Capsule Storage Area (CSA) Functional Design Criteria (Project W-135)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

ch2m
P.O. Box 1600
Richland, Washington 99352

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Terms

ACI American Concrete Institute
AHJ Authority having jurisdiction
AISC American Institute of Steel Construction
ALARA as low as reasonably achievable
ASCE American Society of Civil Engineers
AMU aqueous makeup unit
ANSI American National Standards Institute
ASME American Society of Mechanical Engineers
ASTM American Society for Testing and Materials
AWS automated welding system
BFE buyer furnished equipment
CE&I control, electrical power and instrumentation
CFR Code of Federal Regulations
CHPRC CH2M HILL Plateau Remediation Company
CMAA Crane Manufacturers Association of America, Inc.
COR code of record
CRD contractor requirements document
CSA Capsule Storage Area
CSB Canister Storage Building
CsCl cesium chloride
CSP Capsule Storage Pad
CSS Cask Storage System
DOE U.S. Department of Energy
DOT U.S. Department of Transportation
DOH Washington State Department of Health
DSA documented safety analysis
DTS Dry Transfer System
EU Hanford Site Electric Utilities Group
FDC functional design criteria
FHA fire hazards analysis
### Terms

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>FPE</td>
<td>fire protection engineer</td>
</tr>
<tr>
<td>HMS</td>
<td>Hanford Site Meteorological Station</td>
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<tr>
<td>HVAC</td>
<td>heating, ventilating, and air conditioning</td>
</tr>
<tr>
<td>ICR</td>
<td>interpretation/clarification request</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
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<tr>
<td>IES</td>
<td>Illumination Engineering Society of North America</td>
</tr>
<tr>
<td>ISA</td>
<td>International Society of Automation</td>
</tr>
<tr>
<td>ISIFI</td>
<td>Independent Spent Fuel Storage Installations</td>
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<tr>
<td>LS</td>
<td>limit state</td>
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<tr>
<td>MCSC</td>
<td>Management of the Cesium and Strontium Capsules Project</td>
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<tr>
<td>MSA</td>
<td>Mission Support Alliance</td>
</tr>
<tr>
<td>NACE</td>
<td>National Association of Corrosion Engineers</td>
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<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
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<td>NRC</td>
<td>Nuclear Regulatory Commission</td>
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<td>PC</td>
<td>performance category</td>
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<tr>
<td>PRC</td>
<td>Plateau Remediation Contract</td>
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<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act of 1976</td>
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<tr>
<td>RL</td>
<td>DOE, Richland Operations Office</td>
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<tr>
<td>SDC</td>
<td>seismic design category</td>
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<td>SIP</td>
<td>shielded indexer plate</td>
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<td>SOW</td>
<td>statement of work</td>
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<td>SSC</td>
<td>structures, systems, and components</td>
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<tr>
<td>SrF₂</td>
<td>strontium fluoride</td>
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<tr>
<td>TMS</td>
<td>temperature monitoring and recording system</td>
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<tr>
<td>TSC</td>
<td>Transportable Storage Canister</td>
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<tr>
<td>TSCB</td>
<td>Transportable Storage Canister Basket</td>
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<tr>
<td>TSR</td>
<td>technical safety requirements</td>
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<tr>
<td>UCS</td>
<td>Universal Capsule Sleeve</td>
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<tr>
<td>VCC</td>
<td>Vertical Concrete Cask</td>
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## Terms

<table>
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<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>VCT</td>
<td>Vertical Cask Transporter</td>
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<td>WESF</td>
<td>Waste Encapsulation and Storage Facility</td>
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1 Introduction

1.1 Purpose

The purpose of this functional design criteria (FDC) document is to establish the functional and technical requirements for the structures, systems, and components (SSCs) associated with the Capsule Storage Area (CSA).

The design and construction of the CSA is managed by the Management of the Cesium and Strontium Capsules (MCSC) Project (W-135) which will provide the capability for the removal of cesium and strontium capsules from the Waste Encapsulation and Storage Facility (WESF) and placement of the capsules into an interim storage configuration at the CSA, pending final disposition.

Responsibilities for the MCSC Project are divided between the CH2M HILL Plateau Remediation Company (CHPRC) and various MCSC Project subcontractors as depicted in Figure 1-1. CHPRC has the responsibility for executing the MCSC Project. CHPRC-02252, Management of the Cesium and Strontium Capsules Project (W-135) Functions and Requirements Document, establishes the upper level technical basis, requirements, and design criteria for the MCSC Project, and is the basis for the detailed technical and design requirements contained in this document for the CSA and transfer roadway improvements from WESF to the CSA. The requirements for the cask storage system (CSS) design and fabrication are contained in a separate FDC document, CHPRC-02622, Cask Storage System (CSS) Functional Design Criteria (Project W-135). Similarly, requirements for the WESF modification design are contained in CHPRC-03011, WESF Modifications Functional Design Criteria (Project W-135).

![Figure 1-1. MCSC Acquisition Strategy](image)

Throughout this document, reference is made to CHPRC, the MCSC Project, the CSS design/fabrication contractor, the WESF Modifications design contractor, and the CSA design contractor. Requirements and criteria that reference the MCSC Project apply to the project as a whole, including CHPRC, the CSS design/fabrication contractor, the WESF Modifications design contractor, and the CSA design contractor. Requirements and criteria that reference CHPRC, the CSS design/fabrication contractor, the WESF Modifications design contractor, or the CSA design contractor apply only to that party.

1.2 Applicability

The requirements identified in this FDC apply to the design and construction of the SSCs required for the CSA and transfer roadway improvements from WESF to the CSA in support of the MCSC Project. This
FDC is designed to be implemented in conjunction with the CSA statement of work (SOW), which is part of the contract between CHPRC and the CSA design contractor for the design of the CSA and transfer roadway improvements from WESF to the CSA. The contractor will be required to provide engineering support during the construction activities and prepare as-built drawings after project completion.

The work performed under this FDC includes the following:

- Design and construction of the CSA, including the Capsule Storage Pad (CSP) and operating areas, to support interim storage of the capsules
- Design and implementation of roadway improvements from WESF to the CSA necessary to support transfer of the capsules using CSS components.

2 Project Overview

2.1 Scope Summary

The MCSC Project will acquire capabilities needed to remove the cesium and strontium capsules from WESF and place the capsules into interim storage. The scope covered by this FDC includes the design and construction of the SSCs required for the CSA and transfer roadway improvements from WESF to the CSA needed to support capsule retrieval, loading, and transfer to the CSA for interim storage.

MCSC Project scope not covered by this FDC and that will be performed by others includes:

- Design and fabricate storage and transfer systems and associated equipment necessary to support retrieval, loading, and transfer of the capsules to interim storage (the CSS)
- Perform modifications/upgrades/maintenance required within WESF
- Perform regulatory activities and operational preparations necessary for capsule removal from WESF and implementation of interim storage.

The following scope is not included in the MCSC Project:

- Capsule transfer operations, including retrieval from existing storage, loading and transfer to CSA, and placement into the interim storage configuration
- WESF base operations, including capsule storage in the WESF pool cells
- Decommissioning of WESF or CSA
- CSA base operations
- Final disposition of the capsules
- Disposition of the capsule transfer equipment.

The MCSC Project will be completed when the capability is provided to place all capsules into interim storage at the CSA and project closeout is completed. Although the MCSC Project scope does not include final disposition of the capsules, the CSS acquired by the project shall not preclude actions that can reasonably be expected to be required for future final disposition.
2.2 Key Definitions

The following general definitions pertain to the MCSC Project.

**Ancillary equipment:** Includes all associated or related equipment that is required to fully use and handle CSS components supplied for their intended purpose at WESF. This includes, but is not limited to: equipment for transfer of the empty Transportable Storage Canister (TSC) into the Vertical Concrete Cask (VCC); a frame or cradle to upend or position an empty Universal Capsule Sleeve (UCS) for loading and/or remote welding, as well as potential remote weld removal; lifting equipment including yokes (if used) and slings; test equipment for vacuum testing or helium detection; seismic restraints (if required); and equipment used for component alignment.

Equipment used for component alignment shall also include any solution specific designed, fabricated, and delivered specialty WESF cover blocks, as allowed in the SOW and as may be reviewed and approved by CHPRC. The specialty designed cover block ancillary equipment shall conform and comply with applicable requirements of CHPRC-02622. Ancillary equipment may also include platforms or man-lift equipment necessary to complete CSS loading activities, miscellaneous pumps, hand tools, relief valves, hydrogen detectors, or other items as may be uniquely necessary for the proposed solution technology. Certain common items, e.g. cranes, man-lifts, etc., may be supplied as buyer furnished equipment (BFE) by CHPRC as allowed and agreed in the SOW and/or contract.

**Automated welding system:** The automated welding system (AWS) is used to perform field closure activities following loading of cesium and strontium capsules.

**Capsule storage area:** The CSA includes the CSP required for storage of the capsules and associated fencing, lighting, and road access. The CSA will also include a concrete operating area adjacent to the CSP sufficient to support receipt, assembly and staging of empty CSSs; CSS loading activities and placement of loaded casks for interim storage; and CSA surveillance and maintenance operations. The remainder of the CSA will be graded, compacted gravel. The fencing will be used to limit radiological exposure to non-radiological workers from loaded CSSs and will provide required physical security. The CSA shall include features to address storm water in a manner that does not interfere with the operation of the CSS (e.g. passive cooling).

**Capsule storage pad:** The CSP is the concrete foundation upon which the CSS will be placed for interim storage of the capsules. The CSP shall include features to address storm water in a manner that does not interfere with the operation of the CSS (e.g. passive cooling).

**Cask storage system:** The CSS is the complete system that provides storage of the capsules for the required interim storage period. The CSS includes the TSC, TSC Basket (TSCB), and VCC. A loaded CSS will also include the UCS and capsules.

**Dry Transfer System:** The Dry Transfer System (DTS) is a shielded bell housing that will be used to transfer the UCS from the G Cell into a CSS located in the WESF truck port. The DTS will be moved using the existing canyon crane and is a component of the Ancillary Equipment package.

