JUN 29 1999

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 626885

2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) Nuclear Safety		4. Related EDT No.:	
5. Proj./Prog./Dept./Div.: Spent Nuclear Fuel Project		6. Design Authority/ Design Agent/Cog. Engr.: D. M. Black		7. Purchase Order No.: N/A	
8. Originator Remarks: N/A				9. Equip./Component No.: N/A	
				10. System/Bldg./Facility: CSB	
11. Receiver Remarks: 11A. Design Baseline Document? ☐ Yes ☒ No				12. Major Assm. Dwg. No.: N/A	
				13. Permit/Permit Application No.: N/A	
				14. Required Response Date: N/A	
15. DATA TRANSMITTED					
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Design- nator
1	HNF-4742		0	Canister Storage Building Compliance Assessment DOE Order 6430.1A, General Design Criteria	S

16. KEY									
Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)			
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)				1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged			
17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)									
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature
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Canister Storage Building Compliance Assessment DOE Order 6430.1A, *General Design Criteria*

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U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 626885	UC: 620
Org Code: 2F200	Charge Code: 105625/CB80
B&R Code: 39EW40400	Total Pages: 237 214 <i>RF 6/29/99</i>

Key Words: Spent Nuclear Fuel Project, Canister Storage Building, Compliance Assessment

Abstract: This document presents the Project's position on compliance with DOE Order 6430.1A "General Design Criteria." No non-compliances are shown. The compliance statements have been reviewed and approved by DOE. Open items are scheduled to be closed prior to project completion.

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[Signature] *6/29/99*
Release Approval Date

Approved for Public Release

Canister Storage Building Compliance Assessment
DOE Order 6430.1A, General Design Criteria

Applicable Section	Item #	Criteria	Status	Implementation
0110		Architectural and Special Design Requirements		
0110-5		Health and Safety		
0110-5.1		Performance Objectives		
0110-5.1	1.	Specific project design criteria in the areas of emergency preparedness and emergency management shall be developed with the advice and assistance of DOE organizations responsible for DOE emergency management/emergency preparedness programs. Such criteria shall comply with: <ul style="list-style-type: none"> • DOE 5500.1A • DOE 5500.3. 	C	The CSB FSAR contains emergency preparedness sections in accordance with DOE 3009. (Ref: HNF-3553, Rev 0, Chapters 15.0 and A15.0). The emergency response organization meets the requirements set forth in the DOE 5500-series orders and other applicable state and federal regulations through DOE/RL-94-02, <i>Hanford Site Emergency Response Plan</i> .
0110-5.2		Safety Analysis		
0110-5.2	2.	All DOE facilities shall be evaluated for potential risks to the operators, the public, and the environment.	C	The CSB FSAR contains sections that evaluate the facility for potential risks to the operator, the public and the environment. (Ref: HNF-3553, Rev 0, Chapters 3.0 and A3.0).
0110-5.2	3.	The FSAR shall be updated as appropriate to reflect changes affecting safety that are made to the facility during its lifetime.	C	As discussed in the CSB FSAR the system used to develop an authorization basis document, evaluating and controlling changes, and implementing the authorization basis is the Authorization Basis Management System. (Ref: HNF-3553, Rev 0, Section 17.4.3.2.3).
0110-5.3		Emergency Preparedness Planning		

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0110-5.3	4.	Each facility that has potential on-site and off-site effects during normal or abnormal operations shall have an Emergency Plan prepared which shall be incorporated with the Site Emergency Preparedness Plan.	C	See response to item 0110-5.1 (item # 1) above.
0110-5.4		Asbestos-Containing Materials		
0110-5.4	5.	Maintenance, repair, and demolition of DOE facilities shall comply with OSHA-29 CFR and EPA-40 CFR.	NA	The CSB was designed and constructed of non-asbestos containing materials.
0110-5.5		Polychlorinated Biphenyls (PCBs)		
0110-5.5	6.	If the use, storage, or disposal of polychlorinated biphenyls (PCBs) or materials containing PCBs is to be encountered in a facility, the facility design shall comply with 40 CFR 761.	NA	The CSB was designed and constructed with non-PCB containing components.
0110-6		Fire Protection		
0110-6.1		General		

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0110-6.1	7.	Facilities shall comply with the following: <ul style="list-style-type: none"> • DOE 5480.4 Attachment 2, Section 2.C • DOE 5480.7 • Section 1530, Fire Protection 	C	The fire protection criteria of DOE Order 5480.7A, NFPA 13, 69, 70, 72, and 101, and the UBC were implemented in the CSB design. (Ref: HNF-3553, Sections A2.2 and A2.7.1). Exemption to DOE 5480.7A Section 9.b(3) for a fully sprinkled operations area was approved (Ref: 96-SFD-320). See: <i>Performance Specification for the Spent Nuclear Fuel Canister Storage Building</i> , HNF-S-0425, Rev. 3.
0110-6.1	8.	Facilities shall also comply with 29 CFR 1926 and CFR 1910. Except as required by other sections of these criteria, NFPA 101 shall apply where 29 CFR 1926 and 29 CFR 1910 does not apply or where NFPA 101 exceeds the requirements of 29 CFR 1926 and 29 CFR 1910.	C	CSB facility design is consistent with NFPA 101 for life safety and NFPA 220 for types of construction. (Ref: FDH-9655218). See: <i>Performance Specification for the Spent Nuclear Fuel Canister Storage Building</i> , HNF-S-0425, Rev. 3.
0110-6.1	9.	Definitions, fire resistance ratings, and types of construction shall be as contained in the UBC.	C	Fire resistance ratings are provided by UL certified construction of fire barriers. Types of construction was granted a deviation from UBC to NFPA as part of sprinkler exception. (Ref: 96-SFD-320)
0110-6.1	10.	Any materials with unusual fire characteristics such as urethane foams, and any materials that develop significant quantities of toxic or other harmful products of combustion, shall not be used as interior finishes or other interior applications without the approval of the cognizant DOE fire protection authority.	NA	The CSB design does not use any materials with unusual fire characteristics. Only the MHM neutron absorbing material (Jabroc™) has unique properties. No combustion products with hazardous properties beyond those normally associated with burning wood products are identified for this material. The material does not burn freely. A flame spread test per UL 723 to demonstrate a flame spread rating of 25 or less has been performed (0.8 actual). (Ref: Appendix 5 of ESL/R(96)065-Rev D).
0110-6.1	11.	The use of foamed plastics in construction shall be prohibited unless it fully complies with FM 1-57.	NA	The CSB design and construction does not utilize foamed plastics.

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Criteria	Status	Implementation
0110-6.2		Fire Protection Design Analysis		
0110-6.2	12.	A special fire protection design analysis shall be made of each facility vital to DOE mission accomplishment. The analysis shall use time parameters established in accordance with DOE 5480.7. The analysis shall identify the special fire prevention and protection features and controls deemed by the cognizant DOE fire protection authority to achieve a level of fire protection for vital facilities and programs that meets or exceeds the "improved risk" level.	C	The CSB design was analyzed in Fire Hazards Analysis (FHA) in accordance with DOE 5480.7A. (Ref: HNF-SD-SNF-FHA-002, Rev 2).
0110-6.2	13.	A general fire protection design analysis shall be made of each facility to ascertain and limit the cost of future damage repair and replacement of facilities and their contents from fire. The analysis shall be made using those parameters established in DOE 5480.7. The analysis shall determine the special fire prevention and protection features and controls deemed by the cognizant DOE fire protection authority to achieve a level of improved risk fire protection that limits damage to an acceptable level. The analysis shall be documented in report form in the facility project files and referenced by the SAR.	C	The CSB design is based on Fire Hazards Analysis (FHA). The FHA was prepared using the parameters in DOE 5480.7A. The analysis concluded that no special fire protective features other than control of combustible loading were necessary to achieve an improved risk fire protection. The CSB FSAR references this final FHA. (Ref: HNF-SD-SNF-FHA-002, Rev 2).
0110-6.3		Fire Resistance Ratings		

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0110-6.3	14.	All facilities shall be divided into areas in which the total potential fire loss to each area and its equipment does not exceed \$75 million as described in DOE 5480.7. These areas shall be separated by fire walls and barriers with not less than 4-hour fire-resistance ratings. Where exceptions are necessary for reasons of operations or equipment, exemption procedures shall comply with DOE 5480.7.	C	The CSB above grade structures are divided into two fire zones separated by a 2-hour fire resistive barrier (Ref: HNF-3553, Section A2.7.1). The MPFL for the facility from an operations support area fire destroying the entire support area was \$14.7 Million. The operations shelter area MPFL is < \$1.0 Million. (Ref: HNF-SD-SNF-FHA-002, Rev 2).
0110-6.3	15.	Wall, floor and ceiling, and roof and ceiling assemblies shall be tested and rated for their fire resistance by UL or similar nationally accredited testing laboratories, or shall be listed for their fire resistance as approved by FM or similar national insurance organizations.	C	The CSB utilizes fire rated assemblies at penetrations through the 2-hour fire rated wall between the support and operations area buildings. These assemblies are rated and labeled in accordance with UL or FM. (Ref: HNF-3553, Section A2.7.1).
0110-6.4		Hazardous Areas		
0110-6.4	16.	Hazardous areas, such as radioactive spaces or spaces with inert atmospheres, shall have sufficient alarms and interlocks to assure that access by emergency personnel will not endanger such personnel or result in a public hazard.	C	The CSB design for the storage and handling of MCOs precludes access by individuals to areas where high radiation levels or inert gas atmospheres are present. Areas of high radiation such as the below grade vault are not accessible by personnel. MHM interlocks prevent the MHM from leaving a storage tube without first replacing the shield plug. (Ref: HNF-3553, Section A2.5.1.3).

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0110-6.4	17.	The design of hazardous areas shall facilitate access by emergency personnel from the exterior and, at the same time, shall maintain any required confinement or containment using air locks or other features.	NA	Not applicable. See response to item # 16 above.
0110-6.4	18.	The design of the exteriors of facilities shall follow the recommendations of NFPA 80A. Facilities that are not separated as recommended by NFPA 80A shall have fire protection systems such as exterior sprinklers or barrier walls.	C	The design of the CSB complies with NFPA 80A requirements. There are no other exterior buildings, and therefore the requirements for separation, outside sprinklers or barrier walls are not applicable. (Ref: HNF-SD-SNF-FHA-002, Rev 2).
0110-7		Environmental Protection and Pollution Control		
0110-7	19.	The construction of all DOE facilities shall comply with the environmental protection and pollution control portions of the following:	C	The construction of the CSB was performed in accordance with all applicable environmental and pollution control standards including WAC 173-303, Dangerous Waste Regulations.
0110-7	20.	. DOE 4700.1, Chapter V	C	The CSB project management system as described in the Project Management Plan (Ref: WHC-SD-SNF-PMP-011) is consistent with 4700.1, Chapter V.
0110-7	21.	. DOE 5480.4	C	Environmental Protection, Safety, and Health Protection Standards requirements are met.
0110-7	22.	. DOE 5480.1B	C	Environmental, Safety, and Health Program for DOE Operations. FDH has created an ES&H organization to fulfill the requirements of 5480.1B. (Ref: HNF-3553, Section A7.0). This includes public involvement and the NEPA decision process.

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0110-7	23.	DOE 5440.1C	C	Implementation of National Environmental Policy Act requirements for the entire SNF Project, including the CSB, was accomplished through completion of the Environmental Impact Statement for Management of Spent Nuclear Fuel at the Hanford K Basins. (Ref: DOE/EIS-0245F).
0110-12		Energy Conservation		
0110-12.2		General		
0110-12.2	24.	For existing construction, ASHRAE Standard 100 shall apply	NA	Not applicable. The CSB is new construction.
0110-12.2	25.	HVAC design shall comply with ASHRAE Standard 62.	C	HVAC design for the operating area is governed by contamination control, negative building pressure and filtration requirements. ASHRAE 62 is implemented for the support building HVAC design to achieve the recommended air exchanges.
0110-13		Physical Protection		
0110-13.2		Access Control and Security Areas		
0110-13.2.1		General		
0110-13.2.1	26.	Controls shall be established to prevent unauthorized access to security areas or removal of security interests. In general, the following apply:	C	The CSB provides physical protection for the SNF stored in MCOs by providing intrusion barriers at the entrances to the operating area and below grade vault. The below grade vault and the service and sampling/welding pits are protected areas. The operating area is a limited area. (Ref: CSB Vulnerability Assessment).

C -- compliant
 NA -- Not applicable

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0110-13.2.1	27.	A minimum number of entrances shall be provided for security areas. However, exits from security areas shall be adequate to satisfy the requirements of NFPA 101.	C	Ingress and egress from the limited area (operating area) are through controlled points. Emergency exits are provided in accordance with NFPA 101 and are alarmed for security purposes.
0110-13.2.1	28.	Entrances to and exits from security areas shall be equipped with doors, gates, rails, or other movable barriers that will direct and control the movement of personnel or vehicles through designated portals.	C	Entrances and exits from the limited area (operating area) are controlled by doors. Personnel exiting from the limited area (operating area) to the support building are routed through control points.
0110-13.2.1	29.	Door locks and latches used on security area perimeters shall comply with NFPA 101.	C	Exit door hardware complies with NFPA 101.
0110-99		Special Facilities		
0110-99.0		Nonreactor Nuclear Facilities - General		
0110-99.0	30.	Support areas such as the health physics laboratory/office shall be located near the exit from the process area. The exit areas shall have adequate space for personnel circulation and egress and monitoring equipment.	C	The CSB design places the HP office adjoining the egress point from the operating area. The design of the egress point area provides sufficient space for personnel circulation and monitoring equipment.
0110-99.0	31.	All normal routes of egress shall be directed through exits that contain monitoring stations.	C	Normal routes of egress are routed through exits that contain monitoring stations.
0110-99.0	32.	Radioactive and hazardous materials (chemicals, feed wastes, etc.) shall be segregated from each other to minimize the generation of mixed waste.	NA	The CSB design does not utilize hazardous materials and does not generate hazardous wastes that could be mixed with radioactive wastes.

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0110-99.0	33.	In addition, areas where radioactive materials are used shall be designed for ease of decontamination during building usage and also for decommissioning after the building cycle life.	C	The CSB design is based on a low probability of potential contamination. Areas where contamination may be accidentally released are provided with industrial resinous coatings for ease of decontamination and subsequent decommissioning.
0110-99.0.2		Building Services and Distribution		
0110-99.0.2	34.	Special facilities services and building utilities shall be planned to achieve maximum flexibility and ease of access.	C	The CSB design provides utilities services at all anticipated use locations. For example, service air and electrical power are provided at various locations in the operating area. Maximum flexibility and ease of access to utilities is thereby achieved.
0110-99.0.2	35.	Priority shall be given to gravity-flow piped services and utilities and large air distribution and exhaust duct headers when analyzing the following:	C	CSB service and utility systems are limited to compressed gases (air, helium, argon). (Ref: HNF-3553, Section A2.8.5). Liquid waste collection systems flow by gravity to collection sumps. (Ref: HNF-3553, Section A2.8.6).
0110-99.0.2	36.	Establishment of zones (space) in vertical and horizontal service chases	NA	Not applicable. There are no horizontal or vertical service chases in the CSB design.
0110-99.0.2	37.	Determination of service header sizes	NA	Not applicable, see response to item # 35, above.
0110-99.0.2	38.	Assignment of spaces	NA	Not applicable, there are no gravity flow piped services for which space assignment is required.
0110-99.0.2	39.	Vertical chases shall be provided with fire cutoffs, preferably at each floor level and at the enclosing partitions, consistent with the building construction code classification.	NA	Not applicable. There are no vertical chases in the CSB design.

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Applicable Section	Item #	Criteria	Status	Implementation
0110-99.0.2	40.	Suitable access doors or removable panels shall be provided in service chases for access to valves, dampers, and so forth.	NA	Not applicable. There are no service chases in the CSB design.
0110-99.0.2	41.	To maintain the necessary degree of protection required by the particular building code classification, equipment selections shall be made from products listed by UL or other approved testing organization.	C	Protection required by the particular building codes is ensured by requiring equipment to be furnished with UL or other applicable labels; thus, assuring compliance with this requirement.
0110-99.0.2	42.	Compressed gas cylinders shall be isolated outside of the special facilities building or housed in a special hazardous materials storage room, exhausted gas cabinets, or similar types of containment.	C	Housing of compressed gas cylinders is outside of the operating area building. Compressed gas cylinders used in the operating area building are required to be provided with flow restricting devices to prevent them from becoming dangerous missiles in the event of an accidental drop. The cylinders are securely mounted to the Tube Vent and Purge Cart. (Ref: HNF-3553, Chapter A3.0).
0110-99.0.2	43.	To ensure both the safety of personnel and the effective administration and control of special facilities, access to hazardous areas (e.g., hazardous gas storage locations and electrical power and distribution panels) shall be controlled by locked gates, doors, power panels, or other physical barriers.	C	Access to potentially hazardous locations controlled by locked doors and panels to electrical power and safely stored compressed gas cylinders.
0110-99.0.2	44.	Where continuous services are required, service headers shall be looped and appropriately valved to maintain such services during routine maintenance or systems alterations.	NA	No utility services requiring continuous operation have been identified for the CSB.

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0110-99.0.2	45.	Special facilities services shall extend from horizontal service headers. Services shall be located to avoid penetration of adjacent facility walls and floors in those cases where routine maintenance or alterations of these services would result in undesirable curtailment or interruption of operations in the adjacent special or other facilities.	C	Applicable services for the CSB are limited to the compressed gas systems (air, helium, and argon). Compressed air is provided to utility stations throughout the facility via distribution headers. No penetrations through walls or floors are envisioned for maintenance or future alterations that would interrupt operations. The helium system includes a header, and supply outlets for the Tube Vent and Purge Cart bottle filling station and for the Sampling/Weld Stations. Argon (or mixed helium/argon) welding cover gas is supplied to the Sampling/Weld Stations from a sheltered bottle rack outside the operating shelter to the South.
0110-99.0.2	46.	All piping shall be located outside hazardous areas whenever possible to reduce personnel exposure during maintenance.	C	The CSB design does not provide piping in hazardous areas.
0110-99.0.4		Building Layout		
0110-99.0.4	47.	The design of the facility shall include controlled access to areas of potential hazards within the facility.	C	The CSB is a controlled access facility. Areas that contain potential hazards in the CSB are limited to the below grade vault where SNF containing MCOs are stored. The design precludes personnel access.
0110-99.0.4	48.	The facility layout shall provide for the segregation of administrative and other support personnel from operations and process activities and areas.	C	The CSB facility design provides a separate area for administrative and support functions.

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0110-99.0.4	49.	The arrangement and location of process equipment and its maintenance provisions shall ensure that exposure to radiation and other hazardous materials is within the requirements of DOE 5480.11 and DOE 5480.10, respectively.	C	The areas of the CSB where the transportation cask is checked, MCOs are sampled and/or welded, or off-normal MCOs are stored are compliant with radiation safety and industrial hygiene requirements. All areas of the CSB were designed to incorporate ALARA and to protect the health and safety of workers and the public. 10 CFR 835 is complied with as the updated guidance.
0110-99.0.4	50.	The design shall protect workers sufficiently from hazards to ensure that workers can perform actions required during normal operations, anticipated operational occurrences and postulated DBAs.	C	The CSB design protects workers from hazards during normal or anticipated occurrences, or DBAs. (Ref: HNF-3553, Section A3.3.3).
0110-99.0.4	51.	The design shall ensure prompt, safe shutdown in emergencies and allow ready access to areas where manual corrective actions are required and to areas that contain radiation monitoring equipment.	C	MCO handling equipment in the CSB is provided with emergency shutdowns. Seismic detection and automatic shutdown is provided for the cranes in accordance with ASME NOG-1. Radiation monitoring equipment is located in easily accessed areas of the support building and operating area. The CSB is designed to place all equipment in a safe status upon loss of power.
0110-99.0.4	52.	A minimum number of entrances shall be provided for security areas. However, exits shall comply with NFPA 101. Some exits shall be provided for emergency use only, and equipped with alarm devices and seals.	C	The CSB design is provided with limited entrances for security and safeguards reasons. Exits are provided with alarms. See response to 6430.1A, Section 0110-13.2.1 above (item # 27).
0110-99.0.4	53.	At least two exits shall be provided in rooms where hazardous materials are handled. (Exceptions for explosives facilities appear in Chapter II, Section 2.2, of DOE/EV 06194.)	NA	The CSB operation does not involve direct handling of hazardous materials. Exits are provided in accordance with NFPA 101.

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0110-99.0.4	54.	In those areas where an accidental breach of a primary confinement system could expose personnel to radioactive material, a distance of 75 feet as measured by the method in the NFPA 101 shall be the maximum travel distance to ensure that personnel can exit through the next confinement barrier. This barrier is the partition separating two different air zones, the area of refuge being on the upstream side of the barrier.	C	Personnel exits are provided in accordance with NFPA 101. The maximum travel distance is less than 75 feet.
0110-99.0.4	55.	The assured airflow through the barrier shall be in the direction opposite of exit travel.	C	The operations area building is at a lower negative pressure than the surrounding areas. Personnel exiting the operations area are moving against the flow of air. (Ref: HNF-3553, Section A.2.7.2).
0110-99.0.4	56.	The facility design shall provide space to accommodate all planned activities, operations, and maintenance (e.g., processing, research and development, scrap and waste handling, sample analysis, shipping and receiving, and material staging required for equipment installation and modifications).	C	All planned activities have been space allocated in the CSB design. (Ref: Dwg. H-2-120900, Mechanical CSB Space Allocation, sheets 1 - 4).
0110-99.0.4	57.	The design shall minimize the hazard of handling flammable and other hazardous materials.	NA	Handling of hazardous or flammable materials is not part of the CSB operations and is not included in provisions of the design.
0110-99.0.4	58.	In addition to the usual industrial safety features required in a nuclear facility, the design shall also include the following safety features, as appropriate:	C	The CSB includes the safety features identified in items # 59 and #60.

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0110-99.0.4	59.	Layout of the facility shall provide specific control and isolation, if possible, of quantities of flammable, toxic, and explosive gases, chemicals, and other hazardous materials admitted to the facility.	C	Control of flammable materials is per the FHA. Hazardous, toxic or explosive substances or chemicals do not play a part in CSB operations.
0110-99.0.4	60.	The provision of additional space shall be considered for temporary shielding or for additional shielding in the event radiation levels are higher than anticipated.	C	The shielding design for the CSB is based on very conservative assumptions. If additional shielding were to be needed the facility design can easily accommodate it.
0110-99.0.4	61.	Storage facilities shall be physically separated from process operations, areas for the storage of non-nuclear materials or equipment, and functions not directly required for storage operations.	C	The CSB vault provides a physical separation of the stored SNF from the sampling/weld station area by virtue of the below deck storage configuration. (Ref: HNF-3553, Figure A2-6).
0110-99.0.4	62.	Physical protection of stored SNM shall comply with the DOE 5632 series.	C	The design of the CSB has been independently reviewed against DOE 5632C-1 and protection has been provided commensurate with the categorization of the stored material. (Ref: CSB Vulnerability Assessment). Tamper indicating devices are provided for the storage tubes. (Ref: HNF-3553, Figure A2-14).

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0110-99.0.4	63.	Suitable physical compartmentalization shall be provided, as determined from the safety analysis, to limit the quantities of stored materials in each compartment to safe levels; ensure the necessary access features and controls; and satisfy the loss limitation criteria in Section 0110-99.0.7, Loss Limitations.	C	Compartmentalization of the SNF is done to ensure safe storage regarding criticality and cooling. The CSB vault 1 design accomplishes this goal by virtue of the storage tube array as described in the CSB FSAR. (Ref: HNF-3553, Section A3.0 and A4.3). The SNM (SNF) included in the MPFL is limited to one MCO in a transportation cask exposed to the DBF. The FHA calculates that the DBF would not raise the temperature of the MCO above the administrative limit of 270 °F. Tamper indicating devices are provided at each storage tube opening. (Ref: HNF-3553, Section A2.4.3). The stored SNF is outside the scope of the MPFL calculation. (Ref: HNF-SD-SNF-FHA-002, Rev. 2).
0110-99.0.4	64.	All corridors and door openings shall meet NFPA 101 or more stringent requirements based on the hazards of materials to be handled or operations to be performed, as established by the cognizant DOE Health and Safety authority.	C	The design of exit-ways from the CSB are per the NFPA 101 criteria. The hazards present in the CSB do not introduce more stringent criteria than NFPA 101. (Ref: HNF-SD-SNF-FHA-002, REV. 2).
0110-99.0.6		Fire Resistance		
0110-99.0.6	65.	Development of the DBF shall include consideration of conditions that may exist during normal operations and special situations (e.g., during periods of decontamination, renovation, modification, repair, and maintenance).	C	The design basis fire includes special situations besides normal operations such as due to maintenance activities. Ref: HNF-SD-SNF-FHA-002, Rev 2).

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0110-99.0.6	66.	The structural shell surrounding the critical areas and their supporting members shall remain standing and continue to act as a confinement structure during the DBF under conditions of failure of any fire suppression system not designed as a safety class item. Fire resistance of this shell shall be attained by an integral part of the structure (concrete slabs, walls, beams, and columns) and not by a composite assembly (membrane fireproofing).	C	The critical area of the CSB is the below grade vault. The FHA has not identified a DBF in the operating area deck over the vault that could challenge the structure above the deck. (Ref: HNF-SD-SNF-FHA-002, Rev 2).
0110-99.0.6	67.	In no event shall the fire resistance rating [of the structural shell] be less than two-hours under conditions of failure of any fire suppression system not designed as a safety class item.	C	The operating area shelter is separated from the sprinkled support building by a 2-hour rated partition wall. (Ref: HNF-3553, Section A2.7.1).
0110-99.0.6	68.	Penetrations in this shell shall incorporate, as a minimum, protection against DBF exposures unless greater protection is required by other sections of these criteria.	C	Penetrations through the 2-hour fire rated partition are provided with fire dampers or fire stops as applicable. (Ref: HNF-3553, Section A2.7.1).
0110-99.0.7		Loss Limitations		

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0110-99.0.7	69.	The design shall provide sufficient structural integrity, fire resistance, compartmentalization, detection, and extinguishing systems and alarms (plus other engineered safety systems where required) to generally limit property loss from any single DBA (excluding earthquake and tornados) to less than \$1 million for those special facilities in which safety systems are provided and function properly, and to less than \$25 million where safety systems do not function properly.	C	The MPFL for the operating support area is \$14.7 Million; the MPFL for the operations shelter area is less than \$1.0 Million. (Ref: HNF-SD-SNF-FHA-002, Rev. 2). Both buildings are designed to withstand the other DBAs including earthquakes and tornadoes. (Ref: HNF-3553, Section A2.7.1).
0110-99.0.8		Personnel and Public Safety		
0110-99.0.8	70.	The design of special facilities shall reduce the consequences of normal and DBA events by incorporating ALARA design concepts. Occupancy time, spacing, remote handling equipment, and shielding shall be considered.	C	The CSB design incorporates ALARA principles for normal operation. DBA events that could result in significant worker dose are prevented or mitigated in the CSB FSAR with Safety Significant SSCs and required controls. (Ref: HNF-3553, Table A3-4).

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0110-99.0.8	71.	Automatic monitoring and alarm devices shall be provided (where required by the form and potential hazard of the material being handled or stored) to detect the presence of significant levels or increases of radioactivity and, if feasible, any other hazardous materials, either released in the special facility or escaping from it. (Where monitoring devices are not available for specific contaminants, sampling devices shall be substituted and be evaluated on a frequency sufficient to detect release levels of interest).	C	The CSB FSAR has concluded that a release of material from the MCO is not credible. (Ref: HNF-3553, Section A3.4.2). The operating area is provided with ARMs and CAMs to detect unusual conditions that may affect the workers. (Ref: HNF-3553, Section A6.0).
0110-99.0.8	72.	Cautionary systems or interlocks shall prevent inadvertent entry into hazardous areas. All safety alarm systems shall annunciate inside of the special facility so as to identify hazardous areas. The need for visual alarm devices within the special facility, in addition to audible alarm devices, shall be considered. Where alarms can preclude or minimize exposures outside of the facility, they shall be provided (such as criticality alarms or evacuation alarms).	C	The hazardous material is stored in MCOs housed in storage tubes in the below grade vaults. These vaults are inaccessible except by the through floor storage tube plugs. Entry into the hazardous area (for personnel exposure) is precluded by the design of the CSB. Criticality alarms are not required. (Ref: HNF-3553, Section A2.4.3).

