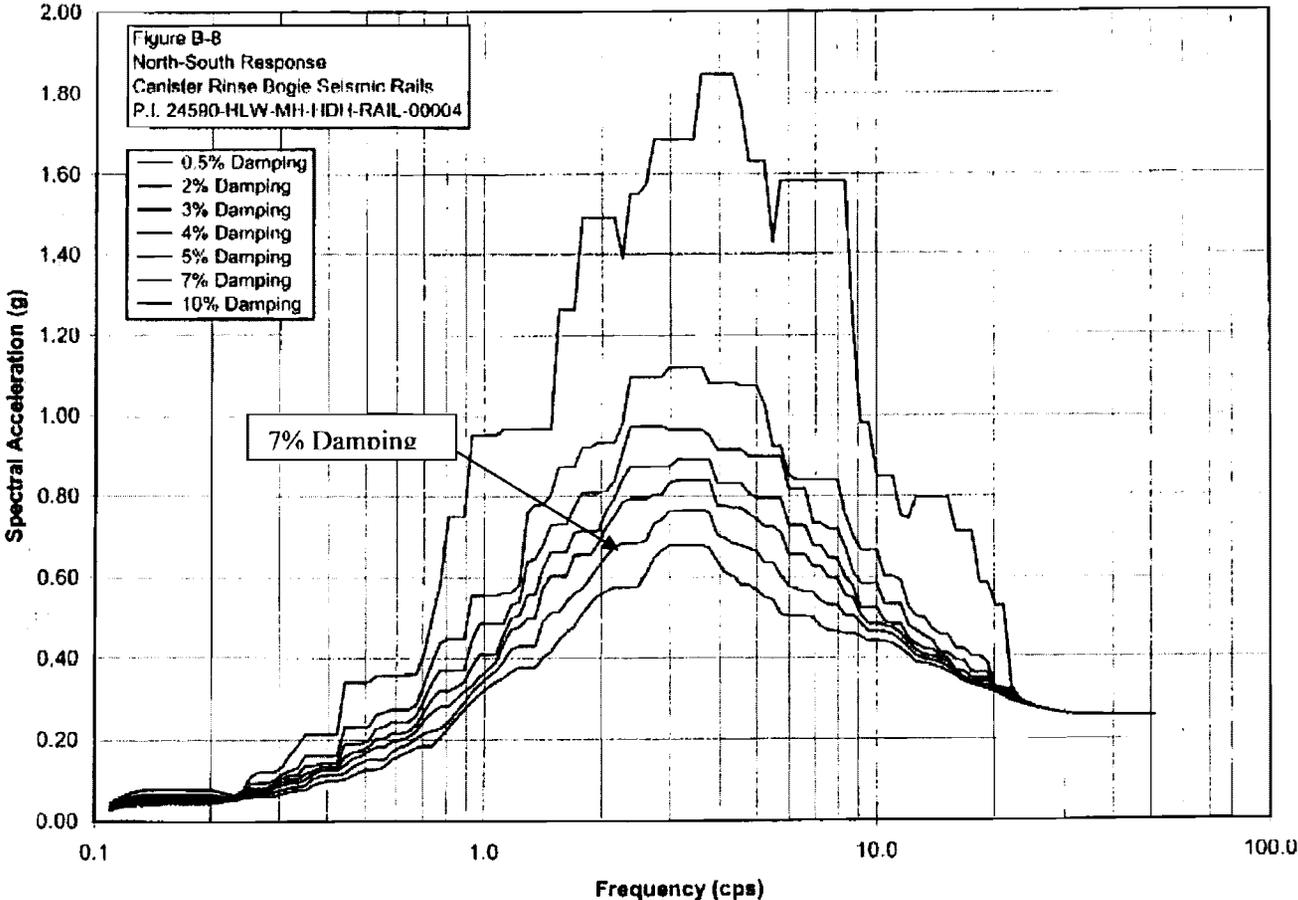


CALCULATION SHEET

BY: Ed Ullie  
DATE: 8/19/05

PROJECT: RPP-WTP  
JOB NO.: 24590  
CALC NO.: 24590-HLW-SQC-S15T-00039  
SHEET REV: D  
SHEET NO.: B-10

SUBJECT: HLW Vitrification Building Seismic Analysis - Enveloped In-Structure Response Spectra