**Safety class structures, systems and components:** Safety class SSCs are defined by 10 CFR 830, “Nuclear Safety Management,” as “the structures, systems, or components, including portions of process
systems, whose preventive or mitigative function is necessary to limit radioactive hazardous material exposure to the public, as determined from safety analyses.”

**Safety significant structures, systems and components:** Safety significant SSCs are defined by 10 CFR 830 as “the structures, systems, and components which are not designated as safety class structures, systems, and components, but whose preventive or mitigative function is a major contributor to defense in depth and/or worker safety as determined from safety analyses.”

**Safety structures, systems and components:** Safety SSCs are defined by 10 CFR 830 to mean both safety class and safety significant SSCs.

**Shielded Indexer Plate:** The Shielded Indexer Plate (SIP) is a device which provides a shielded transfer interface between the DTS and the CSS. The SIP is positioned on top of the CSS and maximizes shielding by providing a pass-through within a shielded housing that is rotated to align with the individual tubes of the TSCB.

**Transfer cask:** A component that provides heat removal, shielding, and physical protection during transfer of a loaded TSC into a VCC or from a VCC into a transportation cask. The transfer cask is typically lifted via lifting trunnions and yoke. A transfer cask is not expected to be used for the MCSC Project, but it is a component that could be used to support future transportation of the TSC off-site for final disposition or as a recovery action.

**Transfer equipment:** Used to move the loaded CSS from WESF to the CSA. It may also be used to move an unloaded CSS or a VCC. It includes equipment such as trailers, crawlers, or tow vehicles, including any restraint or tie-downs required to move the VCC and may include tugs, pushers or tractors used to move any trailer or dolly. SSCs used to protect the VCC from environmental conditions once it leaves WESF shall be included. Transfer equipment does not include temporary lifting yokes, slings and rigging that are considered ancillary equipment (see also Vertical Cask Transporter [VCT]).

**Transportable Storage Canister:** The TSC is designed to fit inside the VCC for storage and the transportation cask for transportation. The TSC houses the empty or UCS loaded TSCB.

**Transportable Storage Canister Basket:** The TSCB is commonly referred to as the basket. It is designed to house multiple UCS and is placed inside the TSC.

**Transportation cask:** A component that provides heat removal, shielding, and physical protection during off-site transfer of a loaded TSC to an alternate off-site location. The transportation cask is typically licensed in accordance with 10 CFR 71, “Packaging and Transportation of Radioactive Material,” for all Nuclear Regulatory Commission (NRC) defined transportation accidents for a list of approved contents. A transportation cask is typically lifted with lifting trunnions and yoke. A transportation cask is not expected to be used for the MCSC Project, but it is a component that could be used for future transportation of the TSC off-site for final disposition or as a recovery action.

**Universal Capsule Sleeve:** The UCS is designed to hold standard cesium/strontium capsules or Type W capsules. It is a metal cylinder used to confine the capsules in a storage system using a canister/overpack design. It is protected from normal, off-normal, and accident conditions by the TSC and VCC.

**Vertical Concrete Cask:** The VCC is the storage overpack that houses the TSC. The VCC provides radiological shielding and physical protection for the loaded TSC package.
**Vertical Cask Transporter:** The VCT is part of the Transfer Equipment set of SSCs. It is a wheeled, towed hydraulic lift unit that is designed to lift and carry a CSS over the grade and road conditions existing at the site along the designated haul path. An aircraft gate tractor is typically provided as the prime mover of the VCT for all on site cask movements. The VCT interfaces with the CSS via two lifting lug sets bolted to the VCC top plate connected by engagement pins to two lift links on the VCT.

### 3 Description of WESF

The MCSC Project shall use existing systems at WESF (225-B Building) to the extent that they are cost effective and practical to support capsule retrieval and loading for on-site transfer and interim storage. The WESF layout is depicted in Figure 3-1.

#### 3.1 WESF Description

The following summary description of WESF is intended to provide an overview of the facility and a description of the key features that relate to the CSA design contractor. The CSA design contractor is responsible for verifying dimensions and features of WESF that are determined to be key to its scope of work. Figures 3-1 through 3-4 provide facility layout information.

#### 3.1.1 Introduction

The current WESF mission is to store cesium and strontium capsules in a safe manner, in compliance with all applicable rules and regulations. The scope of the WESF mission is currently limited to facility maintenance activities; inspection; decontamination and inspection of capsules; and storage and surveillance of capsules. WESF is a Hazard Category 2 facility based upon the quantity, form, and location of radioactive material.

WESF is located in the Hanford Site 200 East Area adjacent to the west end of B Plant (Figure 3-2). The WESF facility consists of the 225-B Building and several support buildings. The 225-B Building is a two-story structure 157 ft long by 97 ft wide by 40 ft high at the outside dimensions. The first floor is 14,000 ft² and the second floor is 6000 ft². The ground elevation of the facility is approximately 700 ft above sea level and approximately 200 ft above the underground water table. The building is divided into Area 1, Area 2, and Area 3. Area 1 is a one-story above grade reinforced masonry wall structure with a metal deck diaphragm roof supported on open-web steel joists and steel beams and includes the WESF support...
area, heating ventilation and air conditioning (HVAC) room, pool cell entry airlock, and pool cell monitoring area. Area 2 is a two-story above-grade structure with reinforced concrete roof and floor slabs supported by reinforced concrete shear walls in the section of the 225-B Building enclosing the hot cells, canyon, hot and cold manipulator shops, manipulator repair shop, operating gallery, service gallery, and aqueous makeup (AMU) area. Area 3 is a one-story structure that contains the truck port and pool cell area. The general elevation view layout of WESF is shown in Figure 3-3. Figure 3-4. presents the WESF first floor plan view showing truck port, hot cells and pool cells. The primary interface point for the CSA design contractor is the truck port and the truck port apron elements of Area 3.

Figure 3-2. WESF located at West End of B Plant

The MCSC Project shall use existing systems at WESF to the extent that they are cost effective and practical to support capsule retrieval and loading for on-site transfer and interim storage. The anticipated facility configuration for WESF at the start of MCSC Project is described in further detail in CHPRC-03011. Details associated with key interfaces and other critical aspects are described in Sections 3 through 10 of this FDC.
3.1.2 WESF Truck Port Area: Key WESF Features Related to the CSA Interface and Capsule Removal

Facility features and dimensions that may pertain to the removal of the capsules from WESF are summarized in this section. Additional information on these features is provided in the balance of Section 3 of this FDC.
The truck port is an enclosed area, located at the west end of WESF, which provides confinement for cask and low-level solid waste loading and unloading. Interior access doors are located in the service gallery and pool cell area. A motor-operated roll-up door (approximately 11 ft wide and 14 ft high) provides access to the outside. However, interferences inside the truck bay (HVAC ducting; wall-mounted equipment, electrical wiring, and instrument air lines; and the bulk of the door in the rolled-up position) restrict the usable space within the bay to nominally 10 ft-6 in. wide by 12 ft-0 in. high.

The roll-up door and the truck port apron (see Figure 3-5) are the primary interface points where CSS components will exit WESF to the transfer roadway. Upgrades to the truck port floor and apron are part of the WESF modifications; the CSA scope includes the haul path road to the truck port apron. This interface is a critical interface between the WESF modifications design contractor and CSA design contractor.

WESF facility drawings and dimensions have not been verified by field walk-downs. Facility dimensions, therefore, should be considered approximate. Verification of any facility dimensions that are critical to the contractor’s design is the responsibility of the contractor. Table 3-1 provides a list of the drawings to be used for dimension references of WESF.

Of importance to the CSA design contractor are drawings H-2-66403 sheet 1; H-2-66421 sheet 1; H-2-66422 sheet 1 and H-2-66428 sheet 1 as these are critical to the existing structural aspects of the truck port and truck port apron.
4 Major Systems, Functions, and Requirements

The following discussion is an overview of the functions and requirements for all of the MCSC Project major systems.

The MCSC Project will load the capsules into a modified/adapted commercially available Dry Cask Storage System. The selected Dry Cask Storage System will be modified/adapted to accommodate the unique needs of the capsules stored at WESF. The CSS shall passively store the capsules, inside a cask and canister system, in a dry configuration.

Design of the storage system shall allow for future removal of the capsules for final disposition.

The selected CSS design approach consists of a UCS, DTS, TSC with TSCB, and a VCC. The UCS is a metal cylinder used to hold the capsules. The TSC is a canister that houses the TSCB and protects the UCS from normal, off-normal and accident conditions in conjunction with the VCC. The TSCB is the internal basket assembly which houses the UCS and which provides radial and horizontal capsule...
distribution support and heat transfer functions within the TSC. The VCC is a vertical concrete cask into which a TSC is placed for storage. VCCs provide long term radiological shielding and physical protection for the TSCs which contain the UCSs containing the capsules. In addition, the VCC also provides a flow path for the internal circulation of air adjacent to the TSC for heat removal.

The MCSC Project shall provide the capability to perform the top-level process functions identified in Figure 4-1.

![Figure 4-1. Top Level Process Functions](image)

The construction of the CSA will be under separate contract in accordance with CHPRC requirements as defined in this FDC and the CSA design contractor SOW. The CSA activities are inclusive of the additional inputs based on the selected CSS, as well as evaluation of, and any subsequent required modifications to the existing roadway from the WESF truck port apron to the proposed CSA site. Modification of the truck port and truck port apron will be coordinated by CHPRC and the responsible contractor identified in their respective SOW.