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0110-99.0.8	73.	DOE 5480.5 contains requirements for safety of nuclear facilities. In addition to its requirements, personnel exposure levels shall comply with Section 1300-6.2, Shielding Design, and exposure of the public shall comply with Section 1300-1.4, Guidance on Limiting Exposure of the Public.	C	Personnel exposure levels are governed by 10 CFR 835, <i>Occupational Radiation Protection</i> . Guidance for protecting the public is found in 97-SFD-172, Risk Evaluation Guidelines (REGs) to Ensure Inherently Safer Designs. The CSB design is in compliance with these REGs. Therefore, DOE 6430.1A Sections 1300-6.2 and -1.4 are met by the CSB design's compliance to the REGs. Compliance with the REGs is incorporated into the CSB as constructed. Note: 10 CFR 835 is updated information relative to 5480.5.
0111		Structural Design Requirements		
0111-1		General		
0111-1	74.	The structural design drawings shall indicate design criteria, the structural materials and their strengths with applicable materials standards, the design loads including loads that can occur during construction, and the allowable foundation loads that were used in the design.	C	The CSB structural design drawings include this information. (Ref: Dwg. H-2-119275).
0111-2		Loads		
0111-2.1		General Requirements		
0111-2.1	75.	Structures and their elements shall be designed for the loads prescribed in these criteria.	C	The structural loadings used in the CSB design are provided in the CSB FSAR. (Ref: HNF-3553, Chapter A4.0). See items # 76 - # 108.

C -- compliant
NA -- Not applicable

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0111-2.2		Dead Loads		
0111-2.2.1		General		
0111-2.2.1	76.	Dead loads are loads that remain permanently in place. They shall include the weights of all permanent materials and equipment, including the structure's own weight, supported in, or on, a structure.	C	Dead weight loads used in the analysis of CSB structures include allowances for the weights of permanent materials and equipment including the facility weight. In addition, ANSI/ANS 57.9 requires a +5% factor on dead weight for structures. (Ref: HNF-3553, Annex A, Chapter A4.0, Sections A4.3.1, A4.3.4 and A4.4.1).
0111-2.2.1	77.	Load calculations shall include an allowance for any loadings anticipated to be added at a later date.	C	The CSB structural analyses include an allowance for future loads. (Ref: HNF-3553, Section A4.3.3.4).
0111-2.2.3		Service Equipment		
0111-2.2.3	78.	Design dead loads shall include the weight of all permanent service equipment.	C	The weight of permanent service equipment is included as a dead or live load as applicable. (Ref: HNF-3553, Section A4.3.3).
0111-2.2.4		Allowance for Partition Loads		
0111-2.2.4	79.	The minimum allowance for weights of partitions, where partitions are likely to be rearranged or relocated shall be as follows: <ul style="list-style-type: none"> For partition weights of 150 plf or less, an equivalent uniform dead load of 20 psf shall be used. For partition weights above 150 plf, the actual linear loads shall be used. 	NA	The CSB design does not include partitions.

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0111-2.3		Live Loads		
0111-2.3.1		General		
0111-2.3.1	80.	Live loads shall include all loads resulting from the occupancy and use of the structure, whether acting vertically down, vertically up, or laterally.	C	The CSB structural analyses include an allowance for live loads. See CSB FSAR for a discussion on live load assumptions. (Ref: HNF-3553, Sections A4.3.1, A4.3.4 and A4.4.1).
0111-2.3.1	81.	Live loads shall include neither dead loads nor loads from the environment, such as wind, tornado, earthquake, thermal forces, earth pressure, and fluid pressure.	C	Live loads used in the CSB analyses do not include dead, fluid, earth, thermal or NPH loadings. (Ref: Design Basis Document, Section 10, and CSB FSAR Chapter A4.0 and Section A4.3).
0111-2.3.2		Buildings and Other Structures		
0111-2.3.1	82.	Live loads for buildings and other structures shall be those produced by the intended use or occupancy.	C	The live loads used for the CSB design are those associated with the intended use. (Ref: HNF-3553, Sections A4.3.1, A4.3.4 and A4.4.1).
0111-2.3.1	83.	In no case shall they be less than the minimum uniform load or concentrated load stipulated in ANSI A58.1.	C	Live loads for the CSB design include those associated with cranes and other material handling equipment. These loads are in excess of minimum live loads required by industrial occupancy in keeping with ANSI 58.1.
0111-2.3.1	84.	Live loads on roofs shall be as stipulated in ANSI A58.1. They shall include the minimum roof live loads or the snow loads and snow drifts or possible rain loads stipulated therein, whichever produces the more severe effect.	C	Roof loads include snow and ashfall amounts stipulated by natural phenomena events, which are in excess of the UBC for minimum live loads or other standard for normal loads. DOE-STD-1020 governs the structural design of the CSB. (Ref: HNF-3553, Section A1.5). This is in keeping with ANSI 58.1.

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0111-2.4		Wind Loads		
0111-2.4.1		General		
0111-2.4.1	85.	The structural frame and exterior components of all buildings, signs, tanks, towers, and other exposed structures shall be designed to resist pressures due to wind assumed to act from any direction.	C	Wind loads used in the CSB structural analyses are obtained from ASCE-7 as required by HNF-PRO-097. The CSB was further strengthened to be "tornado hardened" and, as constructed, will support wind loads in excess of those given in ASCE-7.
0111-2.4.2		Buildings and Other Structures		
0111-2.4.2	86.	Wind load design for buildings and other structures shall be determined in accordance with procedures in ANSI A58.1 with basic wind speed being obtained from UCRL 15910.	C	Wind loads are determined in accordance with ASCE 7 using an importance factor of 1.0. The importance factor of 1.0 conservatively accounts for the degree of hazard to human life and damage to property as described in ANSI A58.1. The 200 mph tornado wind load is about three times greater than the UCRL 15910 wind speed requirement.
0111-2.4.2	87.	The basic wind speed shall be derived from DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1. If site-specific hazard model studies are not available, a hazard model shall be developed that is consistent with the approach used in UCRL 53526, Rev. 1.	C	The CSB design provides a tornado wind resistant structure. Tornado wind speeds are greater than basic wind speeds as given in UCRL 53526. Therefore, the UCRL 53526 criteria are met.

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0111-2.4.2	88.	The basic wind speeds for any specific site shall be determined following the procedures in UCRL 15910, except that Exposure "C" should be used for all construction unless it can be shown that the necessary permanent shielding will be provided by natural terrain (not including shielding from trees or adjacent buildings).	C	The CSB design provides a tornado wind resistant structure. There is no credit taken for shielding of nearby buildings or terrain. Basic wind speeds are superceded by tornado wind design. (Ref: HNF-3553, Section A4.4.1).
0111-2.4.2	89.	To determine the design wind loads, all factors and coefficients stipulated in ANSI A58.1 shall be applied to the site-specific basic wind speeds.	C	Design wind loads are superceded by the tornado wind design. Therefore, ANSI A58.1 criteria are met.
0111-2.4.2	90.	Building additions shall be designed as part of a totally new building without regard to shielding from the original building and without regard to lesser wind resistance for which the original building may have been designed.	NA	Not applicable. The CSB facility is a new building and not an addition to an existing building.
0111-2.5		Tornado Loads		
0111-2.5	91.	The basic wind speed and missile parameters shall be derived from DOE site-specific hazard models studies summarized in UCRL 53526, Rev 1. If site-specific hazards model studies are not available, a hazard model shall be developed consistent with the approach used in UCRL 53526, Rev. 1.	C	The CSB is designed to be resistant to wind and wind driven missiles. Criteria for basic wind speed and wind driven missiles is obtained from HNF-PRO-097. Wind histories and supporting data are presented in UCRL 53526 and UCRL 15910. (Ref: WHC-SD-SNF-DB-009).

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0111-2.5	92.	Facilities for radioactive material handling, processing, or storage, and other facilities having high value or vital importance to DOE programs that are classified as critical facilities, shall require special tornado loading criteria as stipulated in Section 0111-99.0, Nonreactor Nuclear Facilities-General.	C	Tornado loading criteria is governed by NUREG-0800 criteria imposed as part of NRC equivalency per HNF-SD-SNF-DB-003.
0111-2.6		Internal Shock and Blast Loads		
0111-2.6	93.	Building structures (excluding explosive facilities) that house operations that may release energy from rupture of equipment or explosions, either inadvertently or purposely (such as testing), shall be designed to control the resulting internal shock pressure loads per applicable criteria.	NA	The CSB FSAR has not identified the need for designs to control internal shock pressures. (Ref: HNF-3553, Section A3.4.2).
0111-2.7		Earthquake Loads		
0111-2.7.1		Buildings and Other Structures		
0111-2.7.1	94.	The basic seismic parameters shall be derived from DOE site-specific hazard model studies summarized in UCRL 53582. If site-specific hazard model studies are not available, a hazard model shall be developed that is consistent with the approach used in UCRL 53582. In applying UCRL 53582, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	C	Earthquake loads are derived from amplified ground accelerations contained in DOE-STD-1020. These probabilistic hazard models of UCRL-53582 are the basis of the recommended site hazard curves in DOE-STD-1020. (Ref: HNF-SD-SNF-DB-004).

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0111-2.7.1	95.	Earthquake load design for buildings and other structures shall be determined in accordance with the procedures contained in UBC and UCRL 15910.	C	Earthquake loads are determined in accordance with HNF-PRO-097, which incorporates UCRL-15910.
0111-2.7.1	96.	The provisions and design procedures of TM 5-809-10 for the application of seismic loadings to conventional buildings shall also apply.	NA	The CSB seismic criteria being NRC equivalent and construction of massive below grade vaults are not a conventional design as compared to traditional above ground structures.
0111-2.7.1	97.	For <u>critical</u> facilities, the provisions and design procedures of TM 5-809-10.1 shall be used.	NA	Although the CSB has not been designated a critical facility, the CSB seismic design criteria guidance for essential or high risk buildings has been complied with through the Design Basis Document, and was based on dynamic analysis of the SC below grade vault.
0111-2.7.1	98.	Facilities for radioactive material handling, processing, or storage, and other facilities having high value or <u>vital</u> importance to DOE programs that are classified as <u>critical</u> facilities shall require application of dynamic analysis in determining structural requirements for earthquake loading as stipulated in Section 0111-99.0, Non-reactor Nuclear Facilities - General.	C	The CSB seismic design was based on dynamic analysis of the SC below grade vault. (Ref: HNF-3553, Section A4.3).

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0111-2.7.1	99.	An independent review of the seismic design shall be made for facilities and buildings where a seismic event can have a potential risk to operator lives, to public safety, or of large economic loss. The review shall be made in two stages, the first at the end of preliminary design and the second before final design is complete. For additional guidance on independent reviews, see LBL-9143 and UCRL 15910.	C	The structural design of the CSB including seismic has been thoroughly reviewed by in-house and third party reviewers. These reviewers included LLNL, NYCC, and BNLL experts in the field of seismic and structural analysis. Their input is documented in the <i>SER for Canister Storage Building Safety Analysis Report Through Phase 3 (97-SFD-227)</i>
0111-2.8		Other Loads for Buildings and Other Structures		
0111-2.8.1		Vibratory Loadings		
0111-2.8.1	100.	Equipment supports shall be designed to avoid resonance resulting from the harmony between the natural frequency of the structure and the operating frequency of reciprocating or rotating equipment support on the structure.	C	All rotating or reciprocating equipment is anchored to the support building slab. There is no reciprocating or rotating equipment in the CSB operating area with the exception of occasional use fans (EF/AH-005 and EF/AH-006). Wherever possible all reciprocating or rotating equipment is mounted on isolated base plates.
0111-2.8.1	101.	The operating frequency of supported equipment shall be determined from manufacturer's data prior to completion of structural design.	NA	Not applicable. All rotating equipment is mounted on concrete using isolation pads. There are no supporting structures that could be affected by vibrating equipment.
0111-2.8.1	102.	Resonance shall be prevented by designing equipment isolation supports to reduce the dynamic transmission of the applied load to as low a level as can be economically achieved in the design.	C	Resonance is prevented by the use of vibration isolators for equipment mounting in the CSB design.
0111-2.8.2		Earth and Groundwater Pressures		

C -- compliant
NA -- Not applicable

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0111-2.8.2	103.	Every foundation wall or other wall serving as a retaining structure shall be designed to resist, in addition to the vertical loads acting on it, the incident lateral earth pressures and surcharges, plus hydrostatic pressures corresponding to the maximum probable groundwater level.	C	The CSB design for the below grade vaults considers lateral earth loads. (Ref: HNF-3553, Section A4.3.1.4).
0111-2.8.2	104.	Retaining walls shall be designed for earth pressures and potential groundwater levels producing the highest stresses and overturning moments.	C	The CSB design for the below grade vaults considers lateral earth loads. The CSB basemat is approximately 300 to 400 ft above the water table. Consideration of groundwater effects is not required. (Ref: HNF-3553, Section A4.3.1.4).
0111-2.8.3		Fluid and Gas Pressure		
0111-2.8.3	105.	The design of components of buildings and other structures shall include the effects of fluid and gas pressures, both internal and external.	C	The CSB design for internal pressures is limited to the non-vented overpack storage tubes. The design includes the effects of internal gas pressure. The design of the overpack storage tubes is per ASME Section III.
0111-2.8.5		Creep and Shrinkage Forces		

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0111-2.8.5	106.	Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage. For concrete and masonry structures, the minimum linear coefficient of shrinkage shall be assumed to be 0.0002 inch/inch, unless a detailed analysis is undertaken. The theoretical shrinkage displacement shall be computed as the product of the linear coefficient and the length of the member.	C	The CSB's reinforced concrete design is in accordance with ACI-349 and ACI-318 requirements. These codes contain requirements for minimum steel to address the issue of reinforced concrete shrinkage. Compliance with ACI 318 and 349 satisfies this requirement of DOE 6430.1A.
0111-2.10		Combination of Loads and Design Requirements for Buildings and Other Structures		
0111-2.10	107.	Combination of loads, allowable stresses, and strength requirements for buildings and other structures shall be as stipulated in the UBC, except as otherwise indicated in 0111-99, Special Facilities.	C	The CSB design is governed by load combinations per ACI 349 and ANSI/AISC N690. (Ref: HNF-3553, Table A4-3.).
0111-3		Structural Systems for Buildings and Other Structures		
0111-3.2		Floors		
0111-3.2	108.	Where the first floor uses concrete-slab-on-grade construction, the slab shall be placed on a free-draining aggregate base overlying a compacted subgrade.	C	The CSB at-grade reinforced concrete construction is placed on an aggregate base overlying a compacted subgrade. (Ref: Dwg. H-2-119324).

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0111-3.2	109.	A plastic vapor barrier shall be used under the slab where moisture conditions warrant.	C	The CSB at-grade construction uses a 6 mil polyethylene vapor barrier. (Ref: Dwg. H-2-119324).
0111-3.2	110.	Excessive loads or equipment subject to vibration shall be supported by separate pads isolated from the rest of the floor slab with flexible joints.	C	The CSB equipment foundations in the support building are separated from the base slab by flexible expansion joints. Expansion joints are also present between slab and column bases.
0111-3.3		Control Joints		
0111-3.3	111.	Control joints shall be designed and placed in such a manner as to avoid structural distress and uncontrolled cracking from thermal expansion and contraction, concrete shrinkage, and movements due to wind and earthquake forces.	C	Control joints, that have as their primary purpose the prevention of structural distress and uncontrolled cracking, are appropriately designed and placed in the CSB construction.
0111-3.4		Foundations		
0111-3.4.1		General Requirements		
0111-3.4.1	112.	The provisions of the UBC shall be the minimum requirements for foundations design. The potential adverse effects of frost heave and movements due to expansive soils shall also be considered in the design.	C	The design of equipment foundations in the CSB exceed the minimum required per the UBC. The design takes into account frost heaving and expansive soil effects. (Ref: Design Basis Document, Section 10).

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0111-3.4.1	113.	For all structures, Section 0201, Subsurface Investigations, shall be complied with to determine subsurface conditions, recommended foundation type, allowable design soil bearing pressure, seismic potential, and differential settlement.	C	Geotechnical investigations of the 200 East soil profile have been extensive and thorough. The design of the CSB takes into account the soil properties provided by the results of these investigations. (Ref: HNF-3553, Section A4.3.4.2).
0111-3-4-2		Foundation Vibrations		
0111-3-4-2	114.	Analysis of foundation vibrations, design to avoid resonance, and vibration and shock isolation, where required, shall be in accordance with Chapter 1 of DM-7.03.	NA	Foundation vibration is prevented by the use of vibration isolators for equipment mounted to the CSB support building. No additional analysis or design to Chapter 1 of DM-7.03 is required.
0111-99		Special Facilities		
0111-99.0		Nonreactor Nuclear Facilities - General		
0111-99.0.1		General		
0111-99.0.1		Safety class structures are sometimes required in special facilities for the following reasons:		CSB Safety Class structures are defined as noted in items # 115 - # 117.
0111-99.0.1	115.	For nuclear criticality safety.	C	The safety class storage tubes in the below grade vault that house MCOs containing SNF are designed to withstand all applicable DBA and NPH events for criticality control reasons.

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0111-99.0.1	116.	To prevent or mitigate the release of quantities and concentrations of radioactive materials that have the potential to exceed the release guidelines contained in Section 1300-1.4, Guidance on Limiting Exposure of the Public.	C	The safety class below grade vault is designed to withstand all applicable DBA and NPH events including seismic to prevent structural failure and subsequent release of SNF material from breached MCOs as well as to prevent loss of cooling or critically safe geometry. (Ref: HNF-3553, Section A3.4.2.8.).
0111-99.0.1	117.	To achieve and maintain the facility in a safe shutdown condition.	C	The CSB design does not require active systems to achieve and maintain a safe shutdown.
0111-99.0.1	118.	Special facility structures that need not be designed to withstand severe natural phenomena or man-made events shall be designed to the requirements in Section 0111-2, Loads.	NA	The CSB design addresses severe natural phenomena criteria. (Ref: HNF-3553, Chapter A1.0).
0111-99.1	119.	Safety class items required to function during or following severe natural phenomena shall not be prevented from performing their required safety functions by the failure of components, systems, or structures that are not designed to the severe natural phenomena criteria.	C	Interaction of non-safety class structures with safety class structures is evaluated per the A/E's FMEA and/or Interaction Analysis. Where applicable the interaction is prevented by upgrading the design loads for the non-safety class item.
0111-99.0.1	120.	Safety class structures shall be protected against dynamic effects, including effects of wind driven missiles and discharging fluids, that may result from natural phenomena, accidents at nearby facilities, including military installations and transportation facilities, equipment failure, and similar events and conditions inside and outside the facility.	C	The CSB FSAR has not identified credible events that result in missiles impacting safety class structures. The CSB operating shelter is resistant to wind driven missiles. (Ref: HNF-3553, Section A4.4.1).

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0111-99.0.1	121.	The design bases for such events shall take into account their historic frequency and severity if the region of the site and the potential risk to the environment or the health and safety of the public. However, earthquakes, tornados, straight winds and floods shall be addressed.	C	Historical occurrences (frequency and severity) are taken into account in the design for the straight wind driven missile. Return periods for other NPH events are given in the CSB FSAR. (Refs: ASCE -7 and HNF-3553, Table A1-3).
0111-99.0.1	122.	Where floor-mounted special facilities equipment will have a commonality of use, it shall be centrally located with respect to special facilities operations.	C	The CSB design uses dedicated equipment for the individual functions. Where equipment is used at separate locations within the facility the equipment is designed to be mobile.
0111-99.0.1	123.	The design of structures, including their supports, that are confinement system barriers shall ensure satisfaction of the functional requirements for the specific confinement system they are part of.	C	Design requirements of confinement barriers are demonstrated by functional test relative to its next confinement barrier or the environment as applicable.
0111-99.0.1	124.	In addition, safety class confinement barriers (barriers whose continued integrity is shown by a safety analysis to be required following severe natural phenomena, including the DBE, and man-made events) shall be designed to withstand secondary events as well as primary events. Potential secondary events might be fire, explosion, or nuclear criticality caused by the DBE.	NA	The CSB FSAR has not identified Safety Class confinement barriers. (Ref: HNF-3553, Section A2.6).
0111-99.0.1	125.	In no case shall the total combustible loading located in a fire area exceed the fire resistance rating of the area enclosure. This shall be documented in a fire risk analysis.	C	The CSB final Fire Hazards Analysis documents the permissible combustible loadings in the various areas of the CSB. These combustible loading limits need to be complied with during facility operation. (Ref: HNF-SD-SNF-FHA-002 Rev. 2).

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0111-99.0.2		Tornado and Extreme Wind		
		Determination of Design Basis Tornado		
0111-99.0.2	126.	DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1, shall be used to select the DBT and extreme wind characteristics for the design of structures.	C	The DBT is governed by NRC equivalency requirements to implement Reg. Guide 1.76. (Ref: HNF-SD-SNF-DB-003, Rev. 4). Extreme wind characteristics are provided in DOE-STD-1020 and ASCE-7. UCRL 53526 hazard assessments are the basis for the recommended wind speeds in DOE-STD-1020. (Ref: HNF-3553, Table A1-3).
0111-99.0.2	127.	If site-specific hazard model studies are not available, a hazard model shall be developed consistent with the approach used in UCRL 15910.	C	Two site-specific probabilistic wind models have been completed for the Hanford site, UCRL-53526 and NUREG/CR-4492. (Ref: HNF-3553, Section 1.4.1.1.4).
0111-99.0.2	128.	In applying UCRL 53526, Rev. 1, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	C	Frequency of occurrence (probability of exceedence) for PC category 2 (CSB) is provided in DOE-STD-1020. Severity is provided on the UCRL and NUREG curves. (Ref: HNF-3553, Section 1.4.1.1.4).
0111-99.0.2		In designing for tornado or extreme wind resistance:		See items # 129 - # 132.
0111-99.0.2	129.	The tornado rotational speed shall be appropriately combined with the translational speed.	C	The CSB design is based on including rotational with straight wind velocity. (Ref: HNF-3553, Section 1.4.1.1.4).

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0111-99.0.2	130.	Resulting loads from the rate of pressure drop, taking into consideration any pressure equalization due to permissible venting, shall be combined with velocity-induced pressure loads as stipulated in UCRL 15910.	C	The CSB design takes into account the effects of pressure drop and rate of change. (Ref: HNF-3553, Section 1.4.1.1.4, and A4.3.4 and A4.4.1).
0111-99.0.2	131.	UCRL 53526, Rev. 1, provides the characteristics of typical potential tornado-generated missiles. Additional missiles may be identified from review of on-site sources and possible missiles that could be borne to the site by a tornado. Both small high-velocity missiles and massive low-velocity missiles shall be considered separately in terms of penetration, perforation, or crushing effects. The horizontal and vertical velocities of the missiles shall be combined in the design.	C	Tornado generated missiles have been evaluated in accordance with NRC accepted probabilistic risk assessment techniques (WHC-SD-SNF-DB-009). The probability of tornado generated missiles impacting safety class SSCs has been found to be not credible. (Ref: HNF-3553, Section 1.4.1.1.4).
0111-99.0.2	132.	The minimum wind speed used shall be 70 mph.	C	The minimum wind speed used for SC wind loading is 90, 80 for SS and 70 for GS. (Ref: HNF-PRO-097 and HNF-3553, Section 1.4.1.1.4).
0111-99.0.3		Floods		

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0111-99.0.3	133.	<p>The design loads from flooding shall comply with UCRL 15910. In calculating design loads from flooding, a conservative approach shall be taken to ensure that the loads used in the design are as follows:</p> <ul style="list-style-type: none"> • Greater than the maximum historic levels recorded for the site. • No less than the probable maximum flood (PMFL). 	NA	<p>The CSB site is a flood-dry site with respect to river flooding, and accordingly only flooding caused by precipitation runoff need be considered. The effects of local Probable Maximum Precipitation are determined according to ANS/ANS-2.8-1992 (WHC-SD-SNF-DB-009). Local protection for run-off is provided by earthwork and grading design, and by the storm drain system consisting of culverts, ditches, channels, and catch basins as required. The PMP is conservatively assumed to have an annual probability of exceedance of 1×10^{-6}. (Ref: HNF-3553, Section 1.4.1.1.2).</p>
0111-99.0.4		Earthquakes		
		Seismic Analysis		
0111-99.0.4	134.	The use of earthquake experience is an acceptable approach to the seismic qualification of safety class items.	NA	Safety class items are qualified by component testing, dynamic analysis, or a combination of testing and analysis. See also response to item # 141 below.
0111-99.0.4	135.	The systems, components, and structures that shall be designed to meet these special facility criteria shall be identified through a written evaluation (see Section 0111-99.0.1, General).	C	Safety class systems, structures, and components required to withstand severe natural phenomena are identified in the CSB FSAR. (Ref: HNF-3553, Section A4.3).
0111-99.0.4	136.	Such systems, components, and structures shall be designed to provide their passive or active functions as required by the SAR in accord with their designated safety classes.	C	These SSCs provide their identified active or passive safety class function as determined by the CSB FSAR accident analysis. (Ref: HNF-3553, Section A4.3).

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0111-99.0.4	137.	Site-specific seismic parameters shall be determined for a DBE. The SSE shall be equivalent to the DBE.	C	Site specific parameters are used for the CSB's seismic design. For the MHM the SSE is equal to the DBE. (Ref: HNF-3553, Section 1.4.3.8, Tables 1-21, 1-22, 1-23, A1.4.3.8 and A4.4.4).
0111-99.0.4	138.	To determine the DBE, site-specific earthquake hazard models and response spectra given in UCRL 53582, Rev. 1, shall be used to select the appropriate seismic ground acceleration.	C	The seismic ground acceleration selected for the CSB is in excess of what was specified in DOE-STD-1020 in order to meet NRC equivalency (Ref: HNF-SD-SNF-DB-004). The appropriate seismic ground accelerations out of DOE-STD-1020 use the hazard models in UCRL 53582. (Ref: HNF-3553, Section A1.4.3.8, and HNF-SD-SNF-DB-004 and HNF-SD-SNF-DB-009).
0111-99.0.4	139.	Design guidance in UCRL 15910 shall be used in applying UCRL 53582, Rev. 1.	C	Seismic hazards models used in the CSB design use the design and construction guidelines of UCRL 15910 and were provided in WHC-SD-W236A-TI-002. Earthquake load design is in accordance with DOE-STD-1020 which uses the hazard models from UCRL 53582. (Ref: HNF-PRO-097 and HNF-3553, Section A1.4.3.8).
0111-99.0.4	140.	The DBE shall be defined by design response spectra, appropriate for the site, or by acceleration time histories, representative of the anticipated ground motions.	C	The CSB DBE design is to the HWVP horizontal seismic response spectra appropriate for the site, which was a Newmark and Hall median spectra shape anchored at 0.35g. (Ref: HNF-3553, Section A1.4.3.8 and NUREG/CR-0098).
0111-99.0.4	141.	The adequacy of systems, components, and structures to withstand a seismic event shall be verified by a dynamic analysis, except where it can be demonstrated that the use of a simplified approach, such as static load method, component testing, or a combination of testing and analysis provides assurance of adequate seismic design.	C	The CSB structural design has been evaluated for seismic loading in accordance with dynamic analyses. Dynamic analyses have been performed for major equipment such as the MHM. Static equivalent loading is implemented conservatively for tip-over analyses of components primarily for anchorage design. (Ref: HNF-3553, Section A4.3.1, A4.3.15 and A4.4.4, and Design Basis Document, Section 10).