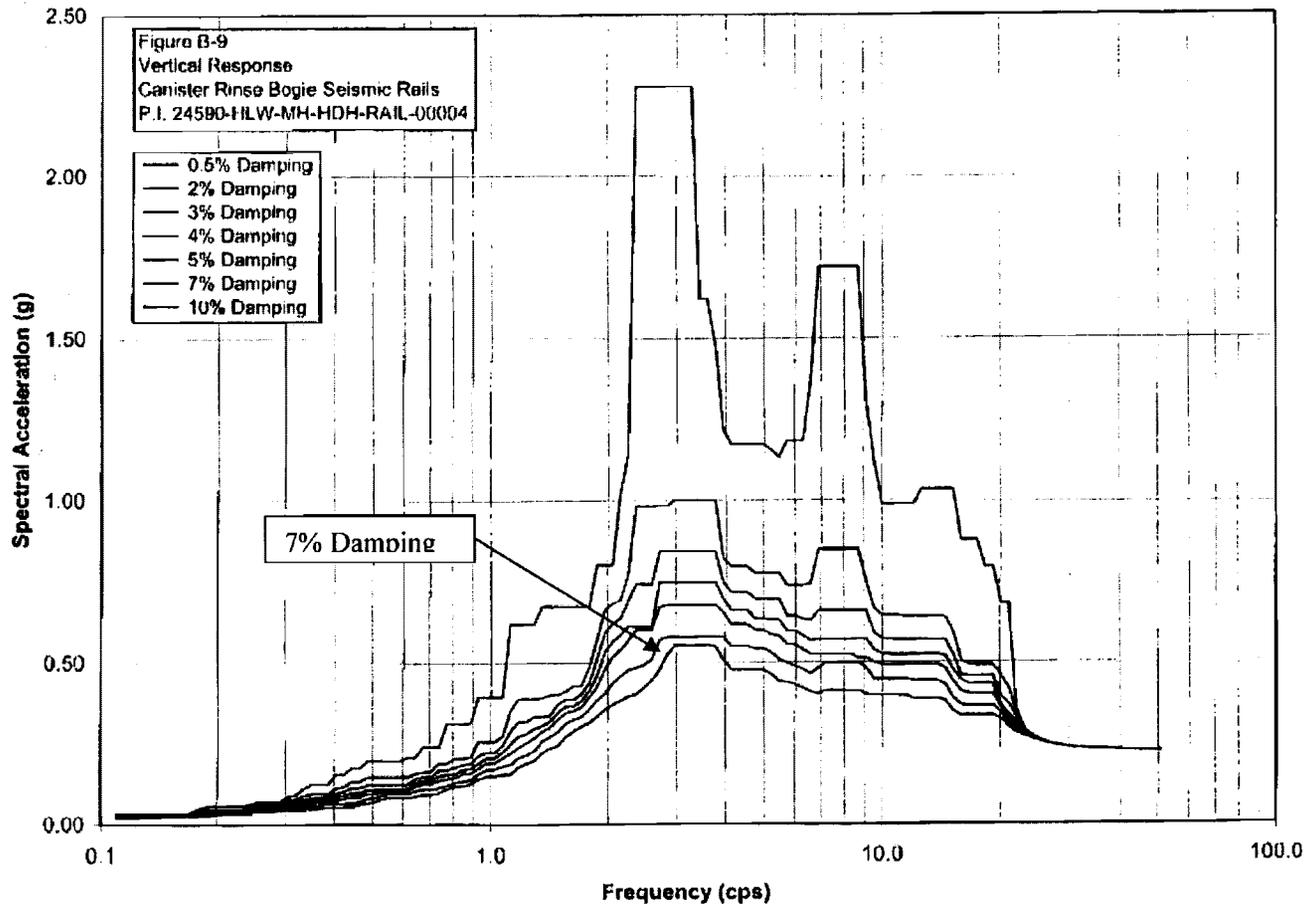


### CALCULATION SHEET

BY: Ed Uile  
DATE: 8/19/05

PROJECT: RPP-WTP  
JOB NO.: 24590  
CALC NO.: 24590-HLW-SOC-S15T-00039  
SHEET REV: D  
SHEET NO.: B-11

SUBJECT: HLW Vitrification Building Seismic Analysis - Enveloped In-Structure Response Spectra



## Appendix C

### ALARA Design Review (ADRs)

24590-HLW-ADR-M-02-005	HLW Canister Rinse Bogie Services Design Evaluation, Rev. 1
24590-HLW-ADR-M-02-006	HLW Bogie Recovery Systems, Rev 1
24590-HLW-ADR-M-02-007	Rinse Bogie Energy Chain, Rev 1
24590-HLW-ADR-M-02-013	Power and Control Supplies for the Canister Rinse Bogie (System HDH), Drum Transfer Bogie (RWH) and Cask Transfer Bogie (RWH), Rev. 1
24590-HLW-ADR-M-02-048	ALARA Review of HLW System Bogies, Rev. 1
24590-HLW-ADR-M-02-050	ALARA Design Review for HLW System HDH & RWH Bogie Rails, Rev. 0