Design of MCSC Project SSCs associated with the CSA design contractor scope of work shall be performed entirely by the CSA design contractor in accordance with this FDC and the CSA design contractor SOW, including the following project SSCs:

- CSA (Section 4.1)
  - Siting (Section 4.1.1)
  - CSP (Section 4.1.2)
  - Operating pad (Section 4.1.3)
  - Security fencing and lighting (Section 4.1.4)
  - Temperature monitoring system interface/external housing unit and control, electrical power and instrumentation (CE&I) cable and conduit SSCs not part of the CSS design/fabrication contractor scope of work (Section 4.1.5)
  - Utilities (Section 4.1.6)
- Transfer Roadway (Section 4.2).
4.1 Capsule Storage Area

The scope of the CSA design encompasses the CSA and its SSCs, including the CSP, operating area, fencing and security systems, and utility and support systems which are not designed and supplied by the CSS design/fabrication contractor. The CSA includes the structures and systems required for interim storage of the capsules contained within the CSS. The CSA will include a concrete operating area adjacent to the CSP sufficient for CSS placement activities and surveillance and maintenance operations. The remainder of the CSA will be graded, compacted gravel. The fencing will be used to limit radiological exposure to non-radiological workers from the loaded CSSs and will provide required physical security. The CSA shall include features to address storm water in a manner that does not interfere with the operation of the CSS (e.g. passive cooling).

The following sub-sections provide the functional requirements for the CSA and its SSCs, including the CSP, operating area, security systems, and utility and support systems.

Additional general and special design requirements (civil/structural, electrical, etc.) are provided in Section 6 of this FDC.

4.1.1 Siting

Based on Site Evaluation 2E-11-09, Cesium and Strontium Capsules Dry Storage Project, the CSA will be located in the 200E Area approximately 0.17 miles from WESF. It is designated as Site 1 in the Site Evaluation’s Attachment 1. In accordance with the Site Evaluation, Site 1 is reserved for the MCSC Project with no outstanding land-use commitments. Site 1 is shown below in Figure 4-2. Should an expansion area of Site 1 still be required, it will be developed south of 7th Street as a simple expansion area of the current designated Site 1 location.

The currently designated CSA site location depicted in Figure 4-2 is in the vicinity of a catch tank (241-ER-311), diversion box, (241-ER-351) and underground pipeline (V-224) used to transfer radioactive wastes within the Hanford tank waste system. Historic releases from these underground utilities have led to an area of contaminated soil (UPR-600-20) in the vicinity of the CSA site. Depending on needs of the CSA, excavation work for the CSA and related roadways may require some soil remediation work. Site surveys will be required to assess potential impacts of UPR sites on CSA construction and vice versa. In addition, contaminated tumbleweeds grow with some regularity in the area of UPR-600-20 so ongoing monitoring should be regularly performed. CHPRC will conduct these surveys.

Other potential interferences noted in the Site Evaluation include a buried 13.8 kV power line and pad mounted transformer adjacent to the northern-most boundary of Site 1, across 7th Street from Site 1, and buried pipelines (200-E-217-PL and 200-E-161-PL) crossing and parallel to 7th Street.

The CSA design contractor shall be responsible for identifying any potential utility interferences based on the selected design solution, including but not limited to the potential interferences describe above, and proposing the best means for resolving them to CHPRC. The contractor will determine and apply the appropriate engineering/design requirements based on the resolution directed by CHPRC.
Figure 4-2. Location of Capsule Storage Area

4.1.2 Capsule Storage Pad

The CSP is the concrete foundation upon which the CSS will be placed for interim storage. The CSP shall be within the CSA fenced area. The CSP shall be designed to accommodate 25 CSSs containing all MCSC-associated cesium and strontium capsules, and shall be designed to allow for routine surveillance and monitoring as required by the CSS design requirements, the Resource Conservation and Recovery Act of 1976 (RCRA) permit, and operations procedures. The CSS design and operational approach for placing the CSSs on the CSP will include a concrete operating area adjacent to the CSP sufficient for CSS operations, and surveillance and maintenance operations. Reinforced concrete pads that support confinement casks in storage do not constitute "pavements." As such, the CSP shall be designed and constructed as a foundation under an applicable code.

The CSP design shall be based on the CSS design/fabrication contractor’s anticipated storage layout, and shall consider loading from the CSS drop and tip-over analysis. The CSS consists of the Vertical Concrete Cask (VCC) which is the storage overpack for the Transportable Storage Canister (TSC) with each TSC containing up to 22 Universal Capsule Sleeves (UCS) and each UCS containing up to 6 capsules. With consideration of heat transfer, radiological control and other design constraints, up to 25 CSSs may be required to dry-store all the capsules from the WESF storage pool.

For the most efficient storage configuration and to minimize CSA boundary dose rates, the CSP design dimensions shall be based on a five by five (5 x 5) storage grid. The final storage array (i.e., final number of CSSs and their positions on the CSP) will be specified by the CSS design/fabrication contractor following CSS Preliminary Design. The VCC as depicted on NAC drawing 30059-062 provides the critical dimensions of the CSS which are 120 in. in diameter x 132.5 in. tall. In order to provide sufficient spacing between the CSSs for placement on the CSP using on-site transportation equipment, a minimum CSS center-to-center distance of 15 ft is required as well as a perimeter that is 10 ft wide (i.e., from edge of CSP to nearest CSS). Based on these assumptions, the CSP shall be a square design, 90 ft on each side. The elevation of this pad shall be above the finish grade of the CSA as required to promote drainage.
The CSP shall be centered within the CSA fenced area, which shall provide for a minimum 85-ft wide area around the CSP.

The CSP and the CSS have been determined to be safety significant SSCs (refer Section 7.0, Nuclear Safety Requirements). The design basis classification for seismic design shall be seismic design criteria (SDC-2) and limit state (LS C) in accordance with CHPRC procedure PRC-PRO-EN-097, Engineering Design and Evaluation (Natural Phenomena Hazard).

The designated preferred site for CSA is in the 200E Area upon what is referred to as the Central Plateau, and is located adjacent to the Canister Storage Building (CSB). The site is relatively flat with soils primarily consisting of sandy loams. CHPRC will evaluate site foundation soil conditions and perform site specific investigations as required to support the contractor’s design of the CSP.

Grading around the CSP shall be such that all storm water shall flow away from the structure. Drainage features shall be incorporated throughout the CSA that will convey water away from the structure and approach roadways.

CHPRC will perform site surveys to identify any potential utility interference based upon the proposed location of the CSA.

The CSA design contractor shall determine if any soil improvements are required to support the loads on the CSP. If significant soil modifications or other preparations are required, the CSA design contractor shall review options and make recommendations to CHPRC for review and approval.

Environmental design conditions and existing site soil conditions shall be considered in the design and analysis of the CSP foundations. The CSA design contractor shall consider the potential for liquefaction or other soil instabilities attributable to vibrating ground motion, and the pad shall be designed with this in mind.

The CSP shall meet the requirements of WAC-173-303-630 (7)(c) and (7)(d) “Dangerous Waste Regulations” “Use and Management of Containers” for impervious surface precipitation control. Therefore, the CSA design contractor shall design and construct the CSP such that:

- it is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation; or
- The storage casks are otherwise protected from contact with accumulated liquids.

The grading and drainage calculation shall include requirements for concrete slabs, roadways and structures in the area of the CSP, and any excavation and backfill requirements for installation of the CSP.

Steel embedments in reinforced concrete structures must satisfy the requirements of the design code applicable to the reinforced concrete structure. Similarly, structural steel must satisfy the requirements of the applicable steel design code.

The CSP layout shall consider transfer equipment and heavy equipment access required to place the CSS for each successive loading. The CSP shall incorporate a design approach apron between the road and the CSP to bridge the elevation difference and allow casks to be placed directly on the CSP with the VCT in order to provide operational efficiency by eliminating the need for crane lifts of the loaded casks. The CSP shall be protected with metal edging at each access point.
The heat transfer from CSS shall be totally passive, by natural convection, radiation and conduction, without any moving parts. The storage pad shall be designed for the maximum temperature of concrete surfaces in accordance with the guidelines and requirements of ACI 349, *Code Requirements for Nuclear Safety-Related Concrete Structures*. The CSA design contractor will be provided with thermal data for the CSS by the CSS design/fabrication contractor, and shall provide in the basis for the design of the CSA an analysis of maximum concrete temperatures and demonstrate how this complies with the system design life requirements. Expected concrete temperatures shall assumed to be 400°F.

The CSP design shall consider expected radiation exposure over the design life of the pad.

The CSP will be fenced with a vehicle gate and man gates for entrance and emergency exit.

See Section 6.1.2 for additional requirements.

### 4.1.3 Operating Area

The CSA design shall include a concrete operating pad adjacent to the CSP sufficient for receipt, assembly and staging of empty CSS casks; CSS loading activities and placement of loaded CSSs on the CSP for interim storage; and CSA surveillance and maintenance operations. The remainder of the CSA will be graded, compacted gravel.

The operating area shall be concrete and shall be designed to support expected loads. The design basis load requirements shall be provided by the CSS design/fabrication contractor. If the existing soil will not support this bearing capacity, then the area shall be rebuilt to obtain the required bearing capacity.

The operating area shall include the apron between the CSP and the access road.

The operating area shall be sized to allow storage of up to 25 empty VCCs and 25 empty TSC/TSCBs. Storage of empty components shall not interfere with moving and placing loaded CSSs. The operating area shall also support the placement of empty TSC/TSCBs into empty VCCs. All CSS assembly activities shall be completed before any capsule loading activity occurs at WESF.

### 4.1.4 CSA Security Fencing, Lighting, and Access Control Requirements


CSA perimeter and the CSP shall each be enclosed by an 8 ft. chain link fence with outriggers.

Vehicle gates shall be sufficiently sized and placed for entry and movement of the VCT and cranes for receipt operations and maintenance activities. Personnel entry gates with crash bars shall be provided for routine entry by personnel; high security locks shall be provided on each fence gate.

Lighting around the perimeter of the storage location shall be provided with an illumination level of not less than that recommended by IES 2013, *The Lighting Handbook*. Lighting shall be replaceable without need to enter the inner fenced area.

The need for a security alarm system, communications, and other measures to prevent unauthorized access to CSA and the stored materials shall be determined by a security requirement analysis performed...
by others and provided to the CSA design contractor. Safeguards and security features shall prevent theft, vandalism, and other malicious acts that could release radioactive material or disrupt facility operations.