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0111-99.0.4	142.	The ratio of vertical-to-horizontal acceleration shall be two-thirds, unless site-specific data justify use of a different ratio.	C	The CSB structural design uses a seismic vertical component of two-thirds the horizontal spectrum. (Ref: HNF-3553, Section A1.4.3.8).
0111-99.0.5		Aircraft		
0111-99.0.5	143.	Unless the safety analysis can demonstrate that the risk from an aircraft crashing into the facility is acceptable, potential aircraft crashes shall be considered among the spectrum of man-made missiles that confinement structures shall be designed to withstand or against which they shall be protected.	C	The risk of an aircraft crashing onto the CSB is calculated using DOE-STD-3014-96. Structural analyses of the safety class structures of the CSB (operating deck structure and intake stack) were performed in accordance with DOE-STD-3014-96 Appendix C. (Ref: HNF-3553, Section A1.6.1).
0111-99.0.6		Nearby Explosions and Externally Generated Missiles		
0111-99.0.6	144.	The potential effects of a major explosion at a nearby facility or transportation route shall be considered among the spectrum of external blast effects and missiles that confinement structures shall be designed to withstand or against which they shall be protected.	C	Other transportation accidents for the CSB were evaluated in the CSB FSAR using methodology described in RG 1.91. (Ref: HNF-3553, Section A1.6.2).
0111-99.0.7		Explosion, Internal Pressurization, Criticality, and Other DBA Causes		

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0111-99.0.7	145.	The probable consequence of DBAs involving internally generated missiles or blast effects shall be considered. Such DBAs typically involve failure of high-speed rotating machinery, cranes, experimental facilities, high-energy fluid system components, or explosives. Structures required to function following such accidents shall be designed to withstand these DBAs.	C	The CSB FSAR has not identified any DBAs associated with failures of high speed rotating machinery or high energy fluid systems. Crane failures leading to load drop events have been addressed by load height limiting devices and impact absorber materials. (Ref: HNF-3553, Section A3.4.2).
0111-99.0.8		Load Combinations		
0111-99.0.8	146.	Safety class structures and structural members shall be designed to resist the appropriate load combinations provided in UCRL 15910.	C	Load combinations for the CSB safety class structures include NPH event loads in combination with normal operating loads as provided in UCRL 15910. These load combinations are in accordance with DOE-STD-1020. (Ref: HNF-PRO-097 and HNF-3553, Table A4-3).
0111-99.0.8		Concrete Structures		
0111-99.0.8	147.	Concrete structures and structural members for safety class concrete structures shall meet the design and construction requirements of ACI 349 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.	C	The safety class reinforced concrete structures comprising the CSB are designed in accordance with load combinations per ACI-349. (Ref: HNF-3553, Section A4.3.1 and Design Basis Document, Section 10).
0111-99.0.8		Steel Structures		

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0111-99.0.8	148.	Safety class steel structures shall meet the design, fabrication, and erection requirements of AISC N690 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.	C	The structural steel design for the CSB Safety Class steel structures meets the requirements of ANSI/AISC N690. (Ref: HNF-3553, Section A4.3.3, A4.3.5, A4.3.6, A4.4.1 and Design Basis Document, Section 10).
0140		Quality Assurance		
0140	149.	A QA program shall be developed and implemented in compliance with DOE 5700.6b and using the elements of DOE 4700.1 and ANS ANSI/ASME NQA-1.	C	Development and implementation of the quality assurance program is in compliance with 10 CFR 830.120 and DOE order 5700.6C. (Ref: HNF-3553, Section 14.3).
0200		Site Development		
0200-1		Facility Siting		
0200-1.2		Radiological Siting Requirements		
0200-1.2	150.	For those facilities in which radioactive materials are processed, used, or stored, or those facilities that incorporate radiation-producing machines, the acceptability of the site shall be evaluated in terms of potential radiological consequences.	C	The potential radiological consequences of the storage of spent nuclear fuel canisters in the CSB is documented in the CSB FSAR. (Ref: HNF-3553, Section 1.7 and A1.7).

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0200-1.2	151.	For a deterministic analysis, events to be analyzed are those judged to have maximum consequences based on technical review of the specific facility design and related radiological processes. For a probabilistic analysis, events to be considered are those events whose annual probability of occurrence exceeds 10^{-6} .	C	The events selected for analysis are described in the CSB FSAR. (Ref: HNF-3553, Section A3.4.2).
0200-1.2	152.	Radiation dose to an off-site individual receiving maximum exposure shall be evaluated.	C	Evaluations for dose to the off-site individual are contained in the CSB FSAR. (Ref: HNF-3553, Section A3.4.2).
0200-1.2	153.	Dose shall be calculated and compared to the dose guidelines established below. Comparisons shall be based on a 50-year committed effective dose-equivalent.	C	The risk acceptance guidelines for radiological consequences are 50-year committed effective dose equivalents. (Ref: HNF-3553, Section 3.4.1.1).
0200-1.2	154.	The off-site individual receiving the maximum dose shall be assumed to be located at the point of highest concentration (or highest exposure rate) outside the boundary controlled by the site.	C	The location of maximum exposure to the public was determined by calculating the air transport factors for the 16 directional vectors at the distances representing the nearest location of the potential receptors. (Ref: HNF-3553, Section A1.4.1).
0200-1.2	155.	Meteorological conditions used in dose calculations shall be representative of unfavorable dispersion, determined by comparing the 0.5 percent dispersion factors (X/Q) for each sector to the 5-percent overall site X/Q and selecting the highest value.	C	The acute X/Q for the analyses were calculated using joint frequency distribution data so as to be exceeded only 0.5% of the time for each sector, or to be exceeded only 5% of the time for data from all sectors combined. (Ref: HNF-3553, Section A1.4.1).
0200-1.2	156.	Consideration shall be given to on-site individuals.	C	The onsite worker is included in the CSB FSAR accident analyses. (Ref: HNF-3553, Section A3.4.2).

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0200-1.2	157.	Prudent measures associated with the radiological protection of on-site personnel and in conjunction with the on-site emergency response planning, as required through implementation of DOE 5500.3, shall be incorporated into the design and siting of a new facility.	C	The siting of the CSB facility was determined based on characteristics conducive to safe operations (i.e., radiological contamination movement due to prevailing winds, vehicular accident potential, proximity to dangerous and/or radioactive waste storage, and nearness of fire stations), and ease of construction. This discussion is provided in the HWVP safety analyses. (Ref: WHC-SD-HWV-PSAR-001, Rev. 1, Sections 1.2.1 and 2.1.2).
0200-1.2	158.	Information on the siting evaluation, including the models, parameters, and assumptions used in the dose calculations shall be documented for use in the facility's SAR and emergency response plans. See DOE 5440.1C and DOE 5481.1B.	C	This information is included in the CSB FSAR. (Ref: HNF-3553, Sections A3.2 and 15.0).
0200-1.3		Radiological Siting Guidelines		
0200-1.3		The following siting guidelines apply to off-site individuals receiving maximum dose from exposure to internally-deposited radioactive materials and/or radiation from external sources.		The guidelines follow below as items # 159 & # 160.
0200-1.3	159.	The maximum calculated dose shall not exceed 25 rem to the whole body, 300 rem to the thyroid, 300 rem to the bone surface, 75 rem to the lung, or 150 rem to any other organ.	C	Off site dose calculations for accidents in the CSB FSAR are below these values. (Ref: HNF-3553, Section A3.4.1).
0200-1.3	160.	If multiple organs receive doses from the same exposure, the effective dose equivalent from all sources shall not exceed 25 rem when calculated by using the ICRP Report No. 26 weighing factors.	C	The dose per unit intake is the 50 year dose commitment for all relevant exposure pathways. The major radiation exposure pathway is inhalation of radioactive material. The EDE is less than 25 rem. (Ref: HNF-3553, Section A3.4.1, Table 3-4 and A3.4.1).

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0200-99		Special Facilities		
0200-99.0		Nonreactor Nuclear Facilities - General		
0200-99.0.2		Other Facilities and Operations		
0200-99.0.2	161.	The potential hazards from other on-site facilities and off-site sources of hazards that could affect the safe operation of the special facility shall be considered.	C	Consideration of other facilities and off-site sources has been given as described in the CSB FSAR. (Ref: HNF-3553, Section A1.7.1).
0200-99.0.3		Services		
0200-99.0.3	162.	Utility systems essential to the support of safety class items shall be designed as safety class items.	NA	The CSB design does not rely on utility systems to support safety class functions. (Ref: HNF-3553, Section A4.3.15).
0201		Subsurface Investigations		
0201-1		General		
0201-1	163.	For permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions.	C	The subsurface conditions at the CSB site are well characterized. (Ref: HNF-3553, Section 1.3).
0201-1	164.	Subsurface investigations shall be made for critical facilities.	NA	The CSB has not been designated a critical facility.

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0201-1	165.	A settlement analysis under differential design loads shall be performed where differential settlement may cause structural or architectural damage.	C	The effects of differential settlement between the slab on grade extensions of the operating deck above the vault and the vault has been considered in the design of the CSB. Settlement of the support building slab has also been considered. (Ref: HNF-3553, Section A4.3.1).
0201-4		Foundation Engineering Evaluation and Recommendations		
0201-4	166.	The soils engineer shall analyze the information developed by investigation or otherwise available, including any aspect of the soil conditions that might affect design and construction of proposed structures, and shall consult with the engineer on the design requirements of the project.	C	The basis for the CSB construction in the 200 East area of the Hanford site is described in the HWVP PSAR. The CSB below grade basemat and slab on grade construction is based on recommendations based on investigations of the soil profile strata. (Refs: WHC-SD-HWV-PSAR-001, Rev 1, Section 3.6.1.9 and the Dames & Moore report).

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0201-4	167.	<p>The soils engineer shall submit a professional evaluation, recommended construction specifications, and recommendations including the following where applicable:</p> <ul style="list-style-type: none"> Foundation support of the structure and slabs, including soil bearing pressures, bearing elevations, foundation design recommendations and anticipated settlement Soil material and compaction requirements for site fill, construction backfill, and for the support of structures and pavement Recommendations and design criteria for shoring and underpinning systems Seismic activity Analysis of the effect of weather and construction equipment on soil during construction Analysis of soils to ascertain presence of dispersive potentially expansive, deleterious, chemically active or corrosive materials or conditions, or presence of gas Recommendation of the most proper foundation system and other alternative workable systems 	C	In preparation of the HWVP construction, the CSB site geology was investigated by Dames and Moore to evaluate subsurface conditions, recommendations on site preparation and general earthwork activities. The results of these investigations are described in the HWVP PSAR. (Refs: WHC-SD-HWV-PSAR-001, Rev 1, Section 3.6.1.9 and the Dames & Moore report).
0235		Building Foundations		
0235-3		Concrete		

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0235-3	168.	Concrete for building foundations shall be designed in accordance with Section 0330, Cast-In-Place Concrete.	C	DOE 6430.1A Section 0330 requires that cast in place concrete be in compliance with ACI-318. The CSB reinforced concrete construction is in accordance with ACI 318 and ACI 349, see DBD, Section 10. (Ref: HNF-3553, Section A4.3.1).
0235-8		Equipment Foundations		
0235-8	169.	Heavy, vibration-producing equipment, such as high-pressure air compressors, chillers, fire pumps and engine/generator sets, shall have separate, isolated foundations.	C	CSB equipment foundation design uses separate and isolated foundations from the slab-on-grade floor. (Ref: Dwg. H-2-119324).
0260		Piped Utility Materials		
0260-2		Exterior Utilities		
0260-2	170.	All water mains, supplying fire protection systems, fire hydrants, etc., shall be treated as fire mains and installed in accordance with NFPA 24.	C	Water mains supplying fire protection systems are in accordance with NFPA 24. (Ref: FDI Design Basis Document, Section 11).
0260-2	171.	Water storage facilities shall comply with NFPA 22.	C	The CSB design does not use water storage provisions except for the fire water storage tank which complies with NFPA 22. As substantiated by a qualified fire protection engineer.

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0260-2	172.	Gas distribution shall comply with local codes and requirements. Fuel gas shall comply with NFPA 54. Liquefied petroleum gas shall comply with NFPA 58.	NA	The CSB design does not use fuel gas or liquefied petroleum gas.
0260-2	173.	Domestic water supply lines shall comply with 40 CFR 141 and 40 CFR 142.	NA	The CSB design does not use domestic water.
0262		Corrosion Control		
0262-3		Cathodic Protection System		
0262-3	174.	The interior of steel water tanks shall be protected by cathodic protection system when the calcium content of the water is less than 18 ppm or when the calcium content is between 18 ppm and 55 ppm and the sulfate content is greater than 25 ppm.	C	The CSB design does not include steel water storage tanks except for the fire water storage/supply tank. Cathodic protection is limited to the fire water system. (Ref: HNF-3553, Chapter A2.0).
0262-3	175.	Cathodic protection for underground flammable/combustible liquid storage tanks and piping shall comply with NFPA 30.	NA	The CSB design does not contain underground flammable liquid storage tanks, (Ref: HNF-3553, Section A2.7.1).
0266		Water Distribution Systems		
0266-4		System Design Considerations		

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0266-4	176.	Domestic water distribution systems shall be designed to deliver the peak domestic flow of 2-1/2 times the average daily demand, plus any special demands, at a minimum residual pressure of 30 psi at ground elevation (or higher if special conditions require).	NA	The CSB design does not have a domestic water distribution system. (Ref: HNF-3553, Chapter A2.0).
0266-4	177.	Each fire hydrant within the distribution system must be capable of delivering 1000 gpm at a residual pressure of not less than 10 psi.	C	The fire hydrants have been tested and provide 1800 to 2000 gpm. Line pressure (pumped from the fire water pump house) is about 125 psig.
0266-4	178.	Where domestic water distribution systems are to serve internal fire protection systems (i.e., sprinklers or foamite systems), adequate residual pressures shall be maintained for proper operation of such fire protection systems.	NA	The CSB design does not have a domestic water distribution system. (Ref: HNF-3553, Chapter A2.0).
0266-4	179.	Fire hydrant branches (from main to hydrant) shall be not less than 6 inches in diameter and no longer than 300 feet.	C	The fire hydrant branches are 6" diameter pipe, at distances of 20, 25, and 150 feet from the 10" and 12" diameter fire water mains.
0266-4	180.	A gate valve shall be installed within each fire hydrant branch to facilitate maintenance.	C	Each fire hydrant has a gate valve with a post indicator for shutting off flow to the hydrant.
0266-4	181.	Fire hydrants shall be installed at a maximum spacing of 400 feet. Fire hydrants shall not be located more than 300 feet from the buildings to be protected.	C	Hose lay distances from three hydrants to exterior portions of the building are not more than 300 feet. The fire hydrants are spaced 437 and 370 feet apart. The two fire hydrants separated by 370 feet satisfy this requirement (Note item #182). (Ref: HNF-3553, Figure A2-4, and Design Basis Document, Section 11.8.1).

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0266-4	182.	Each building shall be protected by a minimum of two hydrants.	C	The CSB is protected with 3 fire hydrants. (Ref: HNF-3553, Figure A2-4).
0266-4	183.	Water mains shall have a minimum pressure rating of 150 psi.	C	The design pressure rating of the water mains is 150 psig.
0266-4	184.	Water distribution systems shall be designed to maintain a normal operating pressure range of 40 psi to 100 psi (at ground level) in distribution mains and building service lines.	NA	The CSB design does not include domestic water service. (Ref: HNF-3553, Chapter 2.0). The fire water system operates at about 100 psig at ground level in the building service lines.
0273		Water Pollution Controls		
0273-99		Special Facilities		
0273-99.0		Nonreactor Nuclear Facilities - General		
0273-99.0	185.	There shall be no interconnections among storm water systems, the sanitary waste system and radioactive or other hazardous material handling systems or areas.	C	The CSB design does not cross connect storm water runoff with any other system. There are no radioactive liquid or sanitary water systems in the CSB. (Ref: HNF-3553, Sections A2.8.6 and A2.8.7).
0273-99.0	186.	The sanitary waste system at each facility shall be monitored or sampled and analyzed (e.g., alpha emitters) for radioactivity unless the site sanitary treatment system is monitored.	C	The CSB design does not have sanitary water effluent. (Ref: HNF-3553, Section A2.8.7).

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0273-99.0	187.	In addition, there shall be no interconnections between the potable water system, the sanitary waste system, and process systems.	C	The CSB design does not connect potable water systems to process or sanitary water systems. (Ref: HNF-3553, Sections A2.8.6 and A2.8.7).
0275		Industrial Wastewater Treatment		
0275-4		Control of Pollution from Other Sources		
0275-4	188.	Precautions shall be taken to prevent contamination of surface water, groundwater, soil, or other environmental resources in the vicinity of storage or treatment tank systems for petrochemical, hazardous material and hazardous wastes. Hazardous waste tank systems shall comply with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 270, and 40 CFR 271. Petrochemical and hazardous material tank systems shall comply with 40 CFR 280 and proposed 40 CFR 281.	NA	The CSB design does not include hazardous material or hazardous waste or petroleum waste storage tank systems. (Ref: HNF-3553, Section A2.8).
0275-99		Special Features		
0275-99.0		Nonreactor Nuclear Facilities - General		
0275-99.0.1		Industrial Wastes		

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0275-99.0.1	189.	Industrial wastes such as discharges from mop sinks, overflow from positive pressure circulating waste systems, and process steam condensate shall be collected and transferred to a liquid waste treatment plant or similar treatment area.	C	The CSB liquid waste system is for the HVAC condensate. It is collected for transfer to a waste processing area. (Ref: HNF-3553, Section A2.8.6).
0275-99.0.1	190.	Provisions shall be made for the continuous monitoring and recording of radioactivity, flow volume, pH, and other parameters required for material control and proper waste treatment operations while each volume of waste is being received by the plant.	C	The transfer of liquid waste from the CSB to the treatment plant is by batch (nominally 55 gal). Sampling of the batches will be performed before shipping to the treatment plant. (Ref: HNF-3553, Section A2.8.6).
0275-99.0.1	191.	The radioactivity monitor shall have an alarm that annunciates locally as well as in an occupied area where corrective action can be initiated.	C	Hand held radiation monitors will be used by the Radiation Control Tech. to check radiation levels of liquid collected in the sump and transferred into the 55-gal drum. (Ref: HNF-3553, Figure A2-43).
0275-99.0.2		Process Wastes		
0275-99.0.2	192.	Liquid process wastes containing radioactive or other hazardous material shall be collected and monitored near the source of generation before batch transfer through appropriate pipelines or tank transfer to a liquid waste treatment plant or area.	C	Liquid wastes are collected and sampled before transfer to a treatment plant. (Ref: HNF-3553, Section A2.8.6).
0275-99.0.2	193.	Waste storage tanks and transfer lines shall be designed and constructed so that any leakage shall be detected and contained before it reaches the environment.	C	Waste collection, storage or transfer is not by permanently installed tanks or pipes. Liquid condensate is collected in a sump and transferred to drums that are removed from the CSB. (Ref: HNF-3553, Section A2.8.6).

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0275-99.0.2	194.	Radiation, liquid level, or conductivity detectors shall be provided in collection systems.	NA	See response to # 192 and # 193 above.
0275-99.0.2	195.	Transfer lines shall have inspection and collection pits at practical intervals into which leakage can drain by gravity.	NA	See response to # 193 above.
0275-99.0.2	196.	Double-walled transfer pipelines or multi-pipe encasements shall be used for high-level radioactive liquid wastes and other equally hazardous nonradioactive liquid wastes as defined by safety analysis.	NA	CSB doesn't handle high-level radioactive or other equally hazardous non-radioactive liquid wastes.
0275-99.0.2	197.	Provisions shall be made for the collection, transfer, and disposal of infiltration into the annulus of double-walled pipelines and for the collection, transfer, and storage (as appropriate) of leakage from the pipe of double-walled transfer pipelines.	NA	CSB doesn't use double-encased piping.
0275-99.0.2	198.	Nuclear criticality safety shall be considered in the design of liquid radioactive waste processing systems.	NA	CSB doesn't have a liquid radioactive waste processing system.

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0301		General Requirements		
0301-1		Buildings and Other Structures		
0301-1	199.	Concrete materials, design, and construction for buildings and other structures shall comply with ACI 318 and 40 CFR 249.	C	<p>CSB concrete materials, design, and construction is compliant with ACI 318 & ACI 349. See Design Basis Document, Section 10.2.15. (Ref: CSB Specification Sections 03300, <i>Cast In Place Concrete</i>, and 03346, <i>Ready Mixed Concrete Production and Delivery</i>).</p> <p>Note: 40 CFR 249, a document that gives guidelines for purchasing of cement and concrete containing fly ash, no longer exists. The concrete used for the CSB contained no fly ash.</p>
0320		Concrete Reinforcement		
0320-1		Materials for Reinforcement		
0320-1	200.	Reinforcement materials for buildings and other structures shall comply with ACI 318; for highway structures, with the AASHTO HB-13; for railway structures, with the AREA Manual for Railway Engineering (Fixed Properties); for special facilities, with ACI 349 (see Section 0111-99.0, Non-reactor Nuclear Facilities - General).	C	<p>Reinforcement materials are in compliance with ACI 318 & ACI 349. See Design Basis Document, Section 10.2.15. (Ref: CSB Specification Section 03200, <i>Concrete Reinforcement</i>).</p> <p>There are no highway structures or railway structures provided by the CSB project.</p>
0320-2		Detailing of Reinforcement		

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0320-2	201.	Reinforcement details shall comply with ACI 352R and ACI SP-66 in addition to ACI 318 for buildings and other structures, the AASHTO HB-13 for highway structures, the AREA Manual for Railway Engineering (Fixed Properties) for railway structures.	C	Reinforcement details comply with ACI SP-66 in addition to ACI 318. There are no highway structures or railway structures provided by the CSB project. ACI 352R is <i>Recommendations for Design of Beam-Column Joints in Monolithic Reinforced Concrete Structures</i> ; there are no locations in CSB that fall under the classic definition of a "beam-column joint", so ACI 352R is NA.
0330		Cast-In-Place Concrete		
0330-2		Materials, Testing, and Quality Control		
0330-2	202.	Materials, testing, and quality control for cast-in-place concrete shall comply with ACI 318 for buildings and other structures, with the AASHTO HB-13 for highway structures, with the AREA Manual for Railway Engineering (Fixed Properties) for railway structures, and with ACI 349 (see Section 0111-99, Special Facilities) for special facilities.	C	Materials, testing, and quality control for CSB cast-in-place concrete comply with ACI 318 & ACI 349. There are no highway structures or railway structures provided by the CSB project. See Design Basis Document, Section 10.2.15.
0330-2	203.	Tolerances for formed concrete shall be as suggested in ACI 347.	C	CSB formed concrete tolerances were as suggested in ACI 347.
0330-3		Selecting Proportions for Concrete Mixes		
0330-3.1		Normal, Heavyweight, and Mass Concrete		

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0330-3.1	204.	The selection of proportions for concrete mixes for normal, heavyweight, and mass concrete shall comply with ACI 211.1.	C	CSB concrete mix proportions complied with ACI 211.1. (Ref: CSB Specification Sections 03300, <i>Cast In Place Concrete</i> , and 03346, <i>Ready Mixed Concrete Production and Delivery</i>). The results of tests required by the specification are available.
0330-4		Mixing, Transporting, and Placing		
0330-4	205.	The mixing, transporting, and placing of cast-in-place concrete shall comply with ACI 304.	C	Mixing, transporting, and placing of cast-in-place concrete for CSB complied with ACI 304. (Ref: CSB Specification Sections 03300, <i>Cast In Place Concrete</i> , and 03346, <i>Ready Mixed Concrete Production and Delivery</i>). The results of tests required by the specification are available.
0340		Precast Concrete		
0340-2		General		
0340-2	206.	In addition to the provisions of Section 0301, General Requirements, precast concrete shall comply with the PCI MNL-116. PCI MNL-120 and PTI Post-Tensioning Manual may also be used as guides for the design and construction of precast concrete structures.	NA	CSB utilized no pre-cast concrete.
0370		Repair and Restoration of Concrete Structures		
0370-2		General		

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0370-2	207.	Methods, procedures, and materials for the repair and restoration of concrete structures shall comply with guidelines ACI 503.4, ACI 546.1R, the AREA Manual for Railway Engineering (Fixed Properties) and the AASHTO Manual for Bridge Maintenance.	NA	No concrete restoration was performed as part of the CSB project.
0710		Waterproofing		
0710-1		General		
0710-1.4		Capillary Water Barriers		
0710-1.4	208.	Capillary water barriers such as sand, gravel, or crushed stone courses shall be provided beneath subslabs at slabs-at-grade and over waterproofed horizontal building elements to be covered with earth except where bentonite clay panels are used.	C	Sand, gravel, and crushed stone were all used as capillary water barriers for the CSB. Sand and gravel under outside sidewalk areas, crushed stone next to the sub-grade vault walls and under the basemat.
0710-1.5		Penetrations		
0710-1.5	209.	Penetrations below grade through slabs-at-grade and other horizontal building elements shall be limited to drains and structural elements.	C	There are no penetrations below grade except those designed to accommodate structural elements. Penetrations through the deck for storage tube embeds are designed as structural elements.
0727		Firestopping		
0727	210.	Firestopping shall comply with NFPA 101, Chapter 6.	C	Fire stopping design and construction are in compliance with NFPA 101, Chapter 6.

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0727	211.	Where Fire-rated assemblies (walls, floor-ceilings, roof-ceilings) are either partially or fully penetrated by pipes, ducts, conduits, or other such building elements, firestopping material shall be placed in and around the penetrations to maintain the fire resistance rating of the assembly.	C	The CSB design required Fire stopping to maintain the integrity of the firewall between the support area and the operating area. This wall is a 2-hour rated firewall.
0800		General		
0800-1		Doors		
0800-1.2		Fire Protection		
0800-1.2	212.	Fire doors, frames, and hardware shall be either tested and listed by UL or similar nationally accredited testing laboratories or approved by FM or similar national insurance organizations.	C	Doors, frames, and hardware in the firewall between the support building and the operating area are tested/listed by UL and/or FM.
0800-1.2	213.	Fire doors, frames, and hardware shall be installed with label attached in accordance with NFPA 80.	C	Installation of these items in the firewall between the support building and the operating area was with the compliant labels attached.
0910		Metal Support Systems		
0910-2		Ceiling Suspension Systems		

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Applicable Section	Item #	Criteria	Status	Implementation
0910-2	214.	<p>Suspended ceilings shall be earthquake resistant. They shall comply with:</p> <ul style="list-style-type: none"> • UBC Standard No. 47-18 • ICBO Report 4071 • ASTM C635 • ASTM C636 • ASTM E580 	C	<p>Suspended ceilings (only used in the support building) are resistant to the UBC earthquake. There are no suspended ceilings in the Operating Bldg.</p> <p>ASTM C635 is referenced in the CSB acoustical ceiling spec (09511); C635 references ASTM C636. These 2 ASTM's cover all aspects of design, procurement, lateral bracing, installation, etc. The CSB explicitly complies with these 2 ASTM references. Because these 2 ASTM references are adequate for all aspects of the support building ceiling system, the CSB implicitly complies with UBC Standard No. 47-18, ICBO Report 4071, and ASTM E580.</p>
0910-2	215.	Nonstructural suspended systems, including ceilings, electrical components, and equipment, shall be considered in terms of UCRL 15714, Section V.	NA	There are no non-structural suspended systems in the CSB. All CSB ceilings, electrical components, and equipment are "structural" in that everything is a minimum of General Service (UBC) seismic design.
1161		Enclosures		
1161-1		General Considerations		

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1161-1	216.	Enclosures as used here are physical barriers (e.g., cubicles, gloveboxes, fume hoods, conveyor tunnels) that, together with their ventilation and operating systems, prevent the release of radioactive or other hazardous material to the work space or the environment. Accordingly, their structural and confinement integrity shall be primary design considerations.	C	<p>Prevention of the release of radioactive materials that may be present in the CSB operations area is achieved through the uses of enclosures. There are no hazardous materials used in CSB operations, and therefore, no hazardous material enclosures are required.</p> <p>Confinement of radioactive contamination and structural integrity were primary design considerations for the MHM cask, the Sample Hood, the Weld Hoods, the Service Station Tent, and the six overpack storage tubes and plugs. (Ref: HNF-3553, Section A2.6.3)</p> <p>All of these enclosures are designed to contain (in the case of the overpack tubes), or to confine and direct (by using sweep air) any radioactive particles that may be present therein through local HEPA filters. The exhaust gases from these enclosures will be taken through the operating area HEPA filters before they leave the building through the HVAC stack. No particulate radionuclides are expected in the operating area during normal CSB operations.</p>
1161-1	217.	The enclosure system, including its internal and external support structures, shall be designed to withstand the effects of normal operating conditions and the environment.	C	The enclosures mentioned in # 216, above, were designed to withstand the effects of normal operating conditions and the environment in which they operate.
1161-1	218.	Also, DBAs such as fire, explosion, criticality, and natural phenomena shall be considered in the design of the enclosure.	C	All DBAs and NPH events (i.e., seismic, wind, rain, flooding, ashfall, etc.) were considered in the design of the enclosures. The DBAs do not impact primary design considerations of confinement and structural integrity in intended use.