## Appendix D

Deleted

## Appendix E

Deleted

## Appendix F

**Deleted**

## Appendix G

**Deleted**

## **Appendix H**

### **Human Factor Codes and Standards**

## Appendix H Human Factor Codes and Standards

IEEE 1023-1988 Application Areas for Mechanical Handling	Applicable Human Factor Attributes	Applicable Code, Standard, or Requirement
3.0 Planning for Human Factors Engineering	HFE Program Management	NUREG-0711, Section 2
	Human Reliability Analysis	NUREG-0711, Sec. 7
	Functional Requirements Analysis and Function Allocation	NUREG-0711, Section 4
	Human Factors Engineering Program Review	NUREG-0711
4.1 Task considerations	Human Engineering Information Display	Part 1 of NUREG-0700, Rev 1
	Task Analysis	NUREG-0711, Section 5
4.2 Environmental considerations:	Environment, Internal Design Conditions	See Section 5.5 of this specification
	Acoustical Noise	MIL-STD-1472F, sec. 5.8.3
	Anthropometric Data	MIL-STD-1472F, sec. 5.6.3
	Illuminance & Illumination	MIL-STD-1472F, Sections 5.8.2, 5.10.5
4.3 Equipment considerations		
	Cranes, Material Handling and construction	MIL-STD-1472F, section 5.12.8
	Vibration	MIL-STD-1472F, Section 5.8.4
	Remote Handling Equipment	
	• Controls: General	DOE-STD-1140-2001 Section 2.5
	• Handle and Grasp Area Design	DOE-STD-1140-2001 Section 2.13
	• Remote Handling	MIL-STD-1472F Section 5.10
	• Self-Alignment	MIL-STD-1472F Section 5.10.1.1
	• Quick-Disconnect	MIL-STD-1472F Section 5.10.1.2
	• Fasteners	MIL-STD-1472F Section 5.10.1.3
	• Lock or Latching	MIL-STD-1472F Section 5.10.1.4
	• Feedback	MIL-STD-1472F Section 5.10.2
	• Manipulators	MIL-STD-1472F Section 5.10.3
	• Position Control	MIL-STD-1472F Section 5.10.3.2

IEEE 1023-1988 Application Areas for Mechanical Handling	Applicable Human Factor Attributes	Applicable Code, Standard, or Requirement
4.4 Personnel Considerations	• Mutual Force Reflection	MIL-STD-1472F Section 5.10.3.2
	• Degrees of Freedom	MIL-STD-1472F Section 5.10.3.2
	• Power Assist	MIL-STD-1472F Section 5.10.3.3
	• Viewing Equipment	MIL-STD-1472F Section 5.10.4
	• Direct Viewing	MIL-STD-1472F Section 5.10.4.2
	• Viewing Angle	MIL-STD-1472F Section 5.10.4.3
	• Indirect Viewing	MIL-STD-1472F Section 5.10.4.4
	Viewing Equipment - Coding	MIL-STD-1472F Section 5.10.4.5
	Viewing Equipment - Lettering	MIL-STD-1472F Section 5.10.4.6
	• Illumination - Reflected Light	MIL-STD-1472F Section 5.10.5.1
	• Threshold Viewing	MIL-STD-1472F Section 5.10.5.2
		Hand Tools
	Interface Design Evaluation,(Human Machine Interface)	NUREG-0711, Section 8
	Labeling	MIL-STD-1472F, section 5.5
4.5 Nuclear Operations Considerations	Remote Handling ( Power Manipulators)	MIL-STD-1472F, section 5.10.3
	Workplace Design	Part III of NUREG-0700, Rev 2, Section 12
	Workstation Design	Part III of NUREG-0700, Rev 2, Section 11.1
	Radiological Hot Workshops	DOE-HDBK-1140-2001, Section3.4
4.6 Documentation Considerations	No attribute identified	
5. Methodology	No attribute identified	
5.1 None observational methods	No attribute identified	
5.2 Observational methods	No attribute identified	
5.3 Expert Opinion Techniques	No attribute identified	
	Procedure Development	NUREG-0711, Section 9
	Task Analysis	NUREG-0711, Section 5,
6: Implementation in Design, Operations, Testing and Maintenance process	Maintenance/Maintainability	DOE-HDBK-1140-2001, Section 5.2 & Section 6.6

IEEE 1023-1988 Application Areas for Mechanical Handling	Applicable Human Factor Attributes	Applicable Code, Standard, or Requirement
6.1 Program Plan		
6.2 Documenting HFE in the Design, Operations, Testing and Maintenance Process	Training Program Development	NUREG-0711, Section 10
	Verification and Validation Maintenance/Maintainability	NUREG-0711, Section 11 DOE-HDBK-1140-2001, Section 5.2 & Section 6.6
6.3 Operational Experience Review:	Operating Experience Review	NUREG-0711, Section 3
	Staffing & Qualifications	NUREG-0711, Section 6