Additional safeguards and security requirements for the MCSC Project are provided in Section 6.7 of this FDC.

4.1.5 Temperature Monitoring System

The CSS design/fabrication contractor will provide a safety significant temperature monitoring/recording system (TMS) for the CSS. The TMS will include RTDs at the CSSs, ambient air temperature monitors (one located at the TMS protective structure and one at the CSP west fence), and a centralized monitoring/recording panel at the CSA to receive temperature signals from the CSS and ambient air temperature monitors. The centralized monitoring/recording panel will also have the capability to provide signals for remote annunciation of an off-normal condition or failed instrument signal. There is a critical interface between the CSS design/fabrication contractor and the CSA design contractor with regard to the installation of the TMS.

The CSA design contractor shall design support equipment for the TMS to include but not be limited to:

- a protective structure located adjacent to the CSA to house the CSS design/fabrication contractor supplied monitoring/recording panel, accessible as required to allow evaluation of CSS temperature conditions
- all conduits/cabling required to provide power to the TMS components at the CSA
- CE&I cabling to connect the signals from the CSS (four per CSS) and the ambient air temperature monitors (2 located at the CSP) to the centralized monitoring/recording panel at the CSA
- all conduits/cabling and interfaces to provide signals to a remote annunciation panel/interface at the CSB.
- all conduits/cabling required to provide power to the TMS components at the CSB
- a remote annunciation panel/interface at the CSB.

The CSA design contractor’s design shall be based on design inputs for the TMS provided by the CSS design/fabrication contractor. The TMS from the CSS to the centralized monitoring/recording panel is safety significant; components shall be designed to safety significant standards as described in Section 6.1.3.

4.1.6 CSA Utility and Support System Requirements

The MCSC Project shall interface with the existing Hanford Site electrical distribution system. The CSA design contractor shall provide designs to modify or extend the existing 13.8kV system as required to provide for construction power and for long-term CSA operations. Designs for interfaces to the electrical distribution system shall be coordinated with Hanford Site Electrical Utilities organization (EU).

Existing systems at WESF and the CSB shall be used to the maximum extent possible to distribute required utilities (e.g., water, power). Assessment of utilities and infrastructure interfaces shall occur following preliminary facility definition and interface definition.
If existing systems modified to support long-term storage operations are not adequate to support construction and capsule transfer operations, then temporary means shall be used to supply the required utilities. Assessment of the adequacy of the 13.8 kV electrical distribution system is to be done in conjunction with EU.

General personnel access to the CSA shall be configured for ease of entry for routine operations, surveillance, and maintenance. The use of existing roadways, electrical distribution systems, and communications network shall be maximized to satisfy CSA requirements; however, modifications (e.g., roadway enhancements to support anticipated vehicle loads; movement of overhead interferences) may be required. CSS delivery to the CSP shall be by the vehicular entrance established further to the east off of 7th Street to take advantage of previously disturbed areas.

Any required support personnel will be housed at existing WESF or CSB facilities. MCSC Project will not provide new facilities or capabilities to house support personnel for CSA operations.

Access roads, aprons, and walkways for CSA will be integrated with the existing infrastructure at CSB.

A raw water system is required for the CSA in order to supply fire water to fire hydrants. There are no structures associated with the CSA. Therefore, automatic fire sprinkler systems are not required. The CSA will interface with the on-site water distribution for raw water. The following requirements are applicable to the CSA raw water system design:

- Raw and potable water systems shall meet the requirements specified in Washington State Department of Health (DOH) 331-123, *Water System Design Manual*. Cross-connection control features shall prevent cross-connection of raw and potable water systems. The Hanford Site water purveyor controls the water system.

- The applicable requirements of Contractor Requirements Document (CRD) O 420.1C (Supplemented Rev. 0), *Facility Safety*, Section 3 and DOE-STD-1066-2012, *Fire Protection* shall be followed for fire suppression (sprinklers and/or hydrants) water supplies. Per the RL Authority Having Jurisdiction (AHJ), Section 3.b.3 of CRD O 421.1C (Supplemented Rev. 0) is not applicable to the CSA since it is not a building.

- The CSA will be a Category 2 nuclear facility. Therefore, CRD O 420.1C, (Supplemented Rev. 0), Section 3.b.4.a requires that a minimum of two operational fire hydrants shall be provided such that parts of the exterior of the facility can be reached by hose lays of not over 300 feet. Additional fire hydrants may be required depending on the location of the water connection.

- DOE-STD-1066-2012 requires that hydrants shall be provided such that:
  - Hydrants are no closer than 40 feet to the facility.
  - Hose runs from the hydrants are no more than 300 feet to all exterior portions of the facility (i.e. coverage over the entire pad, plus 35 ft of clearspace to wildland areas on all open sides).
  - A minimum of two hydrants per facility are provided. The location, access, and arrangement of fire hydrants is subject to the review and approval of the CHPRC cognizant Deputy Fire Marshal and the Hanford Fire Chief.
Branch piping between the water main and hydrants shall not be greater than 300 feet.

The installation of the raw water system shall be in accordance with Hanford Water Utility Standards. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances should be used as reference for the installation of the raw water system. Thrust blocking should be provided as required in accordance with NFPA 24.

The fire water supply shall be capable of providing the minimum fire flow per NFPA 1, Fire Code, as adjusted by the Hanford Fire Chief. The minimum fire flow is 3500 gpm at 20 psi for a minimum duration of four hours in accordance with the Hanford Fire Marshal’s Office Interpretation/Clarification Request (ICR) 2017-02, Rev 1.

Detailed plans, specifications, and calculations shall be submitted to the CHPRC cognizant fire protection engineer (FPE) for review and approved prior to installation.

Inspection, testing, and maintenance for fire water supplies shall be performed in accordance with NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

A lightning risk assessment shall be performed per NFPA 780, Standard for the Installation of Lightning Protection Systems. If the assessment determines lightning protection is required, then it shall be provided.

Cathodic protection systems shall be provided if required by the MCSC Project design and shall be designed in accordance with the guidelines provided in NACE SP0285, External Corrosion Control of Underground Storage Tank Systems by Cathodic Protection, and NACE SP0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

Communications systems shall be designed in accordance with DOE O 200.1A, Information Technology Management. MCSC Project shall use existing telephone capabilities at WESF and CSB for internal and external communication. CSA will not be a normally occupied area and will not require installation of a telephone system. Portable communication devices will be used at CSA. It is not anticipated that any new telephone conduits will need to be installed for communication lines.

MCSC Project shall use the existing public address system at WESF and CSB and ensure that the public address system broadcasts to all CSA areas.

MCSC Project shall use the existing computer intranet system available at WESF and CSB for interfaces with the Hanford Local Area Network, unless new system capacity is identified as needed for the TMS. It is not anticipated that any new computer intranet system interfaces will be required at CSA.

Additional general design requirements for civil/structural and electrical systems and components are provided in Section 6 of this FDC.

4.2 Transfer Roadway

CHPRC operations will use equipment supplied from the West Valley project to move the loaded CSSs the approximately 0.17 miles from WESF to the CSA (loaded) and from CSA to WESF (empty). To the greatest extent possible, the MCSC Project shall take advantage of existing asphalt road (7th Street) at the
The MCSC Project shall extend the existing roadways to the CSA boundary. The construction workforce, facility operations workers, and CSSs will arrive at CSA by existing and extended roadways. The extension of existing roadways and construction of new roadways shall be compatible with existing roadways.

The Transfer Roadway shall be modified/improved as necessary to provide for the safe transfer of the CSSs from WESF to the CSA with minimal maintenance being required during the transfer operations period. The Transfer Roadway will require modifications as needed to accommodate the VCT width, loaded weight, grade requirements, and turning radius. These modifications may include widening, grade adjustments, subgrade improvements, new paving, and protections as may be required to under road utilities, drainage culverts, etc. Above grade structures such as fences, bullocks, overhead lines, etc. may also require relocation to accommodate the CSS transfer equipment.

Roadways, subsurface conditions, and existing infrastructure (i.e., drainage culverts, underground utility lines, and overhead lines) shall be investigated and confirmed to be adequate to support and sustain the loading that will be imposed by the transfer of the CSSs to the CSA. Should the roadways and existing infrastructure not be adequate for the design loads and life-cycle use, then replacement structure design or modifications shall be provided. Proof testing with a simulated design load is an acceptable means for determining the adequacy of the existing infrastructure, except that before proof testing can be performed, calculations shall show that the structures and underground utilities to be traversed are capable of supporting the proposed loading. If not, then the locations above the areas of concern shall be adequately reinforced to assure that no damage to the utility or structure will occur.

Unless otherwise directed, access roadways within the CSA shall typically be concrete or crushed stone and shall be designed to support expected loads. If the existing soil will not support this bearing capacity, then the area shall be rebuilt to obtain the required bearing capacity.

DOE-0359, Hanford Site Electrical Safety Program (HSESP), identifies limited approach boundaries for overhead lines that could be impacted by equipment and cranes in transit or performing work. The CSA design contractor shall evaluate overhead electrical and communication lines that are in or near the path that will be used by the VCT to transfer loaded or unloaded CSSs and move or raise any lines that do not meet DOE-0359 requirements.

## Interfaces

Some MCSC Project provided systems will require physical tie-ins with existing systems and structures at WESF and with the CSB at CSA. The CSA design contractor prepared conceptual design report will define facility interfaces, tie-in requirements and approach to testing, consistent with requirements of PRC-PRO-EN-286, Testing of Equipment and Systems. The project will also require access to and perform work within various areas of WESF and at the CSA site. Requirements for the performance of work on the Hanford Site, including interfaces with CHPRC, are described in the SOW.