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1161-1	219.	Enclosure stability during a seismic event shall be based on the seismic parameters described in Section 0111-99.0.4, Earthquakes.	C	The MHM cask remains stable during a DBE. (Ref: HNF-3553, Section 4.4). The other three enclosures do not require seismic stability to Safety Class or Safety Significant seismic acceleration requirements, but do meet appropriate UBC seismic stability requirements.
1161-1	220.	Where practical and without penetrating the enclosure, all equipment components not functionally required to operate directly in the presence of radioactive materials shall be located outside the enclosure.	C	This guidance was complied with. For example, the ventilation exhaust fans for the Service Station Tent are located outside of the enclosure. This is also true for the exhaust fan for the Sample and Weld Hoods.
1161-1	221.	All equipment that must be located within the enclosure shall be designed to allow for in place maintenance and/or replacement.	C	<p>This guidance is complied with. For example, the MCO process valve operator will be installed and removed within the Sample Hood. Both the Sample Hood and the Weld Hoods can be removed from service for maintenance of interior items.</p> <p>There is not a regular program of maintenance and replacement for the other three enclosure systems:</p> <p>The Service Station Tent and the overpack tubes have no items permanently installed inside.</p> <p>The MHM cask is designed for in-place maintenance.</p> <p>There is no equipment in the overpack storage tubes.</p>
1161-1	222.	The design and operation of support and protection systems, such as fire protection, shall not promote the failure of the enclosure system integrity or the loss of confinement.	C	There are no support and protection systems capable of causing impact upon the integrity of, or loss of confinement of the enclosures mentioned in item # 216, above. The enclosures are all located in the operating area, where there is no sprinkler system.

C -- compliant
NA -- Not applicable

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1161-2		Construction		
1161-2	223.	Noncombustible or fire-resistant materials shall be used for enclosures and, to the maximum extent practicable, for any required radiation shielding.	C	<p>Fire loadings associated with the enclosures are not significant. The overpack tube assemblies provide shielding using concrete and steel and don't contribute to fire loading.</p> <p>The MHM cask is shielded with Jabroc, a high density fire resistant wood product, and steel.</p> <p>The Service Station Tent provides no shielding function. The Service Station Tent is constructed of 18 oz/square yard laminated vinyl/nylon material complies with MIL-C-43006E-Type I and is fire resistant. Tent windows are of 20-mil clear, fire-retardant PVC.</p> <p>The open-bottomed Sample Hood provides no shielding function. It is constructed of stainless steel and includes Lexan viewing windows that were chosen over glass because of the relatively frequent handling and movement of the Sample Hood. Lexan is heat resistant and the amount of material is insignificant with regard to fire loading in the building.</p> <p>The two open-bottomed Weld Hoods are constructed of stainless steel covered with 18 oz. flame resistant laminated nylon/vinyl fabric. These hoods have no shielding function.</p> <p>Borated polyethylene is used for neutron shielding in the sample station design. It is enclosed within the steel stationary shielding next to the operator.</p>

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1161-2	224.	In no case shall the total combustible loading located in a fire area exceed the fire resistance rating of the structural envelope (see Section 0110-99.0.6, Fire Resistance). This shall be documented in a fire risk analysis.	C	The FHA reports the total combustible loads in the support building and the operating area. The FHA shows compliance with this requirement. The FHA shows that the total combustible loading does not exceed the fire resistance rating of the structural envelope. (Ref: HNF-SD-SNF-FHA-002, Rev. 2).
1161-2	225.	Enclosures (except open-face hoods) shall be designed with the objective of being leak-tight.	C	The 6 overpack tubes are designed to be leak tight. (Ref: HNF 3553, Section A2.5.1.1.2). None of the other enclosures listed in item #216, are required to be leak-tight and include ventilation systems.
1161-2	226.	Appropriately sized and located windows shall be part of the enclosure design to provide operators with visual access to the enclosure interior.	C	Appropriately sized viewing windows are provided in the mobile Service Station Tent and in the Sample Hood; a small window is optional in the Weld Hoods. (Ref: HNF 3553, Section A2.5.1.4 and Figure A2-42).
1161-2	227.	Viewing windows in enclosures shall be as small as practicable.	C	Viewing windows, where provided, are appropriately sized.
1161-2	228.	The windows shall be constructed of noncombustible or approved fire-resistant materials as specified in Section 0727, Firestopping.	C	Enclosure windows are of non-combustible or fire resistant materials where possible. See item # 223. No enclosure windows are relied upon as fire stopping features. The small amount of Lexan (polycarbonate) material in the Sample Hood is bounded by fire loading from other structures. (Ref: HNF-SD-SNF-FHA-002, Rev. 2).
1161-2	229.	Window design shall be such that it will enable replacement with minimum risk of releasing contamination to the working area.	C	Replacement of sampling/weld station hood or mobile service station tent windows can be performed without releasing contamination. Normally, there will be no contamination on those items.

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Applicable Section	Item #	Criteria	Status	Implementation
1161-2	230.	The selection of appropriate window material shall be based on specific process, combustible loading, and radiological safety considerations.	C	Window selection was based on the specific enclosure functions (See item # 216). There are no windows in the MHM cask or the overpack tube plugs. For the Weld Hoods and the Sample Hood, specific process requirements for durability and radiological safety led to the selection of fire resistant and heat resistant viewing windows which took precedence over combustible loading considerations that would suggest glass be used.
1161-2	231.	Glove ports shall be located to facilitate both operations and maintenance work inside the enclosure.	C	The Sample Hood is the only CSB enclosure provided with glove ports. The glove ports are located to facilitate work within the enclosure. (Ref: HNF-3553, Section A2.5.1.4).
1161-2	232.	They shall have flexible gloves attached to allow operating personnel access to all interior surfaces and equipment.	C	Access is provided for all operations required within the Sample Hood. The hood is removable and open on the bottom for maintenance and decontamination. The gloves can be removed from the hood.
1161-2	233.	They shall be designed to allow replacement of gloves without losing contamination control and with minimum exposure to the operator.	C	Because the sample hood is not closed on the bottom and is easily removable for bag-out and decontamination, gloves can be replaced without loss of contamination control and with minimal exposure to the operator. Sweep air inflow is sufficient to confine contamination to the hood in the event of a glove failure.
1161-2	234.	When gloves are not in place, a noncombustible shield or cover for each glove port shall be provided.	C	Gloveport shields or covers are provided by the sample hood design.

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Applicable Section	Item #	Criteria	Status	Implementation
1161-2	235.	To reduce migration of contamination, closure devices or permanent seals shall be provided on entrances and exits of piping, ducts, or conduits penetrating confinement barriers.	C	<p>The sealed enclosures are the plug closure device that seals the penetrations between the operations area and the interior of the 6 overpack tubes/plugs are sealed. The other enclosures are not designed to be leak tight and rely on air sweep to reduce migration of contamination.</p> <p>The penetrations between the Service Station Tent and the operating area are through the HEPA filters, or are small and subjected to negative pressure relative to the operating area.</p>
1161-2	236.	Such closures or seals shall have an integrity equal to or greater than the barrier itself.	C	See item # 235, above. The penetration seals for the overpack tube assemblies are valved or capped pipes welded to the plug body. Double o-rings and tight sealing valves form the barrier. The integrity of the overpack tube assembly sealing system is demonstrated through testing and surveillance.

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1161-2	237.	Where pertinent to safety, the enclosure designs shall consider the heat generation in the enclosure.	C	<p>There are no enclosures in the CSB design where heat generation is a safety concern.</p> <p>The overpack tubes are kept from over-heating by the convective cooling of the vault air flow.</p> <p>The MHM cask has been analyzed for heat buildup over extended periods with an MCO carried within. No active cooling is required to be provided during loss of power in order to maintain appropriate enclosure temperatures in the MHM cask. (Ref: HNF-3553, Section A3.4.2.5).</p> <p>Heat-up of the MCO and the Weld Hoods at the sampling/weld stations due to welding is minimal. A polyethylene glycol filled cooling system is used to cool MCOs for welding or sampling activities.</p>
1161-2	238.	Discrete work stations or process areas shall be separated from each other by a barrier designed to prevent the spread of fire based on safety analysis review.	C	<p>There are no instances of barriers within or between enclosures being required by safety analysis to prevent the spread of fire. (Ref: HNF-3553, Section A2.7.1).</p>
1161-2	239.	Generally, the fire barriers within and between enclosures will be normally closed. Where operations require that the fire barrier be in the open position, it shall automatically close upon activation of the fire detection system or by release of a fusible device.	NA	<p>There are no designated fire barriers required within or between the enclosures provided in the CSB design.</p>

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1161-2	240.	Design of the enclosure system shall allow automatic closure of the fire barrier without loss of confinement, without degradation of the enclosure system's integrity, and without injury to personnel.	NA	There are no designated fire barriers required within or between the enclosures provided in the CSB design.
1161-2	241.	The fire barrier shall be capable of being opened or closed manually from the exterior and interior of the enclosure.	NA	There are no designated fire barriers required within or between the enclosures provided in the CSB design.
1161-2	242.	Allowable open area around a fire barrier shall be minimized	NA	There are no designated fire barriers required within or between the enclosures provided in the CSB design.
1161-3		Fire Protection		
1161-3	243.	When an automatic fire suppression system is mandatory and protection against loss from fire originating within the enclosure system is required, a highly reliable, fast-acting system shall be provided.	NA	There are no automatic fire suppression systems required for fires originating within the enclosures.
1161-3	244.	Instead of such a system, an inert atmosphere can be used within the enclosure, provided its reliability is commensurate with an approved fire suppression system (e.g., dedicated gas supply, component quality, and redundancy where appropriate). The oxygen concentration shall be less than the minimum concentration that would allow ignition or combustion of the enclosure contents.	C	Helium (inert gas) is used in the overpack storage tubes and in conjunction with exhaust gasses from the Tube Vent and Purge Cart and the Sample Cart to keep accumulation of flammable hydrogen/oxygen mixtures below 25% of the LFL.
1161-3	245.	Where automatic systems are not required, fire detection shall be installed.	C	There are no combustibles inside the enclosures. Fire detection for the enclosures are provided by the building VESDA system.

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1161-3	246.	Provisions shall also be made for manual fire suppression where deemed necessary.	C	Hand held fire extinguishers are provided.
1161-3	247.	Fire detection systems shall be integrated with any central alarm location and any associated automatic fire suppression systems.	C	The VESDA system in the operating area and the fire detection system associated with the sprinkler system in the support area are integrated with the Hanford site central alarm station.
1161-4		Ventilation		
1161-4	248.	A ventilation system shall be installed on all enclosure systems to maintain minimum negative pressure differential of 0.3 in. of water inside the enclosure (except open-face hoods) with respect to the operating area.	C	<p>The MHM cask will be maintained at a minimum differential negative pressure of 0.3 in. of water with respect to the operating area whenever an MCO is contained therein.</p> <p>The mobile service station tent is designed to maintain a minimum negative pressure with respect to the operating area of 0.5 inches of water. Normal operations are expected to be at a minimum of 0.25 inches of water. (Ref: HNF-3553, Section A2.5.1.2).</p> <p>The Sample Hood and the Weld Hoods are functionally "open-face" hoods, that rely on air-sweep to reduce migration of contamination.</p> <p>Note: The six overpack storage assemblies are maintained at about 5 psig positive pressure for the inert gas function required by NFPA 69.</p>
1161-4	249.	Open-face hoods shall be ventilated such that flow from the operating area into the hood is maintained.	C	The Sample Hood and Weld Hoods maintain inward airflow from the operating area to capture contamination that could otherwise escape to the operating area.

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1161-4	250.	Safety class items of the ventilation system shall be supplied with emergency power.	NA	There are no Safety Class ventilation systems items associated with the enclosures; therefore, no emergency power is required.
1161-4	251.	Failure of any single component or control function shall not compromise minimum adequate ventilation.	C	<p>Minimum adequate ventilation for the MHM cask (for cooling) has been determined to be nearly zero. Tramp radionuclide contamination is not expected on the MCOs.</p> <p>The 6 overpack storage tubes/plugs are pressurized to maintain inert atmosphere.</p> <p>Minimum adequate ventilation is not compromised by failure of any single active component of the Service Station Tent. The Tent has two fans, if one fails, the other starts.</p> <p>The Weld Hoods and the MHM can perform their functions without significant ventilation. So, there is not a minimum adequate ventilation value for those items.</p> <p>The Sample Hood has a TSR that prohibits operation unless ventilation is established. The MCO process valve operator is sealed to the MCO under the Sample Hood and tested. (Ref: HNF-3553, Section A3.4.2.4.5).</p> <p>In the case of the enclosure items, no contamination event of safety class or safety significant consequence would occur upon complete loss of ventilation airflow. (Ref: HNF-3553, Section A3.4.2.4.5)</p>

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1161-4	252.	HEPA filters shall be provided at the interface of the enclosure outlet and the ventilation system to minimize the contamination of ductwork and at the enclosure inlet to prevent movement of contamination within the enclosure to the operating area in the event of a flow reversal.	C	<p>The tent enclosure and the Sample Hood are equipped with local HEPA filters. The tent has a backdraft damper at the enclosure inlet to prevent flow reversal.</p> <p>The exhaust air from the Sample Hood and Weld Hoods is filtered through a HEPA filter located at the inlet to the exhaust fan, AH-006. Discharge from AH-006 is to the main HVAC HEPA filter plenum. (Ref: HNF-3553, Section A2.6.3)</p>
1161-4	253.	The system shall be designed to automatically ensure adequate inflow of air through a credible breach in the enclosure system.	C	<p>The Sample and Weld Hoods are open-face.</p> <p>The tent enclosure is designed to maintain adequate inward airflow from the operating area in the event of a credible breach. If the exhaust fans shut down causing loss of negative pressure, the cask lid is manually reinstalled, providing secondary confinement of the SNF. The MHM cask doesn't have minimum airflow requirements.</p> <p>The six overpack tubes are pressurized when used.</p> <p>No safety class or safety significant event would occur upon complete loss of ventilation into any of the enclosures listed in item # 216, above.</p>

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1161-4	254.	Minimum inward air velocity shall be 125 plus or minus 25 linear ft/min or as determined from guidance provided in the ACGIH Industrial Ventilation Manual.	C	<p>Nominal inward air velocity design for the MHM cask ventilation system operation is 200 fpm. However, there is no safety requirement for MHM cask ventilation.</p> <p>The service station tent does not rely on inward air velocity, but operates at a slight negative pressure relative to the operating area (-0.25 psi).</p> <p>The Sample Hood is designed to maintain inward airflow velocity of 125 fpm. (Ref: HNF-3553, Section A4.4.9.4)</p> <p>Weld Hoods are provided with 125 fpm capability; however, air velocity at the weld face may be required to be lower to maintain quality control of the weld.</p>
1161-4	255.	The design of the enclosure ventilation flow pattern shall minimize the spread of fire, and fire screens shall be provided where necessary.	C	<p>The design of enclosure ventilation flow patterns for the MHM cask, the Service Station Tent, the Sample Hood, and the Weld Hoods minimizes potential fire spread. Fire screens (ember shields) were not necessary. (Ref: HNF-SD-SNF-FHA-002).</p>

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1161-4	256.	For enclosures where over pressurization is possible, a system shall be provided to ensure that confinement is not breached.	C	<p>Of the enclosure systems (See item # 216, above), the 6 overpack storage tubes/plugs and the Sample Hood could possibly be over pressurized.</p> <p>The overpack storage tubes are protected against breach of confinement by the lock-down feature of the overpack plugs and seals. Normal in-tube pressure is about 5 psig. The plug seals will keep any contamination sealed inside the tubes up to a pressure of at least 75 psig. This pressure is greater than could be generated by the off-normal MCO contained in the tube. The Tube Vent & Purge Cart is equipped with over-pressure protection that will ensure that purging of the tube with helium doesn't result in loss of plug/seal integrity. (Ref: HNF-3553, Section A2.6.3).</p>
1161-4	257.	Small enclosure systems with positive-pressure supplied gases shall have positive-acting, pressure-relief devices (connected into the exhaust system) to prevent pressurization of the enclosure.	C	The Weld Hood, and the Sample Hood will be used with positive pressure gases present. Pressure limiting and relief devices have been provided. Under normal operations, these hoods will not become over-pressurized because they are open-bottomed. (Ref: HNF-3553, Section A3.4.2.4)
1161-4	258.	Hood faces shall not be located within 10 ft. of the closest air supply or exhaust point. Hoods shall not be located in or along normal traffic routes.	C	Building HVAC inlet and exhaust points are distant (much farther than 10 ft.) from the Sample and Weld Hoods. The only nearby traffic is associated with Sampling Station and/or Weld Station operations.
1161-4	259.	An open-faced hood shall be designed and located to provide a minimum air velocity of 125 plus or minus 25 linear ft/min over the hood face area.	C	The open-bottomed Sample Hood and Weld Hoods are provided with 125 fpm capability; however, air velocity at the weld face may be required to be lower to maintain quality control of the weld.

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1161-4	260.	All open-face hoods shall be designed to provide appropriate face velocity to ensure capture of contaminants in the hood exhaust (see the ACGIH Industrial Ventilation Manual).	C	<p>The open-bottom Sample Hood is provided with adequate and appropriate face velocity to capture any contaminants that may be present when the MCO coverplate is removed for installation of the MCO process valve operator. This velocity is at least 125 fpm at the openings.</p> <p>The Weld Hood is designed to capture contaminants in the hood exhaust, but not by virtue of high velocity at the weld face. See answers to items # 254 and # 259, above.</p>

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1300		General Requirements		
1300-1		Coverage and Objectives		
1300-1.4		Guidance on Limiting Exposure of the Public		
1300-1.4.1		General		
1300-1.4.1	261.	The confinement of hazardous materials produced, processed, or stored in special facilities shall be designed to minimize dose to a maximally exposed member of the public.	C	CSB confinement systems are designed to minimize the release of material to the environment. This was implemented by the MCO's robust design and many safety features of the material handling system including the MHM, the storage tubes and impact absorbers that prevent damage to MCO confinement and the CSB secondary confinement system. (Ref: HNF-3553 Chapter A2.0)
1300-1.4.2		Accidental Releases		

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1300-1.4.2	262.	Releases of hazardous materials postulated to occur as a result of DBAs shall be limited by designing facilities such that at least one confinement system remains fully functional following any credible DBA (i.e., unfiltered/unmitigated releases of hazardous levels of such materials shall not be allowed following such accidents).	C	DBAs whose consequences result in unmitigated releases of materials have been considered by the design of SSCs, which are required to remain functional during the DBA. The primary confinement system for spent nuclear fuel is the multi-canister overpack (MCO). The MCO arrives at the CSB from the CVDF with mechanical seals on the top of the MCO. At the CSB sampling/weld station a seal cover cap will be welded on the MCO. With the MCO sealed shut, no mechanism is available for the release of any significant gas or particulate. After the MCO is placed in a storage tube, the storage tube becomes a secondary barrier to any release. During sampling, the sampling system provides for secondary confinement of hazardous material. The MHM also provides for secondary confinement when transporting an MCO. The building provides additional confinement during all credible DBAs. (Ref: HNF-3553, Section A2.6)
1300-1.4.2	263.	Facility design shall provide attenuation features for postulated accidents (up to and including DBAs) that preclude offsite releases that would cause doses in excess of the DOE 5400 series limits for public exposure.	C	<p>The primary attenuation feature for postulated accidents is the MCO, which has been designed to be a safety class pressure vessel for the SNF (Ref: HNF-SD-SNF-SARR-005).</p> <p>HEPA filters are provided to filter out radioactive particulate that may be released from the MCO during DBAs associated with receiving, staging, moving or sampling/weld operations. The building's HVAC HEPA filters are a defense in depth feature. (Ref: HNF-3553, Section A2.6)</p> <p>W-379-C-CSB-13098, Rev. 4, Canister Impact Absorbers W-379-C-CSB-15896, Rev. 1, HEPA Filters (mechanical)</p>
1300-1.4.3		Routine Releases		

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Applicable Section	Item #	Criteria	Status	Implementation
1300-1.4.3	264.	The annual dose resulting from postulated, planned, or expected releases from the proposed facility shall be considered in combination with the annual doses resulting from planned or expected releases from other facilities at the same site.	C	Annual dose resulting from postulated, planned or expected releases are considered in the notice of construction or the Notice of Construction (Ref: DOE/RL-98-30). Annual doses from nearby facilities at the same site are negligible.
1300-1.4.3	265.	The sum of the doses from the site shall be limited according to DOE Radiation Standards of Protection of the Public in the Vicinity of DOE Facilities or subsequent guidance included in the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.	C	Each facility on the Hanford Site limits it's potential dose to a fraction of the site's risk acceptance guidelines. The large distances between the nearest facilities assures that the combined doses are within the onsite and offsite risk acceptance guidelines. The dose contribution from widely separated facilities to the total dose at the site boundary is minimal as demonstrated in HNF-2751, <i>Beyond Design Basis Earthquake Dose Calculations for Solid Waste Facilities MSAR</i> .
1300-1.4.4		Monitoring of Releases		
1300-1.4.4	266.	Releases shall be monitored in accordance with the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series.	C	Appropriate health protection monitoring devices for the facility are included in the design. These include hand and foot monitors, area radiation monitors, continuous air monitors for alpha & beta, radioactive gas monitors, record air samplers, and continuous airborne effluent monitors. (Ref: HNF-3553, Section A2.7.3) DOE/RL-98-30; 40 CFR 52, Appendix E; 40 CFR 60, Appendix A; 40 CFR 61, Subpart H; WAC 246-247; DOE Order 5400.1; H-2-121101 sheets 1 through 6
1300-2		Safety Analysis		

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Applicable Section	Item #	Criteria	Status	Implementation
1300-2	267.	Safety Analysis shall comply with DOE 5481.1B. See also Section 0110-5.2, Safety Analysis.	C	The CSB FSAR (Ref: HNF-3553, Section A3.0) identifies and evaluates hazards associated with the CSB and discusses controls for limiting releases. These controls assure protection of the environment, and the safety and health of onsite and offsite personnel from potential hazards within the CSB. The CSB FSAR complies with the requirements of DOE Order 5480.23 using the guidance provided by DOE-STD-3009. DOE Order 5480.23 superceded DOE Order 5481.1B in April 1992.
1300-3		Safety Class Criteria		
1300-3.2		Safety Class Items		
1300-3.2		Safety class items are systems, components, and structures, including portions of process systems, whose failure could adversely affect the environment or the safety and health of the public. Specifically, safety class items are those systems, components, and structures with the following characteristics:	C	See items 268-273.

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1300-3.2	268.	<ul style="list-style-type: none"> Those whose failure would produce exposure consequences that would exceed the guidelines in Section 1300-1.4, Guidance on Limiting Exposure of the Public, at the site boundary or nearest point of public access 	C	<p>The MCO is the primary confinement barrier preventing release of fuel particulates to the environment. The MCO is a safety class component. To minimize the consequence of an MCO breach, the CSB vault is Safety Class and designed for all credible NPH events. (Ref: HNF-3553, Section A4.3).</p> <p>The seismic restraints and associated interlocks on the MCO Handling Machine (MHM) are classified as safety class to protect an MCO that is partially inserted in a storage tube during a seismic event. The safety function of the MHM seismic restraints and interlocks is to ensure that the MHM cannot move enough to shear an MCO that is partially lowered into a storage tube.</p> <p>A drop of the MCO that could cause a breach has been determined to be incredible. MHM interlocks and associated sensors that prevent turret rotation and possible shear of an MCO while the MCO is being lowered from or raised into the turret cask are also classified as safety class.</p> <p>The vault inlet and exhaust stacks are designated as safety class because they provide passive air-cooling that removes heat from the MCOs. The vault inlet and exhaust stack safety function is to provide cooling to limit temperatures below design limits both in the MCO and in the concrete deck.</p> <p>HNF-S-0426, <u>Performance Specification for the SNF MCO</u></p> <p>HNF-S-0468, <u>CSB Integrated MCO Handling Machine Specifications</u></p> <p>HNF-3553, Safety class and safety significant equipment are listed in Chapter A4.</p>

C -- compliant
NA -- Not applicable

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1300-3.2	269.	<ul style="list-style-type: none"> Those required to maintain operating parameters within the safety limits specified in the OSRs during normal operations and anticipated operational occurrences 	C	The safety class below grade structure, the operating deck and the above grade structures (operating shelter and support building) have been designed to maintain the operating parameters within the safety limits.
1300-3.2	270.	<ul style="list-style-type: none"> Those required for nuclear criticality safety 	C	<p>The MCO is designated safety class primarily because it keeps spent nuclear fuel in a geometrically safe array with respect to criticality. (Ref: HNF-3553, Section A3.4.2.1)</p> <p>To prevent MCO shear by the lateral translation of the MHM while the MCO is being lowered, MHM seismic restraints, position indication sensors, and associated interlocks are designated as safety class. (Ref: HNF-3553, Section A4.3)</p> <p>The storage tubes primary functions are to safely contain and structurally protect the MCO during storage and to maintain spacing of the MCOs for criticality control and heat removal. The storage tubes structural attributes are classified Safety Class to fulfill the function of protecting the MCO from damage. (Ref: HNF-3553, Section A4.3)</p> <p>(Ref: HNF-PRO-704)</p>
1300-3.2	271.	<ul style="list-style-type: none"> Those required to monitor the release of radioactive materials to the environment during and after a DBA 	NA	No safety class monitors are required (Ref: HNF 3553, Section A2.7.4).

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1300-3.2	272.	<ul style="list-style-type: none">Those required to achieve and maintain the facility in a safe shutdown condition	C	The CSB facility and equipment, and the MHM specifically, are designed to maintain a safe configuration during loss of power. (Ref: HNF-3553, Section A3.4.2.7.2 and A4.3.14).

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1300-3.2	273.	<ul style="list-style-type: none"> Those that control the safety class items described above 	C	<p>A drop of the MCO from the MHM has been determined to be incredible, however, the storage tube bottom impact absorbers are classified as safety class to provide defense-in-depth. The impact absorbers at the bottom of the weld sample pit, and the impact absorbers at the bottom of the service station pit are also classified as safety class (See HNF-3553, Table A4-1). The safety function of the impact absorbers is to limit the deceleration and associated force applied to the MCO during the drop accident.</p> <p>MHM interlocks and the associated sensors that prevent turret rotation and possible shear of an MCO while the MCO is being lowered from or raised into the turret cask are classified a safety class.</p> <p>The seismic restraints and associated interlocks on the MHM are classified as safety class to protect an MCO that is partially inserted in a storage tube during a seismic event.</p> <p>The vault inlet and exhaust stacks are designated as safety class because they provide passive air-cooling that removes heat from the stored MCOs. The safety function of air-cooling is to limit temperatures below safety design criteria both in the MCO and the concrete deck.</p> <p>The inert gas system pressure safety valves at the sampling/weld station are classified as safety class because they prevent over pressurization of the MCO (See HNF-3553, Table A4-1).</p> <p>There is a specific TSR control for a quality assurance verification of helium gas purity prior to hookup and use in the inert gas system at the sampling/weld station (See HNF-3553, Section A3.4.2.3).</p>

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Criteria	Status	Implementation
1300-3.2	274.	Safety class and nonsafety class items shall comply with Section 0140, Quality Assurance.	C	<p>A QA program for SNF facilities is in place. The SNF QA Program contains the basic elements of Section 0140. The QA program is documented in a set of plans and procedures. (Ref: AP2-014).</p> <p>The CSB QA program provides confidence that the structures, systems, components and systems of the CSB will meet the predetermined requirements. The QA program includes a system for configuration control, quality control and design control for the facility features, equipment, systems and components. (Ref: HNF-3553, Chapter A14.0).</p>
1300-3.2	275.	In addition, their failure shall not prevent safety class items from performing their required functions.	C	<p>The interaction effects of non-safety class items with safety class items have been addressed in the CSB FSAR, and special considerations have been imposed, primarily 3/1 seismic criteria. (Ref: HNF-3553, Section A4.4.1)</p> <p>HNF-PRO-704</p>
1300-3.3		Single Failure Criterion and Redundancy		
1300-3.3	276.	The design shall ensure that a single failure does not result in the loss of capability of a safety class system to accomplish its required safety functions.	C	<p>Safety-Class systems have been designed and analyzed to ensure that a single failure does not result in loss of capability to accomplish its safety function (Ref: HNF-3553, Chapter A4.0 and HNF-SD-HIE 001).</p>

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1300-3.3	277.	To protect against single failures, the design shall include appropriate redundancy and shall consider diversity to minimize the possibility of concurrent common-mode failures of redundant items.	C	Systems in the CSB provide redundant components when required to protect against concurrent common-mode failure. For example, the MHM control system includes redundant components providing protection and minimizing the potential that a single failure will compromise the safe transport and movement of MCOs. (Ref: HNF-3553, Chapter A4.0).
1300-3.4		Equipment Environment Considerations		
1300-3.4.2		Environmental Qualification of Equipment		
1300-3.4.2	278.	Equipment qualification shall provide assurance that safety class items will be capable of performing required safety functions under DBA conditions.	C	Equipment specifications identify the environmental conditions that will be present in the CSB under DBA conditions. There are no unusual environmental conditions anticipated during any credible DBA.
1300-3.4.2	279.	The qualification shall demonstrate that the equipment can at least perform for the period of time that its safety functions are required.	C	See item #278.
1300-3.5		Maintenance		
1300-3.5	280.	Safety class items shall be designed to allow inspection, maintenance, and testing to ensure their continued functioning, readiness for operation, and accuracy.	C	The designs of safety-class systems provide for inspection, testing and maintenance (e.g., the MHM interlocks, seismic restraints, the helium supply system pressure safety valves, and the receiving crane positioning/interlock system). Some SC systems are passive (e.g., the transportation cask). Design features require no special TSRs to ensure performance of their safety function. (Ref: HNF-3553, Section A4.3.13).

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1300-3.5	281.	The design of equipment that must be located within confinement systems shall allow for in-place maintenance or replacement.	C	The only individual equipment components located within a confinement system are the hoists, cables, and drums in the MHM cask. The MHM maintenance pit is designed to facilitate in-place maintenance and repair of these items.
1300-3.5	282.	The capability shall be provided for the maintenance of contaminated equipment that cannot be repaired in place.	C	Potential for contaminated SC equipment in the CSB is minimal. The low levels of contamination and the design philosophy of process HEPA filters and the internal HEPA filters in the MCOs serve to reduce the likelihood of contaminated equipment. Equipment will be decontaminated before repairs are made. (Ref: HNF-3553, Section A16.3.2)
1300-3.5	283.	This capability shall include the necessary provisions for confinement, ventilation, and waste control.	C	Provisions for confinement, ventilation, and waste control during in-place maintenance are developed on a case-by-case basis if needed. A maintenance pit for the MHM is provided. No other special design features are required.
1300-3.5	284.	The design of all process equipment shall include features to minimize self-contamination of the equipment piping, and confinement areas.	C	The CSB is not a processing facility. However, equipment that is exposed to the MCO contents is designed to minimize self-contamination. For example, the Sampling/Weld Station equipment and the Tube Vent and Purge Cart piping is cleaned of contaminants by their helium flow back towards the MCO or overpack tubes. (Ref: HNF-3553, Section A2. 5.1.4)
1300-3.5	285.	The design of process equipment shall also include features to minimize the spread of contamination out of local areas.	C	See #284. The sampling/weld station is provided with a hood ventilated through a HEPA filter and a ventilation exhaust system to minimize potential spread of contamination. (Ref: HNF-3553, Section A2.6.3)
1300-3.6		Testing		

C -- compliant
NA -- Not applicable

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1300-3.6	286.	The design shall include provisions for periodic testing of monitoring, surveillance, and alarm systems.	C	The design includes provisions for testing of monitoring, surveillance, and alarm systems. (Ref: HNF-3553, Section A2.7.4.) These requirements are discussed in the System Design Description document (FDT-138) which describes the testing, surveillance, and maintenance requirements for safety-class equipment and systems.
1300-3.6	287.	In addition, the design shall provide the capability to test periodically, under simulated emergency conditions, safety class items that are required to function under emergency conditions.	NA	Safety class SSCs in the CSB are designed to fail safe. The Seismic Detection and MHM Power Disconnect System which puts the MHM in safe shutdown by disconnecting power has been seismically qualified. (Ref: HNF-3553, Section A4.3.14.) Simulation of upset conditions is not feasible.
1300-3.6	288.	All systems for which credit is taken to meet the criteria of Section 1300-1.4.2, Accidental Releases, shall be in-place testable in terms of pressure, filtration or removal efficiency, alarm capability, leak resistance, and the like.	C	The CSB HVAC HEPA filters are in-place testable and are provided with test provisions in accordance with ASME N 510.
1300-3.6	289.	Safety class items shall be designed to be testable on a regular schedule.	C	The performance of the safety function of Safety Class items is ensured through testing on a periodic schedule. This testing is specified according to TSRs identified in applicable SSCs (see HNF-3553, A4.3.x.5) and further described in HNF 3553, Chapter A5.0 and HNF-3672. The design (i.e., location, access, installation, etc.) of SC SSCs in the CSB does not preclude testing on a periodic schedule.
1300-3.6	290.	The facility design shall allow for routine in-place testing of HEPA filtration systems as outlined by ASME N510.	C	The CSB has no safety-class HEPA filtration systems. The safety significant HEPA filters are in-place testable with test provisions as outlined in ASME N510.

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1300-4		Nuclear Criticality Safety		
1300-4	291.	A criticality monitoring and alarm system (gamma and/or neutron) shall be provided where necessary to meet the requirements of DOE Order 5480.5 and ANS 8.3.	C	There is no need for installation of criticality instrumentation in the CSB. All situations analyzed in Section 5.4 of HNF-SD-SNF-CSER-005, <i>Criticality Safety Evaluation Report for Spent Nuclear Fuel Processing and Storage Facilities</i> , Rev. 3, show that k_{eff} is less than the criticality safety limit, even for the double contingency accidents analyzed. (Ref: HNF-3553, Chapter A6.0). This exclusion of criticality instrumentation is provided for by ANSI/ANS-8.3-1997 and DOE Order 5480.24.
1300-4	292.	When such potential for nuclear criticality exists, the design of nuclear criticality control provisions, including equipment and procedures, shall meet, as a minimum, the requirements of DOE Order 5480.5 and the ANS 8 series on Nuclear Criticality Safety.	NA	The MCO and storage tube design precludes criticality in the CSB. See #291.
1300-4	293.	The design shall ensure that material shall not be displaced or allowed to accumulate to form a critical mass in the event of an internal or external accident.	C	All situations analyzed in Section 5.4 of HNF-SD-SNF-CSER-005, <i>Criticality Safety Evaluation Report for Spent Nuclear Fuel Processing and Storage Facilities</i> , Rev. 3, show that k_{eff} is less than the criticality safety limit, even for the double contingency accidents analyzed. (Ref: HNF-3553, Chapter A6.0). The design of the transportation cask, the MHM interlocks, and the storage tubes are all designated safety-class due to ensuring the MCO's geometric criticality control features are not damaged.

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1300-4	294.	The design shall emphasize geometrically favorable compartments or spacing to minimize reliance on administrative control, and shall prevent the unsafe accumulation of moderator or reflection materials (e.g., water from a fire sprinkler system).	C	The design of the MCO and the storage tubes preclude criticality in the CSB. Water is not allowed in the operations area and any water from fire protection sprinkler system operation in the support area is prevented from entering the operations area.(Ref: HNF-3553, Section A2.7.1)
1300-4	295.	Also, heating or cooling jackets in the safe dimension of geometrically safe vessels shall preclude a leak in the jacket that causes an increase in the system's reactivity.	NA	There are no heating or cooling jackets in the CSB that can increase the reactivity of the MCO.
1300-4	296.	Process designs shall incorporate sufficient factors of safety so that at least two unlikely and independent concurrent changes must occur in process conditions before a criticality accident is possible.	C	All situations analyzed in Section 5.4 of HNF-SD-SNF-CSER-005, <i>Criticality Safety Evaluation Report for Spent Nuclear Fuel Processing and Storage Facilities</i> , Rev. 3, show that k_{eff} is less than the criticality safety limit, even for the double contingency accidents analyzed.
1300-4	297.	Structures, systems, and components that provide nuclear criticality safety shall be designed as safety class systems and be capable of performing their criticality safety functions during and following design basis accidents and events.	C	The design of the MHM interlocks and the storage tubes are all designated safety-class due to ensuring the MCO's geometric criticality control features are not damaged in the event of a DBA.
1300-4	298.	Nuclear criticality safety shall be controlled, in decreasing priority, by geometric spacing, density and/or mass limitation, fixed neutron absorber, soluble neutron absorber, and administrative controls.	C	Nuclear criticality safety is controlled by the design of the MCO, geometric spacing of the MCO storage positions in the CSB vault, integrity of the MCO internals, and mass limitation on the SNF stored in the MCO. (Ref: HNF-SD-SNF-CSER-005).

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1300-4	299.	The design of the facility shall emphasize engineered safeguards and shall not rely strictly on administrative controls.	C	The design of the MCO and the storage tubes preclude criticality in the CSB. The CSB does not rely on administrative controls to prevent criticality.
1300-4	300.	Process systems shall be designed to prevent the carryover of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas.	C	The only potential for transfer of fissile material out of the MCO at CSB is during sampling of the 6 validation MCOs. A filter internal to the MCO located under process valve #2 would have to fail completely before significant fissile material could escape. There is also a HEPA filter on the sample line from the MCO. (Ref: HNF-3553, Section A2.5.1.4) HNF-SD-SNF-CSER-005, <i>Criticality Safety Evaluation Report for Spent Nuclear Fuel Processing and Storage Facilities</i> .
1300-4	301.	A system of positive control and backflow prevention, such as air gaps (siphon breakers) shall be used to prevent inadvertent transfer of fissile material and other material capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers.	C	There is no liquid fissile material in the CSB and no opportunity for transfer of fissile material via backflow. Expelling SNF particulates while obtaining an MCO gas sample is the only place where fissile material could escape. The smallest pieces of SNF are 1/4" thick and only dust would be potentially released during sampling operations. The hazard analysis for the sampling/weld station shows that the particulate release due to shearing of sample lines, for example, would not release enough fissile material to result in the loss of criticality control (HNF-3553, Chapter A3.4.2.2)
1300-4	302.	Locations where a potential critical mass could occur in the event of accidental flooding by water from fire protection systems shall be protected by geometrically favorable curbed areas or collection systems.	C	The design of the MCO and the storage tubes preclude criticality in the CSB. Water is not allowed in the operations area and any water from fire protection sprinkler system operation in the support area is prevented from entering the operations area. (Ref: HNF-3553, Section A2.7.1)

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1300-4	303.	Where frequency estimates for a specific operation at a specific location shows the frequency of a criticality accident to exceed 10^{-6} per year, the combination of shield design and facility layout shall minimize radiation doses to adjacent work stations and exit routes.	NA	There is no credible (frequency $< 10^{-6}$ /year) criticality event at the CSB (Ref: HNF-SD-SNF-CSER-005).
1300-4	304.	Egress routes shall be provided that take into account the locations where postulated criticality accidents would normally be expected to occur.	NA	There are no postulated criticality accidents at the CSB. (Ref: HNF-SD-SNF-CSER-005)
1300-4	305.	All barriers along egress routes shall be designed to allow crash exiting of evacuating personnel (i.e., operator safety should take priority over security concerns).	NA	Although there are no postulated criticality accidents at the CSB, crash exiting hardware is provided on personnel exits to comply with NFPA requirements. (Ref: HNF-3553, Section A2.4.4.2)
1300-5		Source and Special Nuclear Material		
1300-5	306.	In-process source or SNM shall be stored in storage containers to be approved by facility management, and simple physical barriers shall be used to segregate materials and provide a level of confinement and safety consistent with the hazard of the material.	C	There is no in-process source of special nuclear material (SNM) in CSB. SNF arrives at CSB in a mechanically sealed transport cask. Inside the CSB the cask is off loaded from the transport truck into a cask pit. Transport of an MCO from the transportation cask to the sampling/weld area or to a vault storage tube is done via the MHM.
1300-6		Radiation Protection		
1300-6.1		General		

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1300-6.1	307.	Primary radiation protection shall be provided by the use of engineered controls (e.g., confinement, ventilation, remote handling, equipment layout and shielding); secondary radiation protection shall be provided by administrative control.	C	<p>Shielding and remote handling of the MCO are the primary design features in the CSB to provide radiation protection. For example, the MHM is fully shielded and has its own ventilation system equipped with a testable HEPA filtered exhaust, providing a net flow of air into the cask/turret interior. The tube plugs and the concrete floor provide radiation shielding for MCOs stored in the storage tubes. The shield hatch assembly at the MCO service station and the removable shielding for the sampling/weld stations provides shielding during MCO transfer operations between the station and the MHM.</p> <p>A retractable shield skirt is attached to the MHM that can be lowered down to the operating deck against the concrete surface. The skirt provides continuous shielding whenever an MCO is transferred in or out of the MHM. A sampling/weld station is located at the south end of the CSB operating area. Exhaust enclosure hoods are provided for confinement around the top of the MCO during sampling and welding. The function of the enclosure is to capture any potential airborne contamination. During sampling operations, exhaust from the sampling hood passes through a testable HEPA filter and into the exhaust system for the CSB operating area upstream of the building exhaust testable HEPA filters.</p> <p>The CSB does not rely on administrative controls for radiation protection.</p>
1300-6.2		Shielding Design		

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1300-6.2	308.	Concrete radiation shielding design shall comply with ANS 6.4 and ACI 349 and shall consider the material specifications of ANS 6.4.2 where it provides a critical confinement or structural function. For other shields, ACI 318 is appropriate and provides adequate strength for DBE loads.	C	The Radiation Protection and Shielding Section of the <i>Spent Nuclear Fuel Canister Storage Building, Detailed Design, Design Basis Document</i> (Section 12) covers the shielding design bases for the SNF CSB. In particular, criteria and standards are listed in Section 12.2. The design criteria includes ANS 6.4, ACI 349, ANS 6.4.2 and ACI 318 design requirements.
1300-6.2	309.	Straight-line penetration of shield walls shall be avoided to prevent radiation streaming.	C	Shielding walls in the CSB do not contain straight-line penetrations. Primary shielding walls are the operations area floor (over the vault) and the storage tube plugs. The sealing sides of the plugs are angled. The vent from the tube to the CSB operating area contains no straight-line paths. There are no straight-line paths for cooling air inlet or outlet to and from the vault. (Ref: HNF-3553, Section A2.4)
1300-6.2	310.	The shielding design basis shall be to limit the maximum exposure to an individual worker to one-fifth of the annual occupational external exposure limits specified in DOE 5480-11.	C	To achieve the normal occupational limit (a dose not to exceed an annual exposure of 1 rem) various areas in the building have been designated into Radiation Access Zone categories in which maximum allowable design exposure rates have been established based upon access times allowed. (Ref: CSB Design Basis Document, Section 12.3.1, Table 3-1).
1300-6.2	311.	Within this design basis, personnel exposures shall be maintained ALARA.	C	Table 3-1 (mentioned in Item 310) applies in conjunction with an ALARA analysis. No personnel access to the vault storage tube area is allowed, nor is it possible except during construction when the vault contains no fuel. ALARA studies have been performed to assess all exposures associated with CSB operations (Ref: SNF Canister Storage Building ALARA Analysis 09).

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1300-6.2	312.	Specifically, the shielding shall be designed with the objective of limiting the total EDE to less than 1 rem per year to workers, based on their predicted exposure time in the normally occupied area.	C	See response to items #310 & #311.
1300-6.2	313.	In addition, appropriate shielding shall be installed, if necessary, to minimize non-penetrating external radiation exposures to the skin and lens of the eye of the worker.	C	The shielding provided in the CSB design protects workers from this type of exposure. No special shielding is required. (Ref: HNF-3553, Section A2.5.1.4)
1300-6.2	314.	Shielding and other radiation protection measures shall be provided for areas requiring intermittent access, such as for preventive maintenance, component changes, adjustment of systems and equipment, and so forth.	C	A maintenance pit is provided for the MHM. The MHM Radiation Protection Interlock System protects the facility worker from inadvertent high doses of radiation while working inside the MHM cask. (Ref: HNF-3553, Section A4.4.12)
1300-6.3		Hand and Forearm Protection		
1300-6.3	315.	Remote shielded operation (i.e., with remote handling equipment such as remote manipulators) shall be considered where it is anticipated that exposures to hands and forearms would otherwise approach the dose guidance in 5480.11 or where contaminated puncture wounds could occur.	C	Places where operators come in close proximity to MCOs are at the service station pit, where cask fasteners must be removed in order to remove the MCO from the Transport Cask, and at the sampling/weld station where the operator must make sampling connections and set up weld heads. In each case, the CSB design includes shielding that, in conjunction with the MCO shield plug, protects workers from exposure to hands and forearms. Extremity dose rates are within the guidelines of 10 CFR 835, which replaced DOE 5480.11. There is a low likelihood of loose contamination on these components. Standard industrial PPE will protect against puncture wounds during hands-on operations. (Ref: SNF Canister Storage Building ALARA Analysis 09)

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1300-6.4		Internal Radiation Exposure		
1300-6.4	316.	The design shall ensure that occupied operating areas do not exceed the airborne concentration limits of the DOE 5480 series for normal operating conditions.	C	<p>Releases of airborne contamination is prevented at the sampling/weld station. Here a hood with exhaust fan and HEPA filters is provided to capture and remove airborne contamination. The hood exhaust air is discharged directly into the CSB exhaust plenum intake and HEPA filtered again before discharge to the atmosphere. (Ref: HNF-3553, Section A4.4.10).</p> <p>The MHM is provided with fans that draw air into the MCO cask area. The air is then HEPA filtered before discharge to the CSB Operations Area. (Ref: HNF-3553, Section A2.5.1.3).</p> <p>The tube vent and purge cart is also provided with a HEPA filter to filter any accident induced contamination from purging and inerting overpack tubes. (Ref: HNF-3553, Section A2.6)</p> <p>W-379-C-CSB-15896, Rev 1, <u>HEPA Filters (Mechanical)</u> W-379-C-CSB-15897, Rev 0, <u>MCO Service Secondary HEPA Filter</u> W-379-C-CSB-15883, Rev 0, <u>HEPA Filter Housing</u></p>
1300-6.4	317.	In addition, to the extent practical, the concept of ALARA shall be used when designing confinement and ventilation systems to limit airborne contamination levels.	C	<p>Air filtration units are designed and located with appropriate radiation protection to maintain occupational doses ALARA during operations and maintenance and are designed so that a bank of filters can be completely isolated from the ventilation system during filter element replacement. Air filtration units are installed as close as practical to the source of contamination to minimize the contamination of the ventilation system ductwork.</p>

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1300-6.4	318.	The design shall ensure that respirators are not required to meet the dose limits for normal operations.	C	No respirators are required to meet the dose limits for normal CSB operations.
1300-6.4	319.	Engineered controls and features shall also be provided to minimize potential inhalation of radioactive and other hazardous materials under all conditions.	C	The HEPA filtration systems previously described minimize the potential for inhalation of radioactive particulates.
1300-6.5		Monitoring, Warning, and Alarm Systems		
1300-6.5.1	320.	All monitoring systems shall be calibrated annually with appropriate national standards to ensure validity of reported values.	C	Calibration programs for radiation instrumentation and effluent monitoring systems will be employed at CSB. Surveillance requirements are derived from technical safety requirements and included in HNF-3672. Calibration is addressed in SNF Project administrative procedure AP-3-004. (See HNF-3553, Chapters 10.0 and A10.0)
1300-6.5.1	321.	All radiation monitoring, alarm, and warning systems that are required to function during a loss of normal power shall be provided with an emergency UPS (internal or external on-line) unless it is demonstrated that they can tolerate a temporary loss of function without losing needed data and they are provided with standby or emergency (switched) power. Determination of the power supply type and quality shall be based on the safety classification of the monitoring system or device. The sampling motivation (vacuum) shall be installed to the same requirement.	C	There are no radiation monitoring, alarm, or warning systems that are required to operate during loss of power. The CSB Distributed Control System (DCS) is provided with a UPS backup power supply to assure continuity of recorded data. (Ref: HNF-3553, Sections A2.8.3 and A2.8.4)

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1300-6.5.2		Air Monitoring and Warning Systems		
1300-6.5.2	322.	Air monitoring and warning systems shall be installed in work areas where hazardous materials are stored or handled and where hazardous airborne particles or vapors may be present.	NA	There are no hazardous materials stored or handled within the CSB and there are no air monitoring and warning systems required in work areas where hazardous airborne particles or vapors may be present. Relatively small amounts of propylene glycol, lubricants, and weld test materials are present while in use and do not pose unreasonable risks to the workers. (Ref: <i>Notice of Construction</i> , DOE/RL-98-30)
1300-6.5.2	323.	Air sampling heads shall be located to provide a representative sample of potential airborne radioactive materials being breathed.	C	Locations for air sampling heads have been determined by radiological monitoring experts considering the particular operations involved. Air flow rates for the CSB operations area are ~1.5 air changes per hour.
1300-6.5.2	324.	Air monitoring systems shall comply with ANSI N13.1.	C	Air monitoring and warning systems in compliance with ANSI N13.1 are located throughout the CSB in places where the potential for operators breathing airborne radioactive materials, although unlikely, may occur. (Ref: HNF-3553, Section A2.7.3)
1300-6.5.3		Personnel Monitoring and Warning Devices		

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1300-6.5.3	325.	Provisions shall be made for personnel monitoring devices, such as hand and foot counters, in the vicinity of work stations. Installed monitors (supplemented with personal monitoring methods if necessary) shall be used to monitor personnel exiting an operating area through access ways.	C	There is one hand and foot monitor (HFM) located on the north wall next to the step off pad room (room 030) of the CSB. The HFM is used to check personnel hands and feet for contamination. The chosen location ensures that personnel leaving the operations area can survey themselves before leaving the radiological buffer area. There are two body friskers used to check personnel whole bodies for contamination. (Ref: HNF-3553, Section A.2.7.3 and H-2-121101 Sheet 2, Item 22)
1300-6.5.3	326.	CAMs shall be provided to detect and to alarm at prescribed airborne radioactivity levels.	C	There are nine beta continuous air monitors (CAMs) in the CSB Health Protection System, including one mounted on the MHM, and one used in the Mobile Containment Service Tent. Two of the beta CAMs connect to the Distributed Control System. Beta CAMs are located in occupied areas with a high potential for airborne contamination such as the Count room, Maintenance area, and HVAC equipment areas. There is also a portable beta CAM, which will be used only when extra coverage is necessary. (Ref: H-2-121101 Sheets 2, 3, 4, and 6). There are six alpha CAMs, one mounted on the MHM, and one used in the Mobile Containment Service Tent. None of the alpha CAMs are connected to the Distributed Control System. There is one portable alpha CAM, which will be used only when extra coverage is necessary. (Ref: H-2-121101 Sheet 8). There is one Continuous Airborne Effluent Monitor (CAEM) in the CSB Health Protection System, located in the CAEM room (room 016), and connected to the Distributed Control System. The CAEM monitors HVAC exhaust airflow for radioactive and chemical contamination. (Ref: H-2-129586 Sheet 1) There is one Iodine Monitor which checks HVAC exhaust airflow for the presence of I-129. (Ref: HNF-3553, Section A2.7.3)

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1300-6.5.4		Ionizing Radiation Monitoring System		
1300-6.5.4	327.	Where ionizing radiation is present (due to process material, equipment, or operations), an area radiation monitoring system shall be provided to alert personnel of unexpected increases in ionizing radiation levels.	C	There are 23 Area Radiation Monitors (ARMs) located throughout the CSB. ARMs connect to the Distributed Control System through a Remote Terminal Unit. There are three portable ARMs which will be used only when extra coverage is necessary. (Ref: HNF-3553, Section A2.7.3 and H-2-121101 Sheets 2, 3, and 6)
1300-6.5.5		Warning and Alarm Systems Features		
1300-6.5.5	328.	Warning and alarm systems shall be designed, installed, and tested to ensure that they can be heard in the ambient conditions of the area they are intended to cover.	C	Hand and Foot monitors, ARMs, alpha CAMs, beta CAMs, Radioactive Gas Monitors, and the Continuous Airborne Effluent Monitor are all equipped with both audible and visual alarms. Each instrument is designed to be adjusted, or reset by authorized personnel without removing the instrument from service. The alarms will be tested periodically. (Ref: HNF-3553, Section A2.7.3)
1300-6.5.5	329.	Evacuation alarm systems shall comply with ANSI N2.3.	C	The evacuation alarm complies with ANSI N2.3 and is sounded through public address system speakers. It is possible to activate the evacuation alarm from the central control room and from the emergency control station. (Ref: HNF-3553, Section A2.9.1)
1300-6.5.6		Nuclear Accident Dosimetry		

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1300-6.5.6	330.	Where there is the potential for a criticality excursion causing personnel exposures, nuclear accident dosimeters shall be provided with performance features and placement consistent with DOE 5480.11.	NA	Since analyses confirm that no criticality accident at the CSB is credible (probability of a criticality event at the CSB is $<1E-06$ per year), neither a criticality alarm system nor personnel accident dosimeters are required. (Ref: HNF-SD-SNF-CSER-005) HNF-PRO-320, , <u>Personal Nuclear Accident Dosimetry</u> , Section 2.2
1300-6.5.7		Central Radiation Monitoring and Alarm Readout		
1300-6.5.7	331.	In addition to a local station alarm, radiation monitoring system (criticality alarms, CAMSs, alarms associated with stack monitoring systems, and so on) shall have central (i.e., control room or radiation monitoring office) readout and alarm panels that are accessible after a DBA to evaluate internal conditions.	C	The control room contains a central monitoring system and alarm panels to warn plant personnel of hazardous radioactive conditions that may occur as a result of a DBA. (Ref: HNF-3553, Section A2.4.4.3)
1300-6.6		Decontamination of Personnel		
1300-6.6	332.	Design shall provide for personnel decontamination facilities close to areas that represent sources of potential contamination.	C	See response to item #333 below.
1300-6.8		Change Rooms		

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1300-6.8	333.	Men's and women's change rooms shall be provided for changing into and from protective clothing. These areas shall be adjacent to shower facilities. Change rooms shall be designed to ensure that clean clothing (e.g., personal clothing) and protective clothing are segregated. The design shall ensure that storage of contaminated protective clothing will control contamination so that it does not spread beyond the storage container. The change room exhaust air shall be HEPA-filtered if dispersible radionuclides are handled in the process areas it serves.	C	In the CSB Support Building a regulated change room for everyone is provided. Should an emergency ensue requiring personnel decontamination, which is very unlikely, a portable decontamination shower is provided in close proximity to the change room. Air handling unit AH-004, together with its HEPAs, filters and exhausts the change room air. (Ref: HNF-3553, Sections A2.4.4.3, and A2.7.2.2). H-2-117795 Sheet 1 of 3, Rev. 5, Architectural Floor Plan North
1300-6.9		Breathing Air System		
1300-6.9	334.	Breathing air supply systems shall comply with ANSI Z88.2 and 29 CFR 1910.134.	NA	There are no breathing air supply systems in the CSB design.
1300-7		Confinement Systems		
1300-7.2		General		

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1300-7.2	335.	Confinement capabilities, including confinement barriers and associated ventilation systems, shall maintain a controlled, continuous airflow pattern from the environment into the confinement building, and then from non-contaminated areas of the building to potentially contaminated areas, and then to normally contaminated areas.	C	<p>The MCO is the primary confinement barrier for SNF storage at the CSB. Confinement capabilities in the CSB include the HEPA filtered building exhaust, the mobile service station tent, the sampling/weld station exhaust, the MHM's HEPA filtered exhaust, and the locked-down and sealed overpack tube. (Ref: 3553, Section A2.6.3).</p> <p>No normally contaminated areas have been identified for the CSB. Ventilation air flows are from the outside environment to the operating area, and then from non-contaminated areas to potentially contaminated areas. These areas are those surrounding the potentially contaminated MCO. Exhaust air from the CSB Operations area flows through a HEPA filter before exiting to the outside atmosphere through its own exhaust stack. (Ref: HNF-3553, Section A2.7.2)</p>
1300-7.2	336.	Sufficient redundancy shall be provided in the unlikely event of a confinement system failure. At least one of the confinement systems shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events (see Section 0111-99.0, Nonreactor Nuclear Facilities-General), including the postulated DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines of Section 1300-1.4.2, Accidental Releases, are not violated.	C	<p>The MCO provides primary confinement for SNF. The MHM and the storage tubes/tube plugs provide secondary confinement in the CSB. The tube confinement system is designed as safety-class to withstand natural phenomena and postulated DBAs. (Ref: HNF-3553, Section A4.3.4). The MCO is designed to survive NPH and DBA events. (Ref: HNF- SD-SNF- SARR-005) There are no postulated DBF events identified for the tube confinement system. (Ref: HNF-SD-SNF- FHA- 002). There are no expected releases from DBA or NPH events as a result of challenges to these confinement systems. (Ref: HNF-3553, Section A2.6).</p>
1300-7.2	337.	The adequacy of the design of these confinement systems to effectively perform their required functions shall be demonstrated by the safety analysis.	C	<p>The safety analysis document establishes the adequacy of confinement system design. (Ref: HNF-3553, Section A2.6 and A3.4.2).</p>

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1300-7.2	338.	Design of confinement areas shall provide adequate means for decontamination of the areas prior to entry or breaching for maintenance and repair purposes.	C	There are no designated decontamination confinement areas required in the CSB. If decontamination becomes necessary, local temporary confinement will be provided.
1300-7.3		Access Ways		
1300-7.3	339.	Provision for normal and emergency equipment shall be provided in or adjacent to the access ways.	C	Normal and emergency equipment is provided adjacent to the access ways, and the access ways are identified and kept clear of encumbrances to ensure freedom for normal and emergency use. (Ref: HNF-3553, Sections A2. 4.4.2 and 2.4.4.3)
1300-7.4		Transfer Pipes and Encasements		
1300-7.4	340.	Double-walled pipes or pipes within a secondary confinement structure encasement shall be used in all areas where the primary pipe leaves the facility.	NA	The CSB facility does not have primary confinement pipes that leave the facility. Pipes that go between the operating and support areas are routed within sealed pipe sleeve penetrations in the concrete slab. (Ref: HNF-3553, Section A2. 7.1)
1300-7.4	341.	Leakage monitoring shall be provided to detect leakage into the space between the primary pipe and the secondary confinement barrier.	NA	No liquids are transferred between the operating and support areas.
1300-8		Waste Management		
1300-8.1		General		
1300-8.1	342.	The process systems shall minimize the production of wastes at the sources and minimize the mixing of radioactive and nonradioactive hazardous wastes.	C	No nonradioactive hazardous wastes are generated in the CSB. Low-level radioactive wastes resulting from normal activity include protective clothing, tools, and HEPA filters.