Interfaces with Hanford Site Utilities, Mission Support Alliance (MSA), the CSS design/fabrication contractor, and the CSA and WESF Modifications construction contractors shall be coordinated through CHPRC.
5.1 Technical Interfaces

The execution of the CSA design contractor scope of work may impact and/or require technical interfaces with CHPRC, as well as other Hanford Site organization such as, but not limited to, the following:

- Hanford Site Utilities Organization - Any services, such as electricity, air, or water, (either temporary or permanent) required by the CSA design contractor’s design shall be clearly identified by the contractor

- CHPRC Quality Assurance - The CSA design contractor shall have procedures for controlling the configuration of the design during the design, fabrication, and construction phases of the project, in accordance with the contractor’s CHPRC approved Quality Assurance Program

- Change control - Procedures shall ensure that changes to the design are reviewed and approved consistent with the requirements for the initial design

- CHPRC Engineering - The CSA design contractor shall provide to CHPRC any analysis used to support the design of the various system components. The contractor is responsible for determining and performing any additional analysis beyond that specifically identified in the SOW and this FDC to ensure compliance with the project requirements. Change-control procedures shall ensure that changes to the design are reviewed and approved consistent with the requirements for the initial design

- WESF Operations – Any CSA design contractor planned physical modifications to any of the existing WESF facility and equipment requires coordination and approval of CHPRC

- CSB Operations - Any planned CSA design contractor design and construction interfaces with the CSB

- CHPRC Nuclear Safety – Any CSA design contractor nuclear safety analysis requires CHPRC and U.S. Department of Energy (DOE), Richland Operations Office (RL) approval

- CHPRC Environmental - The CSA design contractor’s design shall support and comply with the MCSC Project environmental permitting requirements

- MSA - MSA is responsible for Hanford Site transportation safety and approval of transportation permits. Movement of materials and equipment, including the transfer of the capsules from WESF to CSA must comply with DOE/RL-2001-36, Hanford Sitewide Transportation Safety Document. The CSA design contractor shall support all such permit applications as may be required by CHPRC. The MSA EU organization is responsible for the Hanford Site electrical distribution system. Any required changes to this system to support the CSA shall be coordinated with EU

- CSS design/fabrication contractor – The CSA design contractor will receive design inputs related to the CSS, capsule loading, transfer and storage system activities, design, and safety analysis from the CSS design/fabrication contractor

- CSS design/fabrication contractor, WESF Modification design contractor, and WESF Modifications construction contractor – The CSA design contractor shall provide technical support for design
development, and modifications during construction of the CSS SSCs and any required WESF modifications.

5.2 Utility Interfaces

5.2.1 Hanford Site Utilities/Infrastructure

MCSC Project shall interface with existing Hanford Site utilities and infrastructure as needed to support construction, capsule transfer operations, and long-term storage operations. MCSC Project shall use existing systems at WESF and the CSB (or as elsewhere may be identified) to distribute required utilities (e.g., water, electricity, and sanitation). If existing systems modified to support long-term storage operations are not adequate to support construction and capsule transfer operations, then temporary means shall be used to supply the required utilities.

Access roads, aprons, and walkways for the CSA will be integrated into the existing CSB infrastructure wherever possible.

5.2.2 Service Roads

To the greatest extent possible, MCSC Project shall take advantage of existing asphalt roads at the selected site. The CSA design contractor’s design shall extend the existing roadways to the CSA boundary. The construction workforce, facility operations workers, and casks/canisters will arrive at CSA by existing and extended roadways. The extension of existing roadways and construction of new roadways shall be compatible with the existing roadways. A design analysis shall be performed to confirm that the existing roadways can accommodate the vehicles transferring casks to and from CSA; if existing roadways cannot accommodate cask transfer, modification to the roadways shall be designed by the contractor.

Any new roads or road modifications for the MCSC Project shall meet the requirements of M 41-10, Standard Specification for Road, Bridge, and Municipal Construction.

5.2.3 Interface with Existing 13.8 kV Primary Electrical Distribution System

MCSC Project electrical power needs – as may be required - shall interface with the existing Hanford Site electrical distribution system. MCSC Project shall provide extension of the existing electrical power grid as required for construction power and long-term CSA operations. Depending on facility location and power requirements, the existing electrical distribution system may require upgrades.

The assessment and definition of interface requirements for a MCSC Project substation shall occur following final CSA siting within the designated siting area and definition of electrical loads. Designs for interfaces to the electrical distribution system shall coordinated with EU.

Electrical power delivered to the system and electrical installation and any modifications to the site electrical utilities distribution system, including the 13.8 kVac-480 Vac transformers, shall conform to NFPA 70-2008, National Electric Code, and IEEE C2, National Electrical Safety Code.

5.2.4 Interface with Site Water Distribution

A raw water system is required for the CSA in order to supply fire water to fire hydrants. There are no structures associated with the CSA. Therefore, automatic fire sprinkler systems are not required. The CSA
will interface with the on-site water distribution for raw water. The following requirements are applicable to the CSA raw water system design:

- Raw and potable water systems shall meet the requirements specified in DOH 331-123. Cross-connection control features shall prevent cross-connection of raw and potable water systems. The Hanford Site water purveyor controls the water system.

- The applicable requirements of CRD O 420.1C (Supplemented Rev. 0), Section 3 and DOE-STD-1066-2012 shall be followed for fire suppression (sprinklers and/or hydrants) water supplies. Per the RL AHJ, Section 3.b.3 of CRD O 421.1C (Supplemented Rev. 0) is not applicable to the CSA since it is not a building.

- The CSA will be a Hazard Category 2 nuclear facility. Therefore, CRD O 420.1C, (Supplemented Rev. 0), Section 3.b.4.a requires that a minimum of two operational fire hydrants shall be provided such that parts of the exterior of the facility can be reached by hose lays of not over 300 feet. Additional fire hydrants may be required depending on the location of the water connection.

- DOE-STD-1066-2012 requires that hydrants shall be provided such that:
  - Hydrants are no closer than 40 feet to the facility.
  - Hose runs from the hydrants are no more than 300 feet to all exterior portions of the facility (i.e. coverage over the entire pad, plus 35 ft of clearspace to wildland areas on all open sides).
  - A minimum of two hydrants per facility are provided. The location, access, and arrangement of fire hydrants is subject to the review and approval of the CHPRC cognizant Deputy Fire Marshal and the Hanford Fire Chief.
  - Branch piping between the water main and hydrants shall not be greater than 300 feet.

- The installation of the raw water system shall be in accordance with Hanford Water Utility Standards. NFPA 24 should be used as reference for the installation of the raw water system. Thrust blocking should be provided as required in accordance with NFPA 24.
  - The fire water supply shall be capable of providing the minimum fire flow per NFPA 1, as adjusted by the Hanford Fire Chief. The minimum fire flow is 3500 gpm at 20 psi for a minimum duration of four hours in accordance with the Hanford Fire Marshal’s Office ICR 2017-02, Rev 1.
  - Detailed plans, specifications, and calculations shall be submitted to the CHPRC cognizant FPE for review and approved prior to installation.

- Inspection, testing, and maintenance for fire water supplies shall be performed in accordance with NFPA 25.

5.3 Contractor Interfaces

5.3.1 CSB Interface

The MCSC Project design, construction, and capsule transfer operations will require technical, physical and operational interfaces with adjoining CSB facility and site. The CSA design contractor shall work
with CHPRC to meet the CSB DSA/technical safety requirements (TSR) or modify the DSA/TSR as applicable to the CSA work scope and RCRA Permit requirements.

5.3.2 WESF Interface
The MCSC Project design, construction, and capsule transfer operations will require technical, physical and operational interfaces with WESF. The CSA design contractor shall work with CHPRC to meet the WESF DSA/TSR requirements or modify the DSA/TSR as applicable to the CSA work scope and RCRA Permit requirements.

5.3.3 WESF Modifications Contractor Interface
The interface between the CSA design contract and the WESF Modifications design contract is the WESF truck port apron. The CSA design contractor shall be responsible for all Hanford Site roadway modifications necessary to the MCSC Project, as well as any other civil engineering work external to the WESF (except for any required work on the WESF apron which is the responsibility of the WESF Modifications design contractor). The CSA design contractor will work with the WESF Modifications design contractor for interface between the WESF apron and access road work.

5.3.4 CSS Design/Fabrication Contractor Interface
The CSA design contractor shall ensure that the CSA design is compatible with CSS design/fabrication contractor hardware. Considerations to be addressed include, but are not limited to, operational needs to be defined by the CSS design/fabrication contractor.

6 General Requirements

6.1 Discipline Specific Design Requirements
This section of the FDC provides the general requirements for the MCSC Project design organized by design discipline. It includes relevant codes and standards for those SSCs determined by safety analysis to be safety significant as identified by DOE O 420.1C, Facility Safety. It is the responsibility of the contractor to determine the relevancy of the identified codes and standards to the specific MCSC Project design solution. The codes and standards identified in the following sections are not intended to be all inclusive. It is the responsibility of the contractor to evaluate, identify, and apply the applicable industry codes and standards to the specific design features of MCSC Project.

6.1.1 Mechanical/HVAC
Per DOE O 420.1C, safety significant mechanical handling equipment shall meet the requirements of the codes listed in Table 6-1 below as applicable to the specific MCSC Project design.
Table 6-1. Codes for Safety Significant Handling Equipment

<table>
<thead>
<tr>
<th>Handling Equipment</th>
<th>Safety Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranes</td>
<td>Applicable CMAA standards; ASME NOG-1, ASME NUM-1, ASME B30.2; DOE-STD-1090</td>
</tr>
<tr>
<td>Other Equipment</td>
<td>ANSI N14.6; ASME B30 Series; DOE-STD-1090</td>
</tr>
</tbody>
</table>

All cranes, hoists, and lifting devices designed or used for activities associated with the MCSC Project shall meet the requirements of DOE-STD-1090-2011, *Hoisting and Rigging*, and DOE/RL-92-36, *Hanford Site Hoisting and Rigging Manual*.