C -- compliant
 NA -- Not applicable

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1300-8.1	343.	The waste management systems shall provide facilities and equipment (or incorporate existing facilities and equipment) to handle those wastes safely and effectively.	C	All potentially contaminated wastes taken from the CSB will be surveyed for radioactivity. The data sheets for wastes exiting the facility contain estimates of hazardous wastes, if any, being shipped. Liquid wastes having a potential for containing radioactivity are collected in sumps in the support area, transferred in drums, sampled and disposed as appropriate. Relatively small amounts of propylene glycol, lubricants, and weld test materials are present while in use and may require cleanup and disposal.
1300-8.1	344.	Volume reduction equipment for both liquid and solid wastes shall be required where feasible and shall be designed for process capability and capacity commensurate with the types and quantities of wastes expected.	C	Because of the small volume expected, the CSB contains no volume reduction equipment. The waste receiving sites at Hanford have the capability for volume reduction.
1300-8.1	345.	Waste handling areas shall comply with the standards of confinement and ventilation requirements commensurate with the potential for spreading contamination by the waste packages/forms handled.	C	The load in/load out area adjacent to the filter room is ventilated to the operating area and has air-lock doors for transferring wastes from the filter room and operating area. Waste packages (drums or boxes) provide confinement for the waste being transferred.
1300-8.4		Waste Segregation		
1300-8.4	346.	Facility design shall provide for the segregation of hazardous wastes into compatible groups for storage in accordance with the DOE 5400 series and DOE 5480 series.	C	Wastes are segregated into radioactive and non-radioactive wastes for shipment to the Hanford waste receiving sites. Relatively small amounts of propylene glycol, lubricants, and weld test materials are present while in use and may require cleanup and disposal.
1300-8.5		Spill Prevention and Control		

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1300-8.5	347.	Spill prevention and control shall be considered in the design stage of the facility to minimize the possibility of accidentally releasing hazardous waste to the environment.	C	The potential for spills in the CSB is minimal. Spill prevention and control is being provided by sumps in the support building, designed to collect liquid spills. (Ref: HNF-3553, Section A2.8.6)
1300-8.6		Approvals and Permits		
1300-8.6	348.	Environmental discharges of any effluent, including hazardous and nonhazardous wastes, shall meet applicable Federal and State laws and regulations and DOE orders.	C	The CSB stack airborne emissions monitoring system includes flow and temperature measurement. Continuous stack monitoring for radionuclides that contribute more than 10% of the anticipated offsite effective dose, monitoring for radionuclides that contribute 0.1 mrem/yr or more to the anticipated offsite effective dose, and monitoring for alpha/beta particulates and iodine with a minimum collection efficiency of 50% or more for 10 μ m sized particles. (Ref: HNF-3553, Section A2.7.4). Demonstration that this system meets applicable regulations and orders is contained in the CSB Notice of Construction, DOE/RL-98-30.
1300-9		Effluent Control Monitoring		
1300-9	349.	Hazardous effluents released to the environment (radioactive and nonradioactive) shall not exceed the limits referenced in DOE 5400.1 and the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.	C	The airborne emissions monitoring system in response to item #348 provides data that the limits and directives are not exceeded. (Ref: CSB Notice of Construction, DOE/RL-98-30)

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1300-9	350.	Emphasis shall be placed on reducing total quantities of effluents (both radioactive and nonradioactive) released to the environment.	C	The only liquid effluent from the CSB will be small volumes of condensate collected in the support area sumps. No radioactive effluents are anticipated. Operating procedures, HEPA filters, use of ALARA concepts, emergency planning and lessons learned are methods and equipment used by operations to reduce effluents. (Ref: HNF-3553, Section A2.8.6)
1300-9	351.	During normal operations, the effluent concentrations of radionuclides measured at the site boundary shall not exceed the DCGs specified in the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.	C	During normal operations there will be no hazardous effluents released to the environment. CSB systems have been designed such that, during postulated accident conditions, releases to the public will not result in inhalation doses that exceed guideline values. (Ref: <i>CSB Safety Analysis Report</i> , HNF-3553, Section A3.4.2).
1300-9	352.	At the point of discharge of the facility, i.e., stack or equivalent, the effluent concentration shall not exceed the DCGs specified in DOE 5480.11.	C	As noted in response to item #348 above, the airborne emissions monitoring system provides data that stack discharges do not exceed the DCGs. (Ref: CSB Notice of Construction, DOE/RL-98-30)
1300-9	353.	The guidance on radioactive protection referenced in Section 1300-1.4.3, Routine Releases, shall also apply to effluent treatment and discharge systems.	C	See item #352.
1300-9	354.	All effluent streams shall be sampled or monitored in accordance with the requirements of 5400.1, the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series, and the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series.	C	See item #352.

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1300-9	355.	Sampling and monitoring shall ensure adequate and accurate measurements under normal operations, anticipated operational occurrences, and DBA conditions.	C	The airborne emissions monitoring system is designed to operate during normal operations and anticipated operational occurrences. It is not designed to survive a DBA because the accident analysis shows that the MCO retains confinement and containment capabilities during the postulated DBAs.
1300-9	356.	The design of the facility shall include appropriate groundwater monitoring unless a site-wide program is provided. This monitoring shall be designed to detect releases of contaminants to the ground or ground water.	C	A site-wide groundwater monitoring program is documented in the Hanford Environmental Monitoring Report.
1300-9	357.	Groundwater protection programs shall comply with DOE 5400.1, DOE 5400.3, and the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.	C	A site-wide groundwater monitoring program is documented in the Hanford Environmental Monitoring Report.
1300-11		Decontamination and Decommissioning		
1300-11.1		Decontamination		
1300-11.1	358.	Design of the areas in a facility that may become contaminated with radioactive or other hazardous materials under normal or abnormal operating conditions shall incorporate measures to simplify future decontamination.	C	CSB facilities and equipment have been designed to minimize locations for accumulation of contamination. For example, the equipment surfaces are smooth and designed for ease of decontamination. HEPA filters are located close to the potential source of particulate contamination to limit the length of pipes and ducts that have the potential for becoming contaminated. The concrete surfaces have a sealing coat, which provides for ease of decontamination. (Ref: HNF-3553, Section 16.3)

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1300-11.1	359.	Such items as service piping, conduits, and ductwork shall be kept to a minimum in these areas and shall be arranged to facilitate decontamination.	C	Electrical conduit, ventilation ducts and piping in the operating area and connections between the operating area and the support area are arranged to minimize line lengths and thus facilitate decontamination.
1300-11.1	360.	Filters shall be positioned in ventilation systems in locations that minimize contamination of ductwork.	C	Process filters are located as close to the source of possible contamination as possible. Filters for the operating area exhaust ducting are located adjacent to the operating area. (Ref: HNF-3553, Sections A2.5.1.4 and A2.7.2)
1300-11.1	361.	Walls, ceilings, and floors shall be finished with washable or strippable coverings.	C	In areas of potential contamination, concrete surfaces are coated with a sealing material. The interior walls are painted providing a washable covering. (Ref: HNF-3553, Section A16.3)
1300-11.1	362.	In some areas, metal liners shall be required.	NA	No areas requiring metal liners have been identified.
1300-11.1	363.	If necessary, all cracks, crevices, and joints shall be caulked or sealed and finished smooth to prevent contaminated material accumulation in inaccessible areas.	C	The exposed concrete deck, concrete floors and horizontal surfaces of the concrete equipment pads resist liquid intrusion, aid in preventing contamination of the concrete surfaces, and reduce future decontamination and decommissioning labor by minimizing contamination of the concrete.
1300-11.1	364.	Finishes shall comply with Section 0900-99, Special Facilities.	C	The painting specification identified the requirements of section 0900-99 for painted surfaces.
1300-11.2		Decommissioning		

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1300-11.2	365.	Designs consistent with the program requirements of DOE 5820.2A shall be developed during the planning and design phases based on a proposed decommissioning method or a conversion method leading to other uses.	C	The CSB has limited potential for contamination because of the sealed MCOs. The equipment designed for use in the CSB is consistent with the sealed MCO concept and minimizes the potential for spread of contamination and thus reduces the future decommissioning work. The waste management philosophy of the CSB complies with the requirements of DOE Order 5820.2A providing for safe handling of radioactive waste, waste minimization, confinement, waste collection, temporary storage and waste shipment. It is expected that very little contamination of the CSB facility and its equipment will occur during its life time and the radioactive waste volumes shipped from the CSB will be low. The low potential for contamination increases the potential for successful future decommissioning of the CSB or conversion of the facility to other uses. Equipment and structures are smooth and designed to reduce crevices where contamination could accumulate. (Ref: HNF-3553, Section A16.3)
1300-11.2	366.	Decommissioning of special facilities is of utmost importance. The facility design shall include features that will facilitate decontamination for future decommissioning, increase the potential for other uses, or both.	C	Note response to item # 365, above.
1300-12		Human Factors Engineering		
1300-12.1		Coverage		

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1300-12.1	367.	These criteria shall apply to new construction and to retrofitting of existing facilities. These criteria shall be considered for upgrading existing facilities where cost-benefit or risk-tradeoff analyses indicate justification for such expenditures.	C	The CSB is new construction. The CSB-specific human factors evaluation is contained in SNF-3907 <i>SNF Project Human Factors Engineering Analysis Results and Findings</i> . (Ref: HNF-3553, Section A13.4).
1300-12.3.3		Requirements Analyses		
1300-12.3.3	368.	A systems requirements analysis appropriate to the level of importance of the system and the level of risk associated with system failure shall be performed as an integral part of the design process and shall include human factors engineering considerations.	C	The human factors evaluation addressed the relative importance and risks of CSB systems. For example, the CSB has a control room containing the DCS and the MHM has an operator control console. NUREG 0700 and Mil STD 1472D requirements were applied in designing the DCS and MHM control panels. The MHM vendor completed a human factors engineering plan and human factors review of the MHM systems using man-machine interface criteria. A review was conducted of both control console designs and layouts and suggestions were incorporated to improve ease of operation and minimize the potential for mis-operation. (Ref: HNF-3553, Section A13.5.7)
1300-12.3.3	369.	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.	C	Note response to item # 368.

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1300-12.3.3	370.	For functions allocated to an operator, there shall be a systematic analysis of those vital activity tasks that must be performed by the operator to satisfactorily complete the function, given a proposed system design.	C	Note response to item #368.
1300-12.3.4		Process System Design Interfaces		
1300-12.3.4	371.	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.	C	There are minimal process systems within the CSB. The Sample/Weld station were addressed in the recent CSB human factors engineering analysis. (Ref: SNF CSB HFE Analysis, Gem Ergonomics, January 1999).
1300-12.4		General Human Factors Implementation Criteria and Consideration		
1300-12.4.1		General		
1300-12.4.1	372.	The organization of operator movements and the arrangement and accessibility of equipment and controls in the work area shall facilitate convenient access to each system component for operation and maintenance.	C	The operation of the MHM is the main area where human machine interfaces are required. The MHM vendor completed a human factors engineering plan and human factors review of the MHM systems using man-machine interface criteria. The suggestions for improvement of the MHM control system and the DCS system were incorporated. The formality and the extent of the human factors engineering program has been graded on the basis of the extent of the human interaction, the overall design effort, and the risk associated with human performance failures. Due to the inherent design simplicity of the CSB, its passive nature, and its limited access, instrumentation and control systems requirements are minimal. (Ref: HNF-3553, Section A13.5)

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1300-12.4		General Human Factors Implementation Criteria and Considerations		
1300-12.4.3		Environmental Considerations		
1300-12.4.3		Lighting		
1300-12.4.3	373.	Adequate light levels are necessary to ensure optimum performance in all work areas. Glare and shadowing shall be avoided. For recommended control room illumination levels, luminance ratios, reflectance levels and further lighting considerations, see Section 1655, Interior lighting, and NUREG 0700, Section 6.1.	Open	Lighting systems for the CSB were designed using the requirements of the IES Lighting Handbook-1987 and ASHRAE 90-75R. High intensity discharge lights are used in the high bay areas. Fluorescent lights are provided in the support building rooms. Low brightness, low glare lights provide light in the control room. Lighting fixtures in the personnel decontamination room and the battery room are vapor tight fluorescent lamps. The sample/weld station will add local lighting. Lighting levels in the CSB will be re-evaluated during pre-operational testing and adjusted where needed. (Ref: "SNF CSB HFE Analysis," Gem Ergonomics, January 1999). Design Basis Document (DBD) Section 5.0
1300-12.4.3		Emergency Lighting		
1300-12.4.3	374.	Emergency lighting systems shall be provided as required by NFPA 101. A control room emergency lighting system shall be automatically activated and immediately available for a stated minimum length of time on failure of the normal lighting system.	C	Emergency lighting consists of individual lighting fixtures powered by an integral battery and self-luminous exit signs. These lights are installed in areas where egress routes are identified -- this is in compliance with NFPA-101. (Ref: HNF-3553, Sections A2.4.4.2 and A2.4.4.3)

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1300-12.4.3	375.	The emergency lighting system for vital areas shall be an electrically independent system that is not degraded by failure of the normal lighting system.	C	Note response to item #374.
1300-12.4.3	376.	Control room emergency lighting levels shall be in accordance with NUREG 0700, Section 6.1.5.4.	C	Emergency lighting consists of individual lighting fixtures powered by an integral battery and self-luminous exit signs. These lights are installed in areas where egress routes are identified -- this is in compliance with NFPA-101. Lighting levels in compliance with NUREG 0700, 6.1.5.4 are not required. CSB operations do not require operators' actions during emergency situations. (Ref: HNF-3553, Section A2.4.4.2 and A2.4.4.3).
1300-12.4.3		Noise		
1300-12.4.3	377.	Acoustic design shall: <ul style="list-style-type: none"> • Minimize noise levels where practical and ensure that the limits of DOE 5480.10 are not exceeded • Ensure that verbal communications are not impaired. • Ensure that auditory signals are readily detectable. • Minimize auditory distraction and irritation that can cause operator fatigue. 	C	Acoustical features provided for the control room in the support area building include a suspended acoustical tile ceiling and sound board, which is installed on separate metal stud-framed wall partitions on both sides of the wall adjoining the empty generator room. The control room has acoustic lay-in ceiling. CSB office spaces have painted gypsum board ceilings. CSB design allows the addition of non-flammable noise abatement features if needs are identified during startup testing and preliminary operations. The air compressors were ordered with self-contained noise reduction features. (Ref: HNF-3553, Section A2.4.4.3)

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1300-12.4.3	378.	For further noise level and protection considerations, see NUREG 0700, Section 6, and UCRL 15673, Section 3.2.4.2.	NA	See item #377. Noise surveys indicate that additional noise abatement features are not required. Noise abatement items can be retrofitted as necessary if noise level surveys conducted at completion of construction so require.
1300-12.4.3		Vibration		
1300-12.4.3	379.	Vibration shall be reduced to the extent practical to minimize operator irritation and distraction. Vibration considerations shall include equipment and tool design, potential effects of vertical and horizontal vibrations on seated and standing operators, and use of appropriate protective devices (e.g., isolation, damping materials). For recommended vibration level limits and further considerations see UCRL 15673, Section 3.2.4.3.	Open	<p>Equipment items prone to induce vibration (e.g., fan and motor combinations) are mounted on a common vibration isolation base. Rotating equipment is provided with vibration isolation mounts. The vibration bases and mounts insulate the foundations and walls from vibrations caused by the rotating equipment. Tooling has not been designed.</p> <p>No additional engineered features are anticipated to be needed. However, the definitive assessment of additional vibration reduction measures required for operators' well being can not be performed until startup. Equipment vibration is not expected to reach the limits of UCRL 15673.</p>
1300-12.4.4		Component Arrangement		

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Applicable Section	Item #	Criteria	Status	Implementation
1300-12.4.4	380.	<p>The arrangement of controls and displays on a control panel shall promote efficient use of task-related components, rapid location of any given component, and maximum operator awareness of plant conditions. EPRI NP-3659, Chapter 4, and NUREG 0700, Sections 6.8 and 6.9, discuss these concerns and related items.</p> <p>Components shall be grouped together on the basis of specific criteria appropriate for the required task or tasks. The groupings shall be emphasized and defined by consistently applied graphic-spatial methods such as demarcation and spacing of components, particularly when there are many components. Components shall not be hidden within component groupings. Matrices of components shall have labeled axes to identify any component in the grid. Mirror image arrangements of components shall be avoided.</p>	C	<p>The CSB has a control room containing the DCS, and the MHM has an operator control console. NUREG 0700 and Mil STD 1472D requirements were applied in designing the DCS and MHM control panels. The MHM vendor completed a human factors engineering plan and human factors review of the MHM systems using man-machine interface criteria. A review was conducted of both control console designs and layouts and suggestions were incorporated to improve ease of operation and minimize the potential for mis-operation. (Ref: HNF-3553, Section A13.5)</p>
1300-12.4.4	381.	<p>Component arrangement shall promote easy association of related controls and displays or other related components. Displays are usually placed above and relatively close to the related control.</p>	C	<p>Note response to # 380.</p>
1300-12.4.5		Protective Equipment		

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1300-12.4.5	382.	Provisions shall be made for access and maintenance of protective equipment. Protective equipment shall be periodically checked and shall be maintained in good condition. Storage spaces shall be provided and shall be easily accessible to required personnel.	C	Based on the number of people who will be assigned to work in the CSB, the regulated change room has enough space for whites, blues and other needed protective equipment supplies. The room will also accommodate receptacles for used clothing that will be sent to an offsite laundry facility. The offsite laundry facility provides new clothing and repairs used clothing as needed to maintain an adequate supply of protective clothing. No special personal protective equipment is required for CSB operations.
1300-12.4.5	383.	The design or selection of protective equipment shall be such that it minimizes the impairment of operational and maintenance performance. It shall provide adequate tactile sensitivity and provide the ability to see, reach, move, communicate, and hear.	C	No special personal protective equipment is required for CSB operations. Requirements for specific Personal Protective Equipment are established during the normal job safety analysis activities.
1300-12.4.6		Display Devices		
1300-12.4.6	384.	Displays shall provide only the information about system status and parameter values that is needed to meet task requirements in normal, abnormal and emergency situations. Failure of a display of any type shall be easily recognized and shall not affect equipment or system performance.	C	<p>The Distributed Control System (DCS) serves as the central monitoring system for CSB facility and equipment conditions. The DCS has the capability of displaying and annunciating failure of any monitored component. The DCS will monitor and display all Alarms in the "Alarm Status" portion of most display screens and on the "Alarm Summary Display" screen. (See DCS System Design Descriptions, Rev. 2, Section 1.1.)</p> <p>Onboard display devices are installed in the MHM, which are designed for specific operations of the MHM. The overall MHM control system is equipped with numerous safety interlocks to protect against operating errors which could result in damage to the deck or the MCO as well as to guard against damage to the MHM or its associated equipment.</p>

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Criteria	Status	Implementation
1300-12.4.6	385.	Where CRTs are used, rapid, error-free access to the information required for the task shall be accomplished by ensuring that system response to any query is less than 2 seconds and that user feedback to control action is less than 0.2 seconds or faster wherever possible.	C	The DCS is not used to provide control functions. The DCS operational requirements (with the system assumed to be fully loaded and operating to capacity are given as follows: at the operator workstation the usability of new screen display after operator request for new display is ≤ 3 seconds. The refresh rate of dynamic full system information is ≤ 2 seconds. (See DCS System Design Descriptions, Rev. 2, Section 1.4.2 and HNF-3553, A13.5.1.5)
1300-12.4.8		Warning and Annunciator Systems		

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Applicable Section	Item #	Criteria	Status	Implementation
1300-12.4.8	386.	An effective warning system shall alert personnel to a problem or abnormal condition and shall provide sufficient time to respond appropriately to the problem. For the special case of control room annunciators, see NUREG 0700, Section 6.3. For auditory signals guidelines, see NUREG 0700, Section 6.2.	C	<p>The Distributed Control System (DCS) is designed to serve as the central monitoring system for CSB facility and equipment conditions. It serves to monitor, display and annunciate alarms associated with all ARMs, two CAMs, Stack High Radiation, Stack Equipment Trouble HVAC Sump High Level, Compressor Common Trouble, and Dryer Common Trouble. (See DCS System Design Descriptions, Rev. 2, Section 1.1.)</p> <p>There are also local audible and visual alarms that are activated whenever the roll-up door is opened in the MCO Cask Receiving Area or when the MHM is moving on the track. Standard Hanford Site alarm signals are employed. The following is a summary of the available alarm signals:</p> <ul style="list-style-type: none"> Fire - - gong Evacuation - - steady siren Take cover - - wavering siren Nuclear excursion - - AH-OO-GAH Air contamination - - red flashing light and bell DCS - - vibratory horn Hand and foot counter - - steady ring Crane movement - - pulsating bell Roll up door is open - - ringing with yellow flashing light Very early smoke detection - - fire gong
1300-12.4.8	387.	Each stimulus shall be easily distinguishable from other stimuli in the same modality but it shall not be a distraction. If an alarm can be one of many similar alarms that may occur simultaneously, it shall be easy to locate.	C	See item #386. Alarms are distinct and distinguishable.

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1300-12.4.8	388.	Any specific stimulus shall have only one meaning. It can either designate one problem or it can be a signal to look at a particular place to define the alarm further. When there are many annunciator alarms, priority coding such as "first in/out" shall be used to assist in determining message significance.	Open	Specific stimuli have been reviewed for clarity. Confirmation of alarm priority coding will be reviewed as part of startup preparations. See also item #386.
1300-12.4.8	389.	False alarms and nuisance alarms shall be removed. Set point determination shall allow sufficient response time to the operator.	C	Set points for CSB instruments were determined as part of the facility design activity, but are adjustable in the event that changes are required to facilitate operator response. Identification of false and nuisance alarms is an ongoing activity.
1300-12.4.8	390.	Provision shall be made for active acknowledgment and for silencing of auditory alarms after they have been acknowledged.	C	Alarms are required to be acknowledged. The DCS has an alarm silence push button.
1300-12.4.8	391.	Provision shall be made for maintaining personnel awareness of alarm conditions until they have been corrected or "cleared." Clearing of the alarm shall require a positive response from the assigned personnel.	C	The DCS and MHM alarm windows remain a steady white color until the alarm is cleared. The DCS includes a provision for printing of all systems/instruments in alarm status. The DCS includes an operator option of displaying an alarm screen showing the systems in an alarm status.
	392.	Visual alarm tiles shall be grouped by function or system within panels having horizontal and vertical alphanumeric labeling for ready coordinate designation of individual tiles.	C	The DCS and MHM alarms and the DCS video alarm listing are grouped by function.
1300-12.4.9		Communication Systems		

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1300-12.4.9	393.	The system shall have provisions for periodic maintenance tests, instructions for the use of each system used, and procedures for handling emergency communications where applicable.	C	Communication systems for the CSB include a public address system, intercom, radio and both internal and external phone connections. These provide communications between plant management, operations and maintenance personnel. The systems have been designed to be reliable, trouble-free and can be easily maintained if equipment malfunctions occur. Emergency procedures are in place making use of these systems to communicate emergency information. (Ref: HNF-3553, Sections A2.9.1 and A15.0)
1300-12.4.10		Maintainability		
1300-12.4.10	394.	UCRL 15673 shall be considered for system design.	C	The CSB utilized NUREG 0700, Mil Std 1472D, and UCRL 15673 for guidance in human factors design. The Human Factors study recently completed for the CSB indicates that guidance provided in UCRL 15673 was complied with in the CSB design.
1300-12.4.11		Labels		
1300-12.4.11	395.	Equipment and any parts of that equipment to be used by personnel shall be identified with appropriate labels.	C	Labels/tags have been placed on equipment and instruments identifying the location and function. The labels correspond to the numbering and identification system used in the plant flow diagrams.
1300-12.4.11	396.	The label shall indicate clearly and concisely the function and purpose of the item being labeled.	C	See response to item #395.
1300-12.4.11	397.	Label design shall be consistent.	C	CSB labeling is done in accordance with CSB labeling guidance and is consistent within the facility.

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1300-12.4.11	398.	Permanent labels shall be attached to the specific component or equipment in such a manner that environmental conditions or usage by personnel will not remove or destroy the label.	C	No harsh environmental conditions that could remove the labels are anticipated. See response to item #395.
1320		Irradiated Fissile Material Storage Facilities		
1320-3		Nuclear Criticality Safety		
1320-3	399.	Favorable geometry, as implemented by storage rack design, is the preferred method of implementing nuclear criticality safety.	C	Nuclear criticality safety is controlled by the design of the MCO, geometric spacing of the MCO storage positions in the CSB vault, integrity of the MCO internals, and mass limitation on the SNF stored in the MCO. (Ref: HNF-SD-SNF-CSER-005 and HNF-3553, Section A6.4)
1320-3	400.	When fixed neutron absorbers are used, the rack design shall include provisions to verify the absorber's continual efficacy and to prevent their inadvertent removal by mechanical or chemical action.	C	Neutron absorbent materials are used at the CSB sampling/weld stations fixed shielding and at the MHM cask. These materials are integral with the rest of the shielding and are not prone to removal by mechanical or chemical means.
1320-3	401.	Storage racks shall be designed as safety class items and shall maintain their integrity during and following a DBA.	C	The vault, bottom tube base assemblies, the operating deck, and supports for the standard and overpack storage tube, have been designed safety class to withstand the DBAs. (Ref: HNF-3553, Section A4.3)
1320-4		Special Design Features		

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1320-4	402.	To the extent practicable, passive cooling means shall be used at dry type storage facilities. If a cooling water jacket or air system is provided to ensure an acceptable temperature of the stored material within the dry type storage facility, it shall be designed as a safety class system.	C	The passive cooling system for the CSB has been designed as safety class. The storage vault is passively cooled using the "stack-effect" to promote ventilation flow. Natural convection occurs when a heated surface is in contact with fluid (air) of a different temperature than the surface. Density differences provide the motive energy to move the air. The height difference of 90 ft between the air intake stack (79 ft above the operating vault deck) and the air exhaust stack (169 ft above the operating vault deck) increases the motive force for air flow (stack effect). Also, the top of the inlet plenum opening is 7 ft lower than the top of the exit plenum, causing heated air to preferentially expand into the exit plenum and exhaust up the stack. Air passes down through the air intake stack, where its temperature and flow rate are monitored, to an inlet plenum. From the inlet plenum the air flows into the enclosed volume of the vault where it removes heat from the MCO storage tubes. The heated air flows out of the vault into the outlet plenum, up the exhaust stack, where the temperature is monitored, and discharges into the atmosphere. The air intake canopy over the inlet stack improves air flow efficiencies by reducing wind velocity on the windward side. A wind deflector tip on top of the exhaust stack improves air flow efficiencies for the exiting hot air. (Ref: HNF-3553, Sections A2.5.2 and A4.3.6)
1320-4	403.	A system shall be incorporated into the design that can detect leakage from stored IFM in the event of a cladding or canning failure that could allow the escape of fission products and other radioactive material greater than specified limits. This system shall include the following:	C	The tube vent and purge cart has been designed to monitor the overpack storage tubes containing an MCO that has been determined to be off-normal (a high pressure detected inside the cask received from CVDF or a dropped MCO). The tube vent and purge cart can also be used to monitor standard storage tubes for a leaking MCO. (Ref: HNF-3553, Section A2.5.3)

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1320-4	404.	<ul style="list-style-type: none"> The system shall allow for the sampling of coolant such that an individual leaking assembly can be identified. 	NA	Coolant is not used in the CSB storage vaults.
1320-4	405.	<ul style="list-style-type: none"> System components, piping, and instrumentation shall be appropriately shielded to maintain operator exposures within the guidelines specified in DOE 5480.11 and shall use ALARA design principles to minimize overall exposures. 	C	<p>CSB, MCO, Transport Cask, and MHM A/Es have performed shielding assessments to demonstrate the designs are ALARA.</p> <p>The shielding features of the MCO shield plug, the operating area deck, the MHM, the transportation cask, the receiving station pits, the sampling/weld pits, and the standard and overpack tube shielding plugs provide appropriate shielding for operating the CSB, using the design standards of DOE 5480.11. Also, pre-job meetings, the procedures, post-job reviews and lessons learned are ALARA methods used to reduce overall exposures. These measures will be implemented in CSB operating procedures.</p>
1320-4	406.	<ul style="list-style-type: none"> The storage facility shall contain provisions that allow the temporary storage of a leaky assembly. These provisions shall limit the spread of contamination by a leaky assembly and provide adequate cooling and shielding of the assembly. 	C	The overpack storage tube has been designed to accept and temporarily store off-normal MCOs. The overpack storage tube is designed with two seals in the overpack storage tube plug to maintain a pressurized inert atmosphere around the MCO. Only one MCO is stored in each overpack storage tube. The overpack storage tube provides cooling and confinement for the MCO. (Ref: HNF-3553, Section A2.4.3)
1320-4	407.	<ul style="list-style-type: none"> The design professional of the IFMSF shall consider provisions that allow for the interim canning of leaking assemblies until disposal. 	C	<p>For MCOs, interim canning of suspect MCOs is achieved by the placement of the suspect MCO into an overpack storage tube. (Ref: HNF-3553, Section A2.4.3)</p> <p>The sampling/weld station pits have welding equipment for attaching a welded cap to each MCO.</p>

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1320-4	408.	The Design professional shall consider the criteria provided in 10 CFR 72 and the following guides for applicability to IFMSFs:	C	10 CFR 72 Criteria have been considered for incorporation into CSB design. (Ref: WHC-SD-SNF-DB-003)
1320-4	409.	<ul style="list-style-type: none"> • R.G. 3.49 	NA	Design of an independent water basin type spent fuel storage basin is not applicable to the CSB dry storage facility.
1320-4	410.	<ul style="list-style-type: none"> • R.G. 3.54 	C	Spent fuel heat generation rates have been considered in the design of the CSB passive cooling system. (Ref: HNF-3553, Section A2.5.2)
1320-5		Confinement Systems		
1320-5.1		General		
1320-5.1	411.	In general, the primary confinement shall be the IFM cladding or canning. Secondary confinement shall be established by the facility buildings that enclose the dry storage area and/or the storage pool and auxiliary systems.	C	The MCO is the primary confinement barrier for SNF interim stored in MCOs at the CSB. The secondary confinement barrier during shipping, receiving operations and service station unloading operations is the transportation cask. For other operations in the CSB, the equipment around the MCO provides secondary confinement, i.e., the service station pit and service station mobile tent, the MHM, the sampling/weld station pit and sampling hood, the standard storage tube/standard storage tube plug, and the overpack storage tube/overpack storage tube plug. The CSB operating shelter structure is considered to be a defense-in-depth feature in the provision of secondary confinement. (Ref: HNF-3553, Section A2.6)
1320.5.2		Primary Confinement Systems		

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1320-5.2	412.	The IFM cladding or cans, as appropriate, shall provide primary confinement during normal and anticipated operational occurrences.	C	The MCO provides primary confinement for SNF in the CSB.
1320-5.2	413.	The IFM cladding or canning shall be designed to provide a corrosion-resistant confinement for the IFM material to prevent an uncontrolled release of radioactive material.	C	The MCO has been constructed using ½" thick stainless steel (304L for the shell, bottom baseplate and the MCO shield plug) and designed to <i>Boiler Pressure Vessel Code</i> (ASME 1995), Section III, Subsection NB. (Ref: HNF-SD-SNF-SARR-005)
1320-5.3		Secondary Confinement System		
1320-5.3	414.	The facility building, and ventilation make up the secondary confinement system.	C	See item #411. The CSB facility provides appropriate secondary confinement features for the SNF. (Ref: HNF-3553, Figure A2-45.)
1320-5.3	415.	The secondary confinement system shall be designed to function during normal operations and anticipated operational occurrences.	C	The secondary confinement systems for the CSB are designed to function during normal operations and anticipated operational occurrences.

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1320-5.3	416.	It shall also be capable of performing its necessary safety functions during and following the DBAs it is required to withstand.	C	In every case, the MCO, during an off-normal condition, remains in the state that it was in before the off-normal condition occurred. By design, the MCO shielding systems remain intact, an MCO being transported by any of the cranes will be held in a static position, an MCO in a standard storage tube, pre-selected storage tube, or overpack storage tube remains in the tube and an MCO in a sampling/weld station remains in the station. Further, the confinement features previously mentioned in item #411 will continue to function providing confinement of the SNF. The only exceptions could be the equipment requiring electrical power (service station tent exhaust system, HVAC, and sampling station exhaust), which might lose power during an off-normal condition. These electrical-powered equipment are defined as "providing additional confinement functions," therefore, confinement of SNF during an off-normal condition will be maintained. FSAR accident analyses support the assessment of compliance with this item. (Ref: HNF-3553, Section A3.4.2)
1320-5.3	417.	Penetrations of the secondary confinement barrier shall have positive seals to prevent the migration of contamination. The use of positive seals shall be considered for penetration of enclosures within the facility building to ensure the proper ventilation flow paths and prevent the uncontrolled migration of contamination.	C	The service station mobile tent exhaust system, the MHM MCO cavity vent system, and the sampling hood exhaust systems have HEPA filters to prevent releases of loose contamination. The overpack storage tube has two overpack storage tube seals and the standard storage tube has a breather filter to prevent a release of contamination. (Ref: HNF-3553, Section A2.6)
1320-5.3	418.	Ventilation systems shall provide for inlet air filtration (roughing filters) for the main storage building to prevent dust accumulation, thus reducing the load on other filters in the facility.	C	The HVAC system for the CSB has inlet roughing filters designed to filter dust from the inlet air flow. (Ref: HNF-3553, Section 2.7.2)

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1320-5.3	419.	Recirculated air in the main storage building shall be filtered through a HEPA filter to reduce the buildup of radioactive material in the air.	C	The recirculating air handlers, AH-001 and AH-002, contain pre-filters and high efficiency filters. (Ref: HNF-3553, Section A2.7.2)
1320-5.3	420.	Areas with higher potential airborne radioactive contamination (e.g., pool water purification and waste treatment system areas) shall use only once-through air flow.	C	The service station mobile tent exhaust ventilation system and the sampling hood exhaust ventilation system have once through air flow and HEPA filters.
1320-5.3	421.	Supply air to these facilities shall be drawn from the main storage building if such design is feasible.	C	Supply air for sub-systems is taken from the CSB operating area. The supply air for the CSB operating area comes from the outside atmosphere. The operating area is the main storage building for the CSB.
1320-5.3	422.	Exhaust air shall be HEPA filtered prior to release.	C	HEPA filters PF-001 and PF-002 remove particulates from the CSB operating area exhaust air flow. The vault air is outside air which is neither filtered on inlet, nor on exhaust. This is appropriate because the SNF is contained in MCOs that are separated from the vault air (outside environment) by the storage tubes. (Ref: NOC, DOE/RL-98-30)

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Applicable Section	Item #	Criteria	Status	Implementation
1320-5.3	423.	If safety analysis indicates that the guidelines specified in Section 1300-1.4.2, Accidental Releases, could credibly be violated due to a release of radioiodine from a DBA, radioiodine absorber units shall be installed in the exhaust ventilation system. These units shall be capable of reducing the radioiodine concentration in the effluent to the extent that these siting dose guidelines are not exceeded. Acceptable criteria for the design of these units are found in ERDA 76-21.	NA	The CSB FSAR accident analysis shows that K Basin SNF does not contain significant quantities of radioactive iodine.
1320-5.3	424.	Air flow shall be from areas of lower contamination to higher contamination and areas of higher potential airborne contamination shall be kept less than atmospheric pressure.	C	Air flow in the CSB flows from the support building into the operations shelter (highest potential for contamination) and exits through the exhaust stack. (Ref:HNF-3553, Section A2.7.2)
1320-6		Effluent Control and Monitoring		
1320-6.1		Radioactive Solid Waste		
1320-6.1	425.	The solid radioactive wastes typically associated with IFMSFs that shall be considered during the design include but are not limited to loose pieces of cladding and/or fuel element components, gloves, rags, and mops.	C	All loose pieces of SNF are contained within the MCO and the accident analysis provided no mechanism where significant quantities could be released. Gloves, rags, mops and other equipment within the CSB will not come in contact with loose pieces of cladding or other fuel element components. Solid wastes from the CSB will be handled according to Hanford Site rules for removal of materials from radiologically controlled areas.

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Applicable Section	Item #	Criteria	Status	Implementation
1320-6.1	426.	Nuclear criticality safety shall be considered in the design of the radioactive solid waste processing facility.	NA	Not applicable to CSB - the CSB is not a radioactive solid waste processing facility. Solid waste generated by CSB operations contains no SNF.
1320-6.2		Radioactive Liquid Waste		
1320-6.2.1		Process Wastes		
1320-6.2.1	427.	The liquid radioactive wastes typically associated with IFMSFs that shall be considered during the design include but are not limited to cask wash down liquids and fuel pool water accumulated from equipment maintenance leaks. Nuclear criticality safety shall be considered in the design of the liquid radioactive waste processing facility.	C	Liquid wastes generated by CSB operations contains no SNF. The only anticipated liquid waste is the condensate from the building HVAC system. This liquid will be recovered and removed from the facility in drums for processing as suspect radioactive material at another Hanford Site location. (Ref: HNF-3553, Section A2. 8.6)
1320-6.3		Effluents		
1320-6.3.1		Airborne Effluents		

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Applicable Section	Item #	Criteria	Status	Implementation
1320-6.3.1	428.	The airborne radioactive wastes typically associated with IFMSFs that shall be considered during the design include but are not limited to the airborne releases associated with the venting of transport casks and storage vessels. Cladding or canning failure during long-term wet or dry storage is also a source of airborne radioactive wastes.	C	The postulated accidents in the CSB FSAR show that airborne radioactive wastes should be minimal because the design of the MCO precludes a significant release of airborne radioactive particulates. Leaking MCOs may be placed in overpack tubes, which are vented through HEPA filters on the Tube Vent and Purge Cart according to need. Unfiltered venting will not occur. The overpack tube plugs will contain pressures up to about 75 psig. Potential contamination associated with Sampling/Welding activities is captured in hoods and filtered through HEPA filters prior to being exhausted to the building HEPA filters. (Ref: HNF-3553, Section A2.5.1.4)
1320-6.3.1	429.	All exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems.	C	Two systems are provided, but only one monitoring probe is included in the exhaust stack emissions monitoring system. A deviation request covering the design of this system has been approved by RL (98-SFD-060.) (Ref: HNF-3553, Section A2.7.4)
1320-6.3.1	430.	These monitoring systems shall comply with Section 1589-99.0.1, Radioactive Airborne Effluents.	C	The CSB stack airborne emissions monitoring system includes flow and temperature measurement; continuous stack monitoring for radionuclides that contribute more than 10% of the anticipated offsite effective dose, monitoring for radionuclides that contribute 0.1 mrem/yr or more to the anticipated offsite effective dose, and monitoring for alpha/beta particulates and iodine with a minimum collection efficiency of 50% or more for 10 μ m sized particles.
1320-7		Decontamination and Decommissioning		

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Applicable Section	Item #	Criteria	Status	Implementation
1320-7	431.	Decommissioning of the IFMSF is of utmost importance. The facility design shall include features that will facilitate decontamination for future decommissioning.	C	The facility design includes provisions to facilitate decontamination and decommissioning. (Ref: HNF-3553, Section A.16)

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1525		Mechanical Insulation		
1525-1		Applicability		
1525-1	432.	All insulation material, media used to apply insulation, and jacketing material shall have a maximum flame spread of not more than 25 fuel-contributed and smoke-developed ratings of not over 50 when tested using UL 723 Test Methods. Exception to the smoke-developed rating of 50 shall be made for exterior underground piping and exterior underground piping and exterior above-ground piping beyond 15 feet from buildings or individual supports (stanchions).	C	<p>The design basis for CSB required insulating materials to have maximum fuel-developed and smoke-developed flame spread and smoke ratings of 25 and 50, respectively. The required insulation was installed on the cask servicing system piping and the chiller system piping. These were the only A/E piping systems requiring insulation. Other piping systems requiring insulation were provided as part of vendor furnished equipment. These systems are part of the instrument air dryers and the sample cart. These piping systems are provided with insulation in accordance with ASTM C-1055.</p> <p>CSB Piping Specification Section 15061</p>
1525-4		Safe Surface Temperatures		
1525-4	433.	Insulation shall be provided on hot and cold generation equipment, ductwork, piping, flues or breeching, using a material, thickness, and surface treatment that will maintain the surface temperature between 35 degrees F and 125 degrees F for highly conductive (metal) surfaces or between 32 degrees F and 150 degrees F for nonconductive surfaces. See also Section 1555-2.6.8, Plant Insulation.	C	<p>Insulation provided for all hot or cold equipment, piping, ductwork, etc. meets the safe surface temperature guidance. The insulated pipes are in the cask servicing and chiller systems. The MCO could also be too hot for touching -- a cooling cap is provided for removing heat to the point of safe touching. Glove port gloves are also used. The provision of insulation for the MCO top is not appropriate. Most of the piping and ductwork was not required to be insulated.</p> <p>CSB Piping Specification Section 15061</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530		Fire Protection		
1530-1		General		
1530-1	434.	Fire protection systems shall comply with DOE Order 5480.7.	C	<p>The governing regulations of this section of the DBD cite DOE Order 5480.7A. Fire Protection, as one of the design criteria documents. The wet pipe sprinkler system installed in the support building is compliant with 5480.7A requirements. The CSB is in compliance with 5480.7A and approved waivers/exceptions thereto as described in the FHA for the facility.</p> <p>The automatic wet pipe sprinkler system specification (#15501), identifies the applicable references for the design, materials, fabrication, installation, application of coating materials, inspection and testing of the automatic sprinkler and fire alarm systems for the CSB.</p> <p>DBD: Section 11, Fire Protection</p>
1530-2		Improved Risk Concept for Fire Protection Systems		
1530-2.1		General		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-2.1	435.	Fire protection shall incorporate an "improved risk" level of fire protection as directed in DOE Order 5480.7 as well as Section 0110-5, Health and Safety.	C	<p>The various rooms of the CSB Support Building are protected against fire damage through incorporation of fire walls and provision of a sprinkler system. WHC-SD-SNF-FHA-002, <i>Fire Hazard Analysis for the Canister Storage Building Storage Vaults</i>, determined that a wet pipe sprinkler system is not warranted for the operating area. The determination was based on the fact that the MPFL in the un-sprinkled area is less than \$1 Million and the absence of significant existing combustible loading, the control of transient combustible loading, the minimal benefit of a sprinkler system, and the reduced potential for moisture entering the storage tubes. This meets the "improved risk" criteria.</p> <p>The CSB was granted an exemption from the DOE Order 5480.7A requirement for a fully sprinkled building (96-SFD-320).</p> <p>HNF-SD-SNF-RPT-004, Rev. 6, section 2.7.2 DBD: section 11, Fire Protection System</p>
1530-2.2		Vital Programs		
1530-2.2	436.	Fire protection systems for <u>vital</u> programs shall incorporate a "higher standard of protection" than the "improved risk" level as directed by DOE Order 5480.7	NA	The CSB project has not been designated as a <u>vital</u> program.
1530-2.3		Maximum Possible Fire Loss		
1530-2.3.1		General		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-2.3.1	437.	The application of these criteria shall be considered by an experienced fire protection engineer.	C	The application of fire protection criteria has been subjected to oversight by experienced fire protection engineers. As an example, the structural columns and ceiling structural components in the trailer vestibule area are to be covered with insulation to protect them from damage due to a diesel fuel fire accident. DBD: Section 11, Fire Protection
1530-2.3.2		Criterion I		
1530-2.3.2	438.	Whenever the maximum possible fire loss exceeds \$1 million, automatic fire suppression systems shall be provided.	C	The CSB Support Area has an MPFL greater than 1\$ Million and is protected by a fire protection system. The CSB Operating Area MPFL does not exceed \$1 Million. (See HNF-SD-SNF-FHA-002, Rev. 2) DBD: section 11, Fire Protection System
1530-2.3.3		Criterion II		
1530-2.3.3	439.	The need for automatic fire suppression systems shall be considered when the maximum possible fire loss is below \$1 million.	C	The need for automatic fire suppression was considered for the areas outside the support area, but was not deemed warranted because of the absence of significant combustible loading, the control of transient combustible loading, the minimal benefit of a sprinkler system, and the reduced potential for moisture entering the storage tubes. This is documented in the approved 5480.7A exemption request (See 96-SFD-320). DBD: Section 11, Fire Protection
1530-2.3.4		Criterion III		

C -- compliant
 NA -- Not applicable

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1530-2.3.4	440.	Automatic fire suppression systems are not required if all of the following conditions are satisfied: <ul style="list-style-type: none"> • The maximum possible fire loss is less than \$250,000. • There is no hazard to human life. • There is no danger of a fire resulting in release of toxic or hazardous materials or emissions. • Adequate separation from other facilities is provided. • Important operations or program missions will not suffer unacceptable delays as a result of fire (see DOE 5480.7 for qualification criteria). 	C	All fire criteria in section 1530.2.3 of 6430.1A were evaluated by an experienced fire protection engineer. For criterion III, the MPFL in the Operating Area is greater than \$250,000, but it was determined in the 5480.7A exemption request that fire suppression is not warranted in the Operating Area. Automatic fire suppression is included in the Support Area.
1530-2.3.5		Criterion IV		
1530-2.3.5	441.	Whenever the maximum possible fire loss exceeds \$25 million, the area shall be subdivided with free-standing fire rated walls or suitable redundant fire protection systems to limit the credible loss to less than \$25 million even in the event the primary system fails. In no case shall the maximum loss potential exceed the \$75 million loss limit established in DOE 5480.7; failure-proof systems such as physical separations shall be provided to prevent this possibility.	NA	The MPFL for the support building is \$14.7 Million. (Ref: HNF-SD-SNF-FHA-002, Rev. 2).
1530-2.3.6		Criterion V		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-2.3.6	442.	The need for redundant fire protection systems or methods, or for supplementing existing redundant fire protection capability, shall be considered on a case-by-case basis when the maximum fire loss potential is below \$25 million.	C	The need for redundant fire protection systems or methods has been considered for those areas of the CSB where the MPFL is less than \$25 million. As reported in the Fire Hazards Analysis, a redundant fire protection system is not needed. A backup water supply and pump house is provided for the support building sprinkler system.
1530-3		Waterflow and Pressure Requirements for Fire Protection		
1530-3.1		General		
1530-3.1	443.	Total volume, pressure, and design flow rate of water necessary to provide fire protection for facilities shall be determined by the methods described in the following paragraphs.	C	<p>Subsection 11.8.3, <u>Automatic Wet-Pipe Sprinkler System</u>: The automatic wet-pipe sprinkler system is installed per NFPA 13. A hydraulic design was required for the system. NFPA 13 was used to determine water supply demand requirements for hose streams and duration. Density curves presented in NFPA 13 were used for calculating sprinkler demand for the hydraulically designed system. The system design is based on a density of 0.19 gpm for 2,500 square feet, ordinary hazard, Group 3 (water flow guideline). Determination of the adequacy of water supplies was made on the basis of actual flow test measurements gathered using methods in NFPA 13, Appendix B.</p> <p>DBD: section 11, Fire Protection</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-3.1	444.	All sprinkler or other automatic fire suppression system components shall be UL- or FM-approved for the particular application chosen.	C	Section 1.5: The design, materials, fabrication, installation, and testing of the automatic sprinkler and fire alarm system comply with the requirements listed in section 1.2 of this construction specification. All devices are listed in UL Product Directory and/or the FM Approval Guide for use in fire protection systems. Specification W-379-C-CSB-1550,1 <u>Automatic Wet-Pipe Sprinkler System</u>
1530-3.2		Occupancy Hazard Classification		
1530-3.2	445.	NFPA 13 shall be used to determine the Occupancy Hazard Classification for any facility. Light hazard occupancy rules are prohibited.	C	Subsection 11.8.3, <u>Automatic Wet-Pipe Sprinkler System</u> : Light hazard occupancy rules are not permitted for the design of this system. Occupancy Hazard Classifications were established in accordance with UBC as (H-7). This is in compliance with NFPA 13. DBD: section 11, Fire Protection
1530-3.3		Water Demands for Sprinklered Facilities		
1530-3.3.1		Schedule-Designed Sprinkler Systems		
1530-3.3.1	446.	For systems designed using schedule methods, NFPA 13 shall be used for calculating water demand in the absence of specific requirements provided by cognizant DOE fire protection authorities based on unusual occupancies or special hazards.	NA	Hydraulic design methodology was employed for the support building sprinkler system. See statement #443.
1530-3.3.2		Hydraulically Designed Sprinkler Systems		

C -- compliant
NA -- Not applicable

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1530-3.3.2	447.	NFPA 13 shall be used to determine water supply requirements for hose streams (gpm) and duration (min).	C	Density curves presented in NFPA 13 were used for calculating sprinkler demand for the hydraulically designed system. The system design is based on a density of 0.19 gpm/ft ² for 2,500 square feet, ordinary hazard, Group 3 (water flow guideline). Determination of the adequacy of water supplies was made on the basis of actual flow test measurements gathered using methods in NFPA 13, Appendix B. See statement #37 443 above.
1530-3.3.2	448.	For ordinary hazard occupancies and above, hose stream requirements shall be a minimum of 500 gpm regardless of the hose stream demands listed in the above references unless otherwise specified by the DOE project criteria.	C	Hose stream supply from fire hydrants is in excess of 500 gpm for the CSB. Periodic testing of the fire hydrants is performed by the Fire Department with all hydrants typically testing greater than 1000 gpm. See FHA.
1530-3.3.2	449.	Determination of adequacy of water supply shall be made on the basis of actual flow test data gathered using the methods in NFPA 13, Appendix B.	C	Subsection 11.8.3, <u>Automatic Wet-Pipe Sprinkler System</u> : The determination of the adequacy of water supplies was made on the basis of actual flow test measurements gathered using methods in NFPA 13, Appendix B. See CSB DBD, Section 11, Fire Protection
1530-3.3.3		Fire Hydrant Demand		

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1530-3.3.3	450.	Where reliance is placed on fire department response, either for protection of unsprinklered buildings or where the fire department will serve as redundant (backup) protection, as a general rule the water supply should be adequate to supply at least 0.03 gpm per cubic foot of fuel (building and contents) in the largest fire area (for high-BTU-content fuels, convert to equivalent ordinary BTU loads). This water supply should be available at 20 psig residual pressure at the hydrants.	C	Combustible material is limited in the building and the building structure is of non-flammable and fire retardant materials. The 6" water supply line at 100 psig provides an adequate supply of water for the sprinkled fire protection system in the support building. The design water flow rate of 0.19 gpm/2500 ft ³ exceeds the minimum 0.03 gpm/ ft ³ of fuel.
1530-4		Automatic Sprinkler Protection		
1530-4.1		General		
1530-4.1	451.	All sprinkler systems shall comply with NFPA 13.	C	The automatic wet-pipe sprinkler system for the CSB support building is installed in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems."
1530-4.2		Types of Sprinkler Systems		
1530-4.2	452.	Sprinkler systems shall normally be wet pipe using pipe schedule sizes listed in NFPA 13 for ordinary installations.	NA	The sprinkler system for the CSB support building was hydraulically designed in accordance with NFPA 13.
1530-4.2	453.	The system shall be hydraulically designed where residual pressure is marginal, water application rate is high, response time is critical, or special risks are involved.	C	The sprinkler system for the CSB support building employed hydraulic design in accordance with NFPA 13. See # 443.