6.1.2 Civil/Structural

The CSP shall have a design basis classification of seismic design criteria (SDC-2) and limit state (LS C) in accordance with CHPRC procedure PRC-PRO-EN-097, *Engineering Design and Evaluation (Natural Phenomena Hazard)*. See Section 6.8 for design criteria related to natural phenomenon. Per DOE O 420.1C, safety significant structures shall, at a minimum and unless more restrictive requirements are otherwise specified elsewhere in this FDC, meet the requirements of the codes listed in Table 6-2.

Table 6-2. Codes for Safety Significant Structures

<table>
<thead>
<tr>
<th>Structures</th>
<th>Safety Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>ACI 318</td>
</tr>
<tr>
<td>Steel</td>
<td>ANSI/AISC 360; AISC-325</td>
</tr>
</tbody>
</table>

The maximum temperature of concrete surfaces of the storage pad shall be in accordance with the guidelines and requirements of ACI 349. The maximum temperature of the pad shall be assumed to be 400°F.

CHPRC will conduct required subsurface investigations to assess the adequacy of soil foundation conditions to withstand the loadings associated with permanent structures as well as temporary loadings associated with construction, and capsule transfer operations.

The CSA design contractor’s design documents shall specify that construction-phase activities associated with the installation, inspection, and testing of structural concrete, structural steel, soils and foundations shall be performed under the quality assurance requirements outlined in Section 10 of this FDC. The determination of, and basis for the application of, specific safety basis codes and standards shall be documented in a project specific nuclear safety document which shall be prepared by CHPRC and supported by the CSA design contractor and other project contractors.
All activities associated with the installation, inspection, and testing of structural concrete, structural steel, soils and foundations shall also meet and support the requirements and design basis of the CSS. Therefore, the CSA design contractor shall obtain the necessary design inputs from the CSS design/fabrication contractor, including thermal analysis, as they relate to the CSP design.

Contractor interfaces shall be coordinated through CHRPC.

6.1.3 Instrumentation Systems


In addition, the instrumentation and components shall meet the requirements for the following industry standards as applicable to the project:

- Instruments and components selected for the expected environment
- Enclosure type ratings in accordance with NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*
- Instrumentation equipment certification by an Occupational Safety & Health Administration-registered nationally recognized testing laboratory as required by DOE-0359
- Instrumentation and component design and installation to facilitate operations and maintenance
- Instrument calibration with National Institute of Standards and Technology traceable documentation.

The design of safety-related instrumentation shall provide for the periodic in-place testing and calibration of instrument channels.

Per DOE O 420.1C, safety significant instrumentation and alarm components shall meet the requirements of the codes listed in Table 6-3 below as applicable to the specific MCSC Project design.

**Table 6-3. Codes for Safety Significant Instrumentation**

<table>
<thead>
<tr>
<th>Instruments and Alarms</th>
<th>Safety Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Applicable NFPA codes and standards; ANSI/ANSI-58.8, ANSI N13.1, ANSI N323D; ANSI/ISA-Series including ANSI/ISA-67.04.01 and ISA TR 84.00.06; IEEE C2; IEEE-N42.18, DOE-STD-1020-12; DOE G 420.1-1A; DOE-STD-1195; and ANSI/ISA-84.00.01</td>
</tr>
</tbody>
</table>
All TMS support equipment, inclusive of the TMS protective structure, CE&I cabling, conduit and other CSA design contractor provided TMS support equipment shall meet the following criteria as applicable:

- Enclosure environmental ratings shall meet or exceed NEMA 250 rating
- Maximum expected radiation dose in areas containing temperature monitoring system components shall be considered in the design and component selection
- Expected service life shall be adequate to meet both short term operational needs and long term monitoring needs as applicable
- Quality level and safety significant requirements shall be met as identified in nuclear safety documentation.

6.1.4 Electrical

The MCSC Project shall interface with the existing Hanford Site electrical distribution system. Depending on facility location and power requirements, the existing electrical distribution system may require upgrades. The CSA design contractor shall provide designs to modify or extend the existing 13.8kV system as required to provide for construction power and for long-term CSA operations. Designs for interfaces to the electrical distribution system shall be coordinated with EU. Electrical power delivered to the CSS system, any new electrical installations as may be required, and any modifications to the site electrical utilities distribution system, including the 13.8 kV to 480 Vac transformers, shall conform to NFPA 70-2008 and IEEE C2. All electrical work is subject to the lockout/tagout requirements of DOE-0336, *Hanford Site Lockout/Tagout Procedure*.

Where applicable, modifications or extensions of the 13.8kV electrical system will be in accordance with IEEE C2.

The electrical distribution system designed by the CSA design contractor shall conform to NFPA 70-2008 and NFPA 70E-2009, *Standard for Electrical Safety in the Workplace*.

An electrical meter shall be installed to allow monitoring of power usage at the CSA.

On-site acceptance testing shall be required for each major electrical system to which there has been any modification or new installation. Tests shall be specified to demonstrate that each function and important parameter is implemented. Specific criteria shall be included to determine pass/fail acceptance.

Acceptance and testing procedures for the electrical 480/208/120V distribution equipment shall conform to ANSI/NETA ATS, *Standard for the Acceptance Testing Specifications for Electrical Power Equipment and Systems*, and any other stipulated site specific inspection or safety requirements.

All electrical equipment installed or used on the Hanford Site shall be labeled or listed for use by a nationally recognized testing laboratory as required by DOE-0359.

MCSC Project lighting levels shall be guided by *The IES Lighting Handbook*. Energy efficient lighting shall be used where practical.

Emergency power systems or legally required standby systems as defined by NFPA 70-2008 Articles 700 and 701 are not expected to be required for MCSC Project equipment at CSA. If emergency power is
determined to be necessary, it shall be provided as required to support safety functions, in accordance with NFPA 110, *Standard for Emergency Standby Power Systems* or NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*. Emergency power shall provide uninterruptible power where continuity of monitoring is essential. If required, on-site Class 1E electrical distribution systems, including batteries, shall be designed with independence, testability, and redundancy. These distribution systems shall be sufficient to perform safety-related functions under single-failure conditions.

As may be required for any upgrades or modifications to existing electrical systems, a lightning risk assessment shall be performed per NFPA 780, Annex L. If the assessment determines lightning protection is required, then it shall be provided.

Cathodic protection systems shall be designed, if required, in accordance with the guidelines provided in NACE SP0285 and NACE SP0169.

Per DOE O 420.1C, safety significant electric systems shall meet the requirements of the codes listed in Table 6-4 below as applicable to the specific MCSC Project design.

<table>
<thead>
<tr>
<th>Electrical Hardware</th>
<th>Safety Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Applicable NFPA codes and standards; IES Lighting Handbook; IEEE C2; IEEE C37 series; IEEE-80, -141, -142, 242, -383, -399, -420, -466, -493, -577, 628, -748</td>
</tr>
</tbody>
</table>

### 6.2 Design Life

#### 6.2.1 General Requirements

Components shall be designed such that continued integrity of the component can be verified over the design life to ensure continued functionality of the component within original requirements.

Unless otherwise stated, all systems and equipment provided shall be designed, to the maximum extent practical, to provide a minimum five year, maintenance-free service life unless stipulated otherwise.

Tools provided shall be designed, to the maximum extent practical, to provide a minimum one year, maintenance-free service life.

Consumables shall have a one year minimum service life and be located for ease of inspection, maintenance, and replacement.

#### 6.2.2 Capsule Storage Area

Components within CSA shall have a minimum design life of 100 years, or be designed to be easily replaced without relocation of the capsules from the storage configuration.
6.2.3 Design Life Analysis
The contractor is responsible to document that components meet design life requirements as described in this document.

6.3 Human Factors
The design or the selection of equipment to be operated and maintained by personnel shall include the application of human factors engineering criteria together with other appropriate design criteria.

Decisions concerning which system functions to allocate to the human versus the machine shall be determined by analyses of system functions required, impact of error or no action on safety, and a comparison of human capabilities and equipment capabilities for the separate system functions.


A human factors evaluation shall be performed and documented on the completed design.

6.4 Reliability, Availability, Maintainability, and Inspectability
The CSA design shall consider requirements associated with reliability, availability, maintainability, and inspectability.

6.4.1 Availability Requirements
High availability is a system design approach and associated service implementation philosophy and practice that ensures a pre-determined minimum level of performance which can be met during a contractual period. Key performance indices associated with Availability are losses due to unexpected breakdown, lengthy and unplanned for repeat set-up and adjustment, frequent stoppage and quality defect losses, and poor durability and productive life-span.

The MCSC Project shall have the capability to transfer all 1,936 capsules from WESF to the CSA within a 52-week period following successful completion of system startup and readiness review. This 52-week operational period includes anticipated system downtime for routine maintenance. Other factors that could impact the loading and transfer schedule include ventilation or electrical outages, upset conditions, unexpected radiological conditions, and stop work events. The CSA design contractor shall provide applicable input to a CHPRC analysis which demonstrates that the project throughput requirements can be met.

6.4.2 Maintainability & Inspectability
The CSA design shall consider maintainability factors specific to equipment used in high radiation areas. The design shall provide for routine preventive maintenance/calibration where required, and maintenance, repair, or replacement of equipment subject to failure. Planning and design of the CSA systems and equipment, and evaluation of the mean time to repair systems and equipment, shall take into account all aspects of operation and maintenance, including the following:
• Personnel safety
• Equipment accessibility
• Dismantling
• Replacement
• Repair
• Frequency of preventive maintenance
• Inspection requirements
• Day-to-day operation.

Design decisions shall consider life-cycle costs and all other programmatic requirements affecting the CSA. The initial construction cost shall be balanced against operating and maintenance costs over the design life. Selection of materials and equipment shall include the cost and availability of materials, parts, and labor required for operation, maintenance, repair, and replacement. Safety is the most important design factor and shall not be compromised by cost or schedule considerations.

The design shall consider maintainability factors particular to the specific equipment used. The CSA design shall provide for routine maintenance, repair, or replacement of equipment subject to failure.

### 6.5 ALARA Requirements

As low as reasonably achievable (ALARA) principals shall be applied for any worker activity with the potential of dose and contamination exposure. In the course of application of these ALARA principles, the project will ensure radiation exposures to workers and the public, and releases of radioactivity to the environment, are maintained below regulatory limits and deliberate efforts are taken to further reduce exposures and releases as low as reasonably achievable. Design considerations shall include contamination control, shielding, remote activities, failure recovery, and maintenance.

#### 6.5.1 Key ALARA Requirements

MCSC Project shall be designed to limit occupational radiation exposures in accordance with the requirements of 10 CFR 835, “Occupational Radiation Protection” and CHPRC-00073, *CH2M HILL Plateau Remediation Company Radiological Control Manual*.

Beginning at the earliest design stage, requirements for radiological design shall be incorporated into the designs for new components and equipment and modifications of existing components and equipment. ALARA requirements are defined in 10 CFR 835, Subpart K, “Design and Control.”

The dose rate from the capsules shall be controlled to less than 0.5 mrem/hr at the fenced perimeter of the CSA when all capsules are in their storage configuration and as far below this value as is reasonably achievable. The dose rate in storage shall not exceed 100 mrem/hr at any accessible point in the storage array.
6.5.2 ALARA Analysis

The basic requirements concerning the use of ALARA in design are contained in 10 CFR 835 (in particular Subpart K), CHPRC-00072, CHPRC Radiation Protection Program, CHPRC-00073, and DOE-STD-1098, Radiological Control.

ALARA analysis for the MCSC Project will be performed by CHPRC and the CSS design/fabrication contractor.

6.6 Safety

The contractor shall perform work in a safe, compliant manner that adequately protects the employees, the public and the environment. The contractor, and its lower-tier subcontractors, shall comply with applicable laws and requirements.

Contractor shall perform work in accordance with a CHPRC approved safety and health procedure. The contractor can implement the preapproved procedures included in PRC-PRO-SH-40078, Contractor Safety Processes, Appendix F, or submit an alternative program for approval. This alternative safety and health program shall comply with federal, state, and local codes and PRC-PRO-SH-40078, Appendix F. Additional health and safety requirements are specified in the SOW.

6.6.1 Occupational Safety and Health

MCSC Project shall be designed for safe installation, operation, and maintenance in accordance with the applicable requirements of 10 CFR 851, “Worker Safety and Health Program,” 29 CFR 1910, and 29 CFR 1926, “Safety and Health Regulations for Construction.”

6.6.2 Confinement Strategy

MCSC Project will protect facility workers, collocated workers, and the public by providing multiple layers of protection (i.e., defense-in depth) to prevent and mitigate uncontrolled releases of hazardous materials.

6.6.3 Fire Mitigation Strategy


6.6.4 Anticipated Safety Functions

Safety SSCs will be selected based on results of facility-specific and process-specific hazards analyses. These analyses will be performed as the design develops and will be reviewed and revised as necessary during preliminary and final design.

CSA is expected to be passive with no active safety SSCs.
6.6.5 Safety Analysis
The MCSC Project shall be managed under the requirements of DOE-STD-1189-2008, Integration of Safety into the Design Process. The MCSC Project-specific strategy is described in CHPRC-02236, Waste Encapsulation and Storage Facility Management of Cesium and Strontium Capsules (Project W-135) Safety Design Strategy. The CSP shall have a design basis classification of PC-2, safety significant.

6.7 Safeguards and Security
MCSC Project shall comply with applicable requirements in DOE O 470.4B, Safeguards and Security Program. The need for a security alarm system, communications, and other measures to prevent unauthorized access to CSA and nuclear materials shall be determined by completion of a security requirements analysis. Safeguards and security measures shall prevent theft, vandalism, and other malicious acts that could release radioactive material or disrupt facility operations.

- Logistics required for Security, in processing of materials, tools, equipment and personnel (including removal and restoration of security barriers, if required) into and out of the CSA, shall be considered in the design as determined necessary by the security requirements analysis
- Sufficient lighting and accessibility shall be provided for the CSSs on the CSP to enable their visual inspection on all sides for security purposes from a distance of 250 ft, and no less than 0.2 foot candles
- In addition to the existing 200E Area perimeter fence, additional local fencing and security features will be provided as necessary at CSA
- Movement and/or relocation of existing ecology blocks in the vicinity of the CSA location shall be evaluated.

6.8 Natural Phenomena Criteria
Design criteria for seismic and other natural phenomena are described in the sections below.

6.8.1 Seismic
Seismic design criteria for CSA SSCs shall be established and implemented as specified in PRC-PRO-EN-097, Engineering Design and Evaluation (Natural Phenomena Hazard), using SDC-2/LS C seismic design criteria, which were derived as discussed in the following paragraphs.

DOE-STD-1189-2008 and ANSI/ANS 2.26-2004, Categorization of Nuclear Facility Structures, Systems and Components for Seismic Design, (ANS 2.26) were used to determine the general seismic design basis for the CSA.

DOE-STD-1189-2008, Appendix A states the following:

“The seismic design classifications of ANS 2.26 are to be used in association with DOE radiological criteria provided in this appendix. It is intended that the requirements of Section 5 of ANS 2.26 and the guidance in Appendix A of ANS-2.26 be used for selection of the appropriate LS for SSCs performing the safety functions specified. The resulting combination of SDC and LS
selection provides the seismic design basis for SSCs to be implemented in design through ASCE/SEI 43-05.”

This text has been interpreted to state that the SDC is to be based on DOE-STD-1189-2008, Appendix A, specifically Table A-1, radiological criteria. The LS designations are derived using Section 5 and Appendix A of ANS 2.26.

SDC Determination: Using the guidance provided by DOE-STD-1189-2008, Appendix A for seismic design of SSCs and the unmitigated consequences from a seismic event in the existing WESF DSA, a Seismic Hazard Category of SDC-2 will be used for the CSA, which should be applied to the design of both the CSS and the CSP.

Limit State Determination: Section 5 and Appendix B of ANS 2.26 were reviewed to support determination of an LS. LS C for building structural components was chosen for the CSP. The Section 5 definition of LS C for buildings and structural components is that the SSC retains nearly full stiffness and retains full strength, and the passive component it is supporting will perform its normal and safety functions during and following an earthquake. LS C for structures or vessels for containing hazardous material was chosen for the CSS. The Section 5 definition of LS C for structures or vessels containing hazardous material is applicable to low-pressure vessels and tanks with hazardous contents where a release may potentially injure workers. Damage will be sufficiently minor and usually will not require repair.

CHPRC procedure PRC-PRO-EN-097 provides seismic design criteria based on SDC and LS designation. Seismic design criteria for SDC-2/LS C will be specified in design documentation. Since the CSA has been classified as SDC-2/LS C, the structural design will be implemented using ASCE/SEI 7-2010.

### 6.8.2 Natural Phenomena Other Than Seismic


When applicable, the environmental data found in the current and archival data housed within the HMS web accessed database shall be used when performing analysis and design in accordance with PRC-PRO-EN-097. The HMS data set can be accessed at the following URL:

http://www.hanford.gov/page.cfm/hms

This website presents real-time meteorological data from the project's monitoring stations; daily, monthly, and annual weather summaries (including charts and tables); links to Hanford climatology reports; and a wealth of other data.

Data from HMS that is different than that specified in PRC-PRO-EN-097 shall not be used in final calculations without supporting justification and review and approval from CHPRC.
6.9 Decontamination and Decommissioning


Designs consistent with the program requirements of DOE O 430.1C shall be developed during the planning and design phases based on a proposed decommissioning method, or a conversion method leading to other uses. SSCs shall include features that will facilitate decontamination for future decommissioning, increase the potential for other uses, or both.

Design or modification of the facility and selection of materials shall also include features that facilitate decontamination and decommissioning.

MCSC Project should incorporate the following design principles:

- Provide equipment that precludes, to the extent practical, accumulation of radioactive or other hazardous materials in relatively inaccessible areas
- Use materials that reduce the amount of radioactive and other hazardous materials requiring disposal, and materials easily decontaminated
- Incorporate designs that facilitate cut-up, dismantlement, removal, and packaging of contaminated equipment and components at the end of useful life
- Use modular radiation shielding, in lieu of or in addition to monolithic shielding walls
- MCSC Project equipment that is likely to become contaminated shall have special coatings that facilitate decontamination. The design should consider use of rounded corners and epoxy-coated walls in areas that handle or store radioactive material. Finishes shall meet the requirements set forth in ANSI N512, *Protective Coatings (Paints) for the Nuclear Industry*.

7 Nuclear Safety Requirements

7.1 Nuclear Safety

The MCSC Project shall comply with the requirements of 10 CFR 830 and DOE-STD-1189-2008, as implemented by PRC-PRO-NS-700, *Safety Basis Development*. The specific strategy that will be used to ensure compliance is described in CHPRC-02236. CHPRC-03293, *Conceptual Safety Design Report for the Capsule Storage Area*, includes an initial list of safety equipment. The CSP and the TMS have been identified as safety significant.

Required safety documentation that will be developed by CHPRC for the CSA includes a preliminary hazard analysis, a conceptual safety design report, a preliminary DSA, and a final DSA document. The CSA design contractor will provide input to the CHPRC analysis as described in the CSA design contractor SOW.
7.2 Safety Basis

The CSA design contractor will provide input to the CHPRC analysis and shall develop nuclear safety documentation as required by the CSA SOW to the standards identified in CHPRC-02236.

CHPRC’s hazard analysis shall cover all new activities within WESF that are necessary to implement the contractor's design, activities to transfer the canisters from WESF to CSA, and all hazards associated with long-term storage of the capsules at CSA.

The impacts of natural phenomena hazards shall be addressed consistent with the requirements of PRC-PRO-EN-097.

7.3 Fire Hazards Analysis

Required documentation that will be developed by CHPRC with support from the CSA design contractor includes a preliminary FHA and a final FHA for the CSA. The FHA will be developed according to the requirements of PRC-PRO-FP-40420, Fire Protection Analysis.

CHPRC-03299, Preliminary Fire Hazards Analysis for the Management of the Cesium and Strontium Capsules Project (W-135), describes fire protection controls applicable to CSA. Preliminary controls include an assumption that the operations that will be performed at the CSA are as described and that combustible materials will be controlled. The preliminary FHA will be revised as the design progresses. Changes to FHA controls require CHPRC approval.

CHPRC shall perform an analysis of fire, blast, missile, and overpressure hazards, and the CSA design contractor will provide input to CHPRC to the extent identified in the SOW to demonstrate compliance with DOE requirements.

Preliminary analysis has determined that the CSA design shall include a minimum of two fire hydrants. An automatic water suppression system for fire protection is not required.

8 Transportation and Packaging

Transfer of loaded CSSs between WESF and CSA shall be performed according to the requirements of PRC-PRO-TP-156, Onsite Hazardous Material Shipments, and PRC-MP-TP-40476, Transportation Program Management Plan.

The transfer of the CSSs to the CSA will not be 10 CFR 71 compliant. Based on potential normal and accident conditions for this transfer, the package shall meet equivalent safety per DOE/RL-2001-36.

9 Environmental/Permitting Requirements

The permitting strategy for the MCSC Project has been agreed upon by DOE and the Washington State Department of Ecology.

9.1 Dangerous Waste Permitting

The capsules are managed at WESF as mixed high level waste under RCRA and the implementing regulations specified at WAC 173-303. DOE has transmitted RCRA Part B permit applications for both
the WESF modifications (DOE/RL-2017-43, Rev. 0) and Capsule Storage Area (DOE/RL-2017-44. Rev.
01) in DOE-RL letter 18-AMRP-0013, dated November 16, 2017. The MCSC Project shall comply with
the information within the RCRA Part B permit applications and applicable requirements of the following
sections of WAC 173-303:

- WAC 173-303-280 – “General requirements for dangerous waste management facilities”
- WAC 173-303-281 – “Notice of intent”
- WAC 173-303-282 – “Siting criteria”
- WAC 173-303-283 – “Performance standards”
- WAC 173-303-290 – “Required notices”
- WAC 173-303-300 – “General waste analysis”
- WAC 173-303-320 – “General inspection”
- WAC 173-303-330 – “Personnel training”
- WAC 173-303-335 – “Construction quality assurance program”
- WAC 173-303-340 – “Preparedness and prevention”
- WAC 173-303-350 – “Contingency plan and emergency procedures”
- WAC 173-303-360 – “Emergencies”
- WAC 173-303-370 – “Manifest system”
- WAC 173-303-380 – “Facility recordkeeping”
- WAC 173-303-390 – “Facility reporting”
- WAC 173-303-395 – “Other general requirements”
- WAC 173-303-600 – “Final facility standards”
- WAC 173-303-610 – “Closure and post-closure”
- WAC 173-303-630 – “Use and management of containers”
- WAC 173-303-680 – “Miscellaneous units”
- WAC 173-303-803 – “Permit application requirements”
- WAC 173-303-806 – “Final facility permits”
- WAC 173-303-830 – “Permit changes.”

The CSA design contractor shall be responsible for designing the CSA and any assigned WESF interface
modifications in accordance with the requirements of the above sections of WAC 173-303 and the
information within the permit applications. The CSA design contractor will be responsible for preparing
the work-scope specific documentation required for CHPRC to apply for a Washington State Dangerous
Waste permit as described in WAC 173-303-803(3) and WAC 173-303-806. This will include, but is not limited to, design documents, and the documentation required by WAC 173-303-806(4)(a) through (m), as appropriate to the CSA design. This includes certification of design drawings, specifications, and engineering studies by a registered professional engineer as required by WAC 173-303-806(4)(a).

9.2 Environmental Protection and Pollution Control

MCSC Project shall comply with applicable federal, state, and local laws and regulations to protect the public, worker health and safety, and the environment.

CSA will be permitted as a RCRA miscellaneous unit that is fully compliant with WAC 173-303-280 and WAC-173-303-680.

National Environmental Policy Act of 1969 review requirements for MCSC Project activities will be established through an amended record of decision for the Tank Closure and Waste Management Environmental Impact Statement.

9.3 Environmental Design

MCSC Project design and construction activities shall be performed in compliance with the CRD of DOE O 436.1, Departmental Sustainability. Strategies will be aimed at improving performance in energy savings, water efficiency, carbon dioxide emissions reductions, indoor environmental quality, and stewardship of resources. The High Performance Sustainability Building requirements (Executive Order 13693, Planning for Federal Sustainability in the Next Decade) shall be implemented to the extent practical. Applicability of these requirements to the CSA are defined in CHPRC-03260, MCSC Project (W-135) Implementation of Guiding Principles for High performance and Sustainable Buildings.

9.4 Environmental and Safety Management

The environmental and safety management system, which integrates environment, safety, and health requirements into the work planning and execution processes to effectively protect workers, the public, and the environment, is described in PRC-MP-MS-003, Integrated Safety Management System/Environmental Management System Description (ISMSD). Personnel safety, equipment safety, and environmental safety are all part of the integrated safety management system.

9.5 Managing Waste Generated

MCSC Project may generate a minimal amount of waste in several forms during decontamination, normal operations, and maintenance. MCSC Project shall provide for disposal of waste, including accumulation and handling areas as applicable, in accordance with DOE O 435.1, Chg1, Radioactive Waste Management; DOE-STD-1098; WAC 173-303; and WA7890008967, Hanford Facility Resource Conservation and Recovery Act Permit. The MCSC Project shall interface with existing Hanford Site waste treatment and disposal facilities for disposition of hazardous and radioactive solid wastes generated by MCSC Project. CSA design contractor provided systems shall be designed with intent to minimize future generation of waste requiring management and disposal by the MCSC Project.
9.6 Airborne Emissions

The design of the capsules and the CSS has resulted in a determination that the capsules will be exempt from licensing by the DOH in accordance with WAC 246-247-020, “Radiation Protection – Air Emissions” “Exemptions” (the capsules and the CSS meet the definition of a sealed source [WAC 246-247-030, “Definitions”]). No air permit is required for the CSA based on the capsule, however, if excavation or site preparation of the CSA will disturb subsurface contamination, an air permit may be required.

Neither criteria air pollutants nor toxic emissions require permitting actions based on the characterization of the capsule contents and capsule construction.

To be protective of personnel, toxic and hazardous airborne emissions shall comply with the permissible exposure levels identified in DOE O 458.1, Radiation Protection of the Public and the Environment, and 29 CFR 1910, Subpart Z, “Toxic and Hazardous Substances.”

To meet ambient air quality standards, toxic and hazardous airborne emissions shall comply with WAC 173-400 “General Regulations for Air Pollution Sources” and WAC 173-460, “Controls for New Sources of Toxic Air Pollutants.”

Radionuclide airborne emissions shall comply with the ALARA-based limits for exposure (dose) to the public, as identified in WAC 173-480, “Ambient Air Quality Standards and Emissions Limits for Radionuclides,” and WAC 246-247.

10 Quality Assurance Requirements

MCSC Project will be performed under a quality assurance program meeting the requirements of ASME NQA-1-2008, Quality Assurance Requirements for Nuclear Facility Applications, with the ASME NQA-1a-2009 addenda, Part I and applicable portions of Part II. The applicable portions of Part II are Subparts 2.2, 2.5, 2.7, 2.14, and 2.15. Contractors performing design, construction, or operation activities shall be subject to the enforcement actions under 10 CFR 820, “Procedural Rules for DOE Nuclear Activities,” Subpart G, “Civil Penalties,” Appendix A, “General Statement of Enforcement Policy.”

The CSA design contractor’s quality program shall be submitted to CHPRC for review prior to the start of work, and work shall not be authorized until the program is specifically approved by CHPRC as meeting the requirements noted above. Such approval may be conditional, and limited to certain program elements.

The CSA design contractor shall demonstrate compliance with the requirements of this FDC by keeping current a design requirements compliance matrix, tracking each requirement and where and how it has been implemented in the design documentation.

Design verification for safety significant SSCs conducted through design review or alternative calculations shall be performed by competent individuals or groups other than those who performed the original design, but who may be from the same organization or same project team. The design verification shall include a review to ensure that design characteristics can be controlled, inspected, and tested, and that inspection and test criteria are identified. The contractor shall be responsible for performing and documenting all design verifications for each system developed.
CHPRC reserves the right to witness any design verification conducted through qualification testing.

MCSC Project activities shall comply with applicable portions of IAEA-TECDOC-1169, *Managing suspect and counterfeit items in the nuclear industry*.

Cleaning, cleanliness, and foreign material exclusion requirements shall be implemented during design, procurement, construction, and operations activities according to the requirements of PRC-PRO-QA-33415, *Structures, Systems, Components Cleaning/Cleanliness and Foreign Material Exclusion*.

**11 Design Document Requirements**

The CHPRC design document requirements for preparation of engineering submittals are provided in the CSA SOW.

**12 Applicable Requirements Documents**

Two code of record (COR) documents have been established for the MCSC Project, CHPRC-02288, *Cask Storage System Code of Record (Project W-135)*, and CHPRC-03275, *Capsule Storage Area and WESF Modifications Code of Record (Project W-135)*.

The COR shall serve as a management tool and source for the applicable requirements documents used to design, construct, operate, and decommission MCSC Project equipment over its lifecycle. The COR shall include federal and state laws and regulations, DOE requirements, Hanford Site-specific requirements, and design criteria defined by national codes and standards and by state and local building codes that directly affect public, worker, environmental, or nuclear safety.

The COR shall be updated by CHPRC to include more detailed design requirements during preliminary design. The CSA design contractor shall be required to provide input and supporting documentation to the COR throughout the duration of the MCSC Project contract.

**13 Reference Documents**


ASME NUM-1, 2016, Rules for Construction of Cranes, Monorails, and Hoists (with Bridge or Trolley or Hoist of the Underhung Type), American Society of Mechanical Engineers, New York, New York.


ISA TR 84.00.06, *Safety Field bus Design Considerations for Process Industry Sector Applications*, 2009.