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1530-4.2.3		Preaction		
1530-4.2.3	454.	A preaction system shall be used where it is particularly important to prevent the accidental discharge of water. Need for a preaction system shall be based on review by and recommendation of a professional fire protection engineer. The detection system chosen to activate the preaction valve shall have high reliability and a separate alarm/supervisory signal to indicate status.	NA	<p>The support building is separated from the operating structure such that an accidental discharge of water in the support building will not affect the operations area. A preaction system is not needed in the support structure because excessive water damage to the building and its contents is not expected to result from sprinkler system activation.</p> <p>The fire protection engineer identified no need for preaction system.</p>
1530-5		Special Protection Systems		
1530-5.1		General		
1530-5.1	455.	Special protection systems may be used to extinguish or control fire in easily ignited, fast burning substances such as flammable liquids, some gases, and chemicals. They shall also be used to protect ordinary combustibles in certain high-value occupancies especially susceptible to damage. 472Special protection systems supplement automatic sprinklers as described by NFPA and shall not be used to substitute for them except where water is not available for sprinkler protection.	NA	<p>There are no fast burning substances within the CSB requiring additional special protection systems. Uranium and plutonium metals, which under special circumstances could be considered relatively fast burning, are contained within the MCOs and are not available as fuel for a fire.</p>
1530-5.2		Types of Special Suppression Systems		
1530-5.2.1		Water Spray		

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1530-5.2.1	456.	Installation of water spray systems shall comply with NFPA 15.	NA	The sprinkler system in the support building is not a special suppression water spray system.
1530-5.2.2		Carbon Dioxide		
1530-5.2.2	457.	[Carbon dioxide] agent quantity requirements and installation procedures shall comply with NFPA 12.	NA	The CSB has no carbon dioxide fire suppression system.
1530-5.2.3		Dry Chemical		
1530-5.2.3	458.	[Dry chemical] systems shall comply with NFPA 17.	NA	The dry chemical hand operated portable fire extinguishers installed in the CSB comply with NFPA 10 as required in 1530-7. The CSB does not have a requirement for a dry chemical fire suppression system.
1530-5.2.4		Foam		
1530-5.2.4	459.	Foam systems shall comply with NFPA 11, 11A, 16, 16A, and NFPA 409.	NA	The CSB does not have a permanently installed foam fire suppression system. Foam may be used by firefighters who bring such equipment with them.
1530-5.2.5		Halon		
1530-5.2.5	460.	The installation of Halon 1301 systems and Halon 1211 systems shall comply with NFPA 12A and NFPA 12B, respectively.	NA	The CSB does not have any Halon fire suppression systems.
1530-6		Standpipes and Hose Systems		

C -- compliant
 NA -- Not applicable

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-6	461.	Installation of standpipe systems shall comply with NFPA 14.	NA	There is no standpipe/hose system at the CSB.
1530-7		Portable Fire Extinguishers		
1530-7	462.	Portable fire extinguishers shall comply with NFPA 10.	C	The portable (hand-held) fire extinguishers comply with NFPA 10.
1530-8		Fire Detection and Alarm Systems		
1530-8.1		General		
1530-8.1	463.	All fire detection and alarm devices shall have UL-listed components or be FM-approved.	C	All fire detection and alarm devices are listed as UL or approved by FM.
1530-8.1	464.	Devices and systems shall comply with NFPA 71, NFPA 72A, NFPA 72B, NFPA 72C, NFPA 72D, NFPA 72E, NFPA 72F, NFPA 72G and NFPA 72H as applicable.	C	The fire detection systems and alarm devices comply with applicable NFPA 71 and NFPA 72 requirements.
1530-8.2		Alarm Systems		
1530-8.2.1		General		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-8.2.1	465.	<p>Fire alarm systems shall have the following basic features:</p> <ul style="list-style-type: none"> • Transmission of signals to the DOE facility fire department alarm center and other constantly attended locations in accordance with the appropriate NFPA Signaling Systems Standard • Local alarms for the building or zone in alarm • Trouble signals as required by the appropriate NFPA Signaling Systems Standard • Emergency battery backup for system operation • Electric supervision of all circuits as required by the appropriate NFPA standard • Supervisory devices for all critical functions (valve position switches, water level, temperature) • Capability of annunciating at least three separate conditions: 1) a fire alarm, 2) a supervisory alarm, and 3) a trouble signal indicating a fault in either of the first two. Annunciation of each condition shall be separate and distinct from the other two. 	C	<p>The fire alarm system complies with the requirements of NFPA 72 and includes fire detection devices, and both local and remote alarms. A very early smoke detection alarm (VESDA) system draws air from the upper portion of the operating area through plastic piping and detects smoke. The fire alarm system can also be activated by a manual pull box. These fire alarm signals and a sensor on the water supply line for the automatic water sprinkler system send fire alarm signals to a central fire alarm control panel. The central fire alarm control panel activates the building fire gong systems and transmit a radio signal to the fire department. The central fire alarm control panel also indicates trouble alarm and supervisory signals locally and communicates these signals to the central fire station.</p> <p>The local alarm is a fire gong warning building occupants that a fire has been detected and to evacuate the building.</p> <p>The fire alarm system receives electrical power from the normal electrical distribution system and also has a battery-powered backup. The battery backup system provides short term power during loss of normal power.</p>
1530-8.2.1	467.	Fire alarm systems for new DOE buildings shall be compatible with those for the DOE complex where the new building is to be located.	C	The CSB fire alarm system is compatible with the other Hanford Site fire alarm systems.
1530-8.2.2		Alarm Actuating Devices		

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1530-8.2.2	468.	Alarms that respond to flow of water shall be provided wherever a sprinkler system is installed and shall comply with requirements of the NFPA standard for the type of signaling system used.	C	Note response to # 465.
1530-8.2.2	469.	A manual fire notification method such as manual fire alarm boxes shall be provided and located in accordance with the appropriate NFPA standard.	C	Manual pull box is provided. Note response to # 465.
1530-8.2.2	470.	Combined watch reporting and fire alarm systems, if used, shall be in accordance with the appropriate NFPA standard.	C	Alarm systems for the CSB are in place. See item # 465. If the fire alarm system is shut down or there is a loss of power, the emergency procedure provides for fire watch reporting using the appropriate NFPA standard.
1530-8.3		Automatic Fire Detection Systems		
1530-8.3.1		General		
1530-8.3.1	471.	Automatic fire detectors shall comply with NFPA 72E. Detector spacing shall be in accordance with NFPA 72E, Appendices A, B, and C.	C	Note response to # 465. Detector spacing is in compliance with NFPA 72E.
1530-8.3.4		Smoke Detectors		

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1530-8.3.4	472.	Smoke detectors shall be installed in all areas where required by the appropriate NFPA standard or by the cognizant DOE fire protection authority. Smoke detectors shall be of a type operating on one of the principles described in NFPA 72E. Location and required spacing of smoke detectors shall be determined by the methods of NFPA 72E and its Appendix C. Spacing shall be based upon threshold fire size, fire growth rate, and ceiling height as described in these standards.	C	Note response to # 465.
1530-9		Water Storage and Distribution		
1530-9	473.	Wherever practical, dedicated fire water storage and distribution systems shall be used. If a dedicated fire water supply system cannot be provided, the fire protection water supply shall assure availability regardless of simultaneous process and domestic water usage.	C	The water supply line for the CSB is a 6" pipe connected to a 10" fire water main. The fire water main is part of the fire water supply system for the Hanford Site using a pumping system at the East Area power house. The fire water main is a loop system supplying fire water to all of the major buildings in the 200 East Area.
1530-9	474.	Where automatic sprinkler systems or standpipes are fed from a potable water system, approved check valves shall be installed in sprinkler lead-ins to preclude the introduction of pollutants from systems or recirculation of stagnant water that would contaminate the domestic water system.	NA	The fire water supply line for the CSB uses water from the 10" fire water main line; this is not connected to the potable water system.

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1530-9	475.	Fire mains (except those supplying a single hydrant or extensions of existing smaller mains) shall be at least 8 inches. Mains shall be sized to supply the largest fire demand plus the largest domestic and process demand with consideration for residual sprinkler system pressure requirements.	C	The fire water main near the CSB is a 10" pipe. Considering the limited amount of combustibles within the CSB, the fire water supply is adequate for the support building.
1530-9	476.	Sprinkler supply lead-ins should be at least 6 inches, except lead-ins of 4 inches may be used for very small sprinkler systems when substantiated by hydraulic calculations. In no case shall the lead-in be smaller than the sprinkler riser.	C	The sprinkler lead-in is a 6" pipe.
1530-9	477.	Where combined fire and domestic-process water systems are used, the supplies to each building shall be arranged and valved so that the domestic and process systems can be shut down without shutting off the fire system supply.	NA	The fire water system supplies fire water only for the fire sprinkler system.
1530-9	478.	Outside control valves that can be locked open shall be provided on each supply lead-in, located if possible a minimum distance of 40 feet from the building.	C	The outside raw water control valve (fire water system makeup) is located approximately 140 feet north of the CSB with bollards located adjacent to the post indicating valve to protect the valve from inadvertent collision with off-road vehicle traffic.
1530-9	479.	Key-operated buried valves shall not be used for sprinkler control valves. In no case shall there be more than one valve controlling a sprinkler supply lead-in.	C	The post indicating control valve operator is located above ground.

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1530-9	480.	All lead-ins shall be connected with the sprinkler system at the base of the riser. Alarm valves shall be located as close as practical to the building entry point.	C	The lead-in line is connected to the base of the control valve and the alarm valve is located just inside the support building.
1530-9	481.	Hydrants shall be provided so that hose lays from hydrants to all exterior portions of a protected building are no more than 300 feet. Hydrants shall not be closer to buildings than 50 feet.	C	Three fire hydrants located near the CSB are between 80 and 130 feet from the buildings.
1530-99		Special Facilities		
1530-99.0		General		
1530-99.0	482.	An assessment shall be made early in the design or modification to determine the facility structures, systems, and components that shall be protected against the effects of a DBF and explosion.	C	A fire protection requirements assessment was made early in the design of the CSB by a competent, experienced fire protection engineer. The design that was built was based on that early assessment. (Ref: CSB DBD, Section 11, Fire Protection).
1530-99.0	483.	A fire protection engineer or person knowledgeable in applying the principles of fire protection shall develop the fire protection system.	C	Knowledgeable fire protection engineers from WHC, FDI, ARES, and Hughes Associates, developed the fire protection system. The fire protection design was reviewed by the Hanford Fire Marshall. See item # 437.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-99.0	484.	To maximize the protection against fire, the system shall contain an appropriate integration of fire prevention, detection, and suppression features.	C	Fire prevention features of the CSB design include wiring to meet NEC requirements, minimization of flammable or combustible materials, and the provision of fire-rated doors and walls between the Operating and Support areas. Fire suppression is achieved by a wet pipe sprinkler system in the Support area and hand-held fire extinguishers in the Operating area. Note response to # 465 for a discussion of detection features.
1530-99.0	485.	Fire protection systems shall not: (1) prevent a facility from achieving and maintaining a safe shutdown condition, (2) prevent the mitigation of DBA consequences, or (3) cause an inadvertent nuclear criticality.	C	The fire protection system provided is compliant with these requirements. The fire protection automatic sprinkler system in the support building is designed to suppress fires detected in the support area and notify the central fire station. This system provides for a safe shutdown condition and mitigates the potential loss if a DBA causes a fire. Fire water is prevented from entering the operating shelter.
1530-99.0	486.	Total reliance shall not be placed on a single fire suppression system. Appropriate backup capability shall be provided.	C	The fire water loop system includes two sources of water to the fire hydrants and sprinkler system. These sources are the 200E fire water supply and the CSB Fire Water Pump House. The described in #465 and the close-by central fire station provides backup fire-fighting backup -capability. The wet pipe system in the support building is supplemented by hand held fire extinguishers.
1530-99.0	487.	To ensure that redundant safety class components shall be capable of performing the necessary safety functions, the facility design shall provide appropriate separation against fire, explosion, and failure of fire suppression systems.	C	Subparagraph 5.16.1, <u>Safety Classification</u> , states that redundant circuits serving Safety Class and Safety Significant equipment are physically and electrically separated. There are no Safety Class or Safety Significant circuits for which redundancy and separation is required because all such functions fail safe upon loss of power. DBD: Electrical, section 5, subsection 5.16

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1530-99.0	488.	Fire protection systems, or portions of them, that must function to control effects of a DBA event (as determined by safety analysis accident scenarios) shall be designed to be functional for all conditions included in the accident scenario. This shall include both the event initial cause and its consequences.	C	Subsection 11.3.2 states that all design basis accidents are considered in the design of any Safety Class or Safety Significant fire protection system. The fire protection systems in the CSB are General Service as determined in the CSB Safety Analysis. It is not required to operate during or after a DBA. (Ref: HNF-3553, Chapter A3) 1.) DBD: Fire Protection System, section 11 2.) DBD: Safety Design, section 3
1530-99.0	489.	The operation or failure of a fire protection system that interfaces with a safety class system such as a safety class water system, shall not prevent the safety class system from completing its safety functions when required.	NA	The CSB fire protection system does not interface with safety class systems. The failure of the fire protection system (sprinklers in support building and VESDA in operating area) cannot prevent safety class equipment from fulfilling its safety function.
1530-99.0	490.	Confinement systems, particularly the building structural shell and its associated ventilation systems, shall be designed with the capability of retaining the confinement function during the DBF.	C	The DBF does not challenge the building structural shell or associated ventilation systems. Required confinement functions will be maintained. In their confinement role, the building shell and building ventilation system are defense-in-depth. (Ref: HNF-3553, Chapter A2, Section A2.6)
1530-99.0	491.	When the use of water sprinkler coverage is precluded because of nuclear criticality or other hazards, non-aqueous extinguishing systems (i.e., inert gas, carbon dioxide, high-expansion foam, or halogenated organics) shall be used.	NA	No fire suppression system is required in the CSB in areas where sprinklers are not installed. Also, note response to #435.

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1530-99.0	492.	Fire protection systems shall be designed so that the failure of any component (equipment or control device) shall not disable the entire fire protection system.	C	The fire protection systems (sprinklers in the support building & VESDA in the operating area) incorporate appropriate redundancy and protection against single failures disabling the systems in their entirety. These systems are General Service and do not have Safety Class or Safety Significant protective functions. Note response to #465.
1530-99.0	493.	Fire protection systems and components shall have fail safe features and audible and visual alarms for operability and trouble indications.	C	Appropriate alarms and trouble indicators are provided with the systems. Note response to #465.
1530-99.0	494.	An emergency source of electric power shall be provided to operate fire protection systems. Fire protection systems shall be capable of operating during a normal power outage. The emergency power sources and the electrical distribution circuits shall have independence and testability to ensure performance of their safety functions assuming any single failure.	C	The fire protection system is General Service. The fire protection system is supported by a battery backup power system so that it remains functional in the event of a power failure for up to 48 hours. The battery backup is not "emergency power" in the safety class sense.
1530-99.0	495.	The designers of the fire protection system shall consider the fire and explosion potential of the materials being processed and the solvents used during processing. In addition, the design shall include facility-specific fire protection systems to mitigate the damage from pyrophoric and other materials that are fire hazards, (e.g., magnesium, ion exchange resins, nitrate solvent and nitrate reduction reactions, and zirconium fuel element cladding hulls).	C	<p>The FHA addresses potential sources of fire in the CSB. The CSB contains no unusual fire hazards requiring special fire protection systems beyond the sprinkler system for the support building and the VESDA for the operating area.</p> <p>No processing takes place in the CSB operations. Uranium metal, which under special circumstances could be considered pyrophoric is contained within the sealed MCO and is not available for a fire as fuel.</p>

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1530-99.0	496.	Automatic water sprinkler coverage shall be provided throughout the facility except in areas where nuclear criticality or other hazards specifically preclude its use or where Halon systems are required to reduce equipment damage.	C	Automatic sprinkler system is provided in the support building. See FHA. Note response to #435.
1530-99.0	497.	The water supply for the permanent fire protection installation shall have a minimum of two reliable, independent sources each with sufficient capacity (based on maximum demand) for firefighting until other sources become available. Only one of these two sources shall be required to be DBE qualified.	C	<p>The two fire water supplies are the tie-in to the 200E fire water system at 4th street and the pump house and tank originally constructed for HWVP.</p> <p>Neither of the two fire water supply systems is DBE qualified. An exemption to this requirement was given by DOE-RL in 1992 for this system on the basis that it was not a Safety Class 1 fire protection system. This is still the case and the value of the protected facilities is much lower than was the case for HWVP.</p>
1530-99.0	498.	<p>To protect the integrity of process confinement systems, fire protection systems shall include the following features:</p> <ul style="list-style-type: none"> • Automatic and redundant fire detection devices • A fire-extinguishing system to rapidly remove heat produced by fire to prevent or minimize the pressurization of a process confinement and to rapidly extinguish a fire to minimize the loading of ventilation system filters with combustion products • The introduction of the extinguishing agent in a way that does not result in overpressurization of the confinement barriers 	NA	The quantities and fire loadings of combustibles in the Sampling/Weld station, the MHM, the tube vent and purge cart, and the cask servicing system (service station gantry crane, mobile service station tent, and cask servicing system) were evaluated in the FHA. The calculations show that these systems in the operating shelter have insufficient fire loading to cause structural damage to any structural members. Further, the distance from these materials to any building structural members removes concern over radiant heat damage.

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1530-99.0	499.	Where fire barriers are penetrated by the confinement system's ventilation ducting, fire dampers shall be appropriately used to maintain the barrier integrity. However, the closure of such dampers shall not compromise the functions of the confinement system where the loss of confinement might pose a greater threat than the spread of fire. In such cases, alternative fire protection means (e.g., duct wrapping) shall be used as a substitute for fire barrier closure. In no case shall a sprinkler system (including safety class sprinklers) be considered a fire barrier substitute.	C	<p>Subsection 11.10.3, <u>Fire Doors and Fire Damper</u>, All closable openings in firewalls and ventilation systems penetrating rated fire separations are provided with fire doors or fire dampers of the appropriate ratings.</p> <p>Fire dampers are tested in accordance with the requirements of ASTM E-119 and listed by Underwriters Laboratories or approved by Factory Mutual. Fire dampers are provided only where closure has not prevented the functioning of safety class systems in fire rated separations necessary for confinement. Operation is made by thermal link or automatically from the fire protection system.</p> <p>DBD: section 11, Fire Protection System</p>
1530-99.0	500.	Where the risk of uranium or plutonium metal fire is high, the operator shall be provided with a supplementary capability to extinguish a fire (e.g., dousing with carbon microspheres or magnesium oxide sand).	NA	Uranium and plutonium are part of the spent fuel contained in the MCO. The MCO has been back-filled with helium and the MCO temperature is maintained below the ignition temperature by the CSB passive cooling system. A supplementary fire suppression capability is not needed.
1530-99.0	501.	Because of flammable or potentially flammable atmospheres, electrical installations in hazardous process locations shall be designed to preclude the introduction of any ignition source by the electrical equipment.	NA	There are no hazardous process locations in the CSB where potentially flammable atmospheres exist.
1540		Plumbing/Service Piping		
1540-1		Plumbing		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1540-1.5		Safety Devices		
1540-1.5	502.	As directed by project criteria, emergency eye washes, emergency showers, or combination emergency eye wash-showers shall be provided where corrosive or other skin or eye irritant chemicals are stored, handled, used, or dispensed.	C	A portable self-contained shower permanently installed in the support area provides for personnel working in the CSB.
1540-1.5	503.	Equipment shall comply with ANSI Z358.1 and be serviced by the potable water system.	C	Eyewash and portable decontamination shower use self-contained water supplies. The CSB is not connected to a potable water supply. The portable (but permanently installed) self-contained shower and eyewash station complies with ANSI Z358.1 .
1540-1.5	504.	Backflow preventers and air gaps shall be used to prevent cross-connection (contamination) of potable water supplies. Vacuum breakers (to prevent back-siphonage) shall be used only in conjunction with administrative control.	NA	The CSB has no potable water supply.
1540-99		Special Facilities		
1540-99.0		Nonreactor Nuclear Facilities - General		
1540-99.0.2		Water Collection System		

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1540-99.0.2	505.	Collection systems shall be provided for water runoff such as from fire fighting activities from areas within special facilities containing radioactive material.	NA	A collection system for water run-off is not needed for the CSB because there is no radioactive material that would come in contact with water. The CSB site has been evaluated and found capable of diverting water from the probable maximum precipitation event away from the facility. Fire fighting water sprayed into the operations area of the facility would run away from the deck over the SNF in MCOs because it is slightly graded to the edges. Sprinkler water discharged into the support building will flow out of the doorways. There are no water lines in the CSB.
1540-99.0.2	506.	Nuclear criticality prevention (if necessary), confinement, sampling, volume determination, and retrievability of liquids and solids shall be provided for in the design of collection systems.	NA	The MCO provides the primary criticality protection for the contained materials. The SAR (Chapter 6A) has indicated that criticality in the CSB is not a credible event.
1540-99.0.2	507.	The size of the collection system for firefighting water shall be based on the maximum amount of water that would be collected in fighting the DBF.	NA	See statement #505 above. There is no engineered fire water collection system.
1540-99.0.2	508.	The configuration of the system components shall be based on conservative assumptions as to the concentration of fissile or other materials capable of sustaining a chain reaction that might collect in the system.	NA	See statement #506 above. The potential for collection of fire water in the vault is not a criticality concern.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1540-99.0.2	509.	For facilities that process, handle, or store fissile or other material capable of sustaining a chain reaction, the water runoff collection system shall be designed with the following nuclear criticality safety considerations: <ul style="list-style-type: none"> • The maximum material mass loading that could be in the runoff system. • The most disadvantageous material concentrations, particle size, and material dispersion in the water slurry. • The change in concentration of material and geometric configuration of the slurry as the particulate matter settles out of the water. 	NA	The collection of water runoff is not a criticality safety concern for the CSB even when the vault is fully flooded. See statement #506 above
1540-99.0.3		Other Collection Systems		
1540-99.0.3	510.	Safety shower water and personnel decontamination shower water shall drain to the contaminated process wastewater system.	C	The CSB has a portable, self-contained personnel decontamination safety shower located in the support area; there is not a piped water supply to the shower. The water for the shower will be added batch-wise to a fresh water tank that is part of the shower system. The shower does not drain to a contaminated process waste water system. Water used in the portable shower is collected in a holding tank, pumped into drums and transferred away from the CSB to the Treated Effluent Disposal Facility in the 200 East Area for disposal.
1540-99.0.4		Equipment Operability Qualification		

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1540-99.0.4	511.	Testing or a combination of testing and analysis shall be the preferred method of demonstrating the operability of fluid system components, mechanical equipment, instrumentation, and electrical equipment that are required to operate during and following a DBE.	C	This requirement only applies to the seismic detection and MHM power disconnect system (Ref: HNF-3553, Section A4.3.14). Simulation of seismic motion effects on the safety class MHM power disconnect components are used to qualify the equipment's operability during a DBE.
1540-99.0.5		Water Supplies and Other Utility Services		
1540-99.0.5	512.	The design of each utility service or cooling water system shall consider the demands for normal operations, anticipated operational occurrences, and DBA conditions.	C	All of these demands have been considered (as noted in HNF-3553, Chapter A3). No utility services provide a safety related function or are required to survive all DBAs.
1550		Heating, Ventilating and Air-Conditioning Systems.		
1550-1		General Sizing and Design Criteria		
1550-1.5		Ventilation-Exhaust system Design Requirements		
1550-1.5.5		Industrial Ventilation Requirement		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-1.5.5	513.	Industrial type facilities and laboratories shall be provided with ventilation (supply and exhaust) systems as required for heat exposure control, or dilution ventilation. Ventilation air shall be provided in the quantities required to maintain OSHA air quality limits, all the PELs established by 29 CFR 1910 and all ACGIH TLVs.	C	The CSB HVAC system provides ventilation and air conditioning for the operating area and the support area. The design ventilation rates are 44,000 ft ³ /hr (733 ft ³ /min) for the operating area and 3,100 ft ³ /min for the support area. These flows are sufficient to maintain all PELs and ACGIH TLVs below their OSHA limits.
1550-1.5.5	514.	Design air quantities and transport velocities shall be calculated according to the calculation methods prescribed by the ASHRAE Systems handbook, the ASHRAE Application handbook, the ACGIH Industrial Ventilation Manual, 29 CFR 1910, and NFPA 45.	C	<p>The CSB HVAC system is classified as general service because no known or expected radiological or toxicological wastes are mitigated by the HVAC system. The HVAC system functions by drawing air inward from outside the building to sweep any potential contaminants into the HVAC discharge HEPA filters for containment.</p> <p>The system has been designed to meet ASHRAE 62 indoor air quality standards, 29 CFR 1910, and NFPA 45 standards (fire protection for laboratories using chemicals), and also meets ACGIH requirements.</p>
1550-1.5.5	515.	Makeup air shall be provided in the quantities required to maintain required positive or negative room static pressure requirements and to offset local exhaust air quantities. Makeup air shall be tempered.	C	The CSB HVAC system draws outside air through filtered air handlers where the air is cooled in the summer time and heated in the winter time to maintain a comfortable working environment in all areas of the facility. The support area is maintained at a positive pressure with respect to the operating area for confinement of potential hazardous airborne contaminants.
1550-1.5.6		Local Exhaust Systems		

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1550-1.5.6	516.	Local exhaust systems shall be designed to maintain the required capture air velocities for source containment control. Air quantities and transport shall be calculated based on the calculation methods prescribed by the ASHRAE systems handbook, the ASHRAE Applications handbook and the ACGIH Industrial Ventilation Manual.	C	Local exhaust systems (tent enclosure, and sample and weld hoods) are designed to maintain the required capture air velocities for source containment control. Note response to # 514.
1550-1.5.7		Equipment Room Ventilation		
1550-1.5.7	517.	Mechanical and electrical equipment rooms shall be exhausted so that room temperature does not exceed NEMA equipment ratings. DOE project criteria shall provide the space temperature limit criterion. Where mechanical ventilation cannot maintain a satisfactory environment, evaporative cooling systems or other mechanical cooling systems shall be provided.	C	The CSB mechanical and electrical equipment rooms are provided with HVAC. The Design Basis Document (DBD) references HPS-SDC-5.1 for recommended temperature and humidity limits. The exhaust design for the equipment rooms is based on maintaining temperatures below levels that challenge NEMA equipment ratings. Evaporative cooling is not required. The temperature control range for these rooms is 55F to 95F. NEMA equipment temperature range for sensitive electronic equipment is 58F to 104F. A review of the installed equipment shows that there are no instruments/equipment in the CSB that would be effected with a room temperature of 55F. Note response to # 515.
1550-2		Heating, Ventilation, and Air-Conditioning Systems Selection		
1550-2.5		Air Handling and air Distribution Systems		
1550-2.5.5		Air Cleaning Devices		
1550-2.5.5		<u>High-Efficiency Particulate Air Filters</u>		

C -- compliant
NA -- Not applicable

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1550-2.5.5	518.	HEPA filter assemblies shall comply with ASME N509.	C	The HEPA filter assemblies comply with ASME N509. Periodic changing of the HEPA filters occur based on filter differential pressure or radiation data. Filter efficiency testing is performed periodically.
1550-2.5.5	519.	HEPA filtration systems shall be used to minimize the release of particulate contaminants such as carcinogens, infectious agents, radioisotopes, or highly toxic materials when determined by safety analysis to be necessary.	C	Subparagraph 6.3.4.1, <u>Filtration Requirements</u> , HEPA filtration or equivalent filtration systems are used for areas handling potentially radioactive particulates to minimize the exposure to personnel or the environment. Exhaust ventilation systems are provided with HEPA filtration to minimize the release of hazardous materials through the exhaust path. DBD: section 6, HVAC
1550-2.5.5	520.	The design professional shall design for a location that facilitates in-place testing of HEPA filters, with particular attention given to plenum hardware provisions that allow for testing of the HEPA filter bank without requiring the testing personnel to enter the plenum. Utility services shall be extended to the plenum location (e.g., electrical receptacles and compressed air) to facilitate testing work.	C	Diethyl phthalate (DOP) ports are provided upstream and downstream of the HEPA filters to test the filters for entrapment efficiency of airborne particulates. Testing personnel are not required to enter the plenum. Testing is done after the HEPA filter has been isolated from the normal vent flow. DOP forms an airborne particulate as it is injected into the upstream port and particulates not captured by the HEPA are sensed by a downstream sensor inserted into the downstream port. The sensor measurement is converted to a filter efficiency value. HEPA filters not meeting the standard are replaced.

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1550-2.5.5	521.	In-place testing design requirements shall meet all the recommendations of UL 586, ASME N510, and ERDA 76-21.	C	The design of the CSB HEPA filter assemblies and enclosures include DOP test ports in accordance with ASME N510. HEPA filter elements comply with ASME AG-1, Division II, Section FC, <i>Code on Nuclear Air and Gas Treatment</i> . HEPA filter element compliance to UL 586 is accomplished through compliance with ASME AG-1. ERDA 76-21 is referenced in the Design Basis Document for the CSB (DBD). Design guidance contained in ERDA 76-21 is reflected in the CSB design philosophy as demonstrated by the presence of upstream test sections for multiple filter elements to verify and ensure uniformity of challenge aerosol mixing.
1550-2.5.5	522.	HEPA filtration systems shall be designed with prefilters installed upstream of HEPA filters to extend the HEPA filter's life.	C	Outside air flows through pre-filters installed in the CSB HVAC air pathway to remove larger airborne particulates before the air reaches the HEPA filters.
1550-2.5.5		<u>Air Cleaning Devices for Special Application</u>		
1550-2.5.5	523.	Absorbers for nuclear or toxic applications should comply with ERDA 76-21, ASME N509, and ASME N510.	NA	The CSB design does not require absorbers for nuclear or toxic applications.
1550-2.5.5		Fire Protection of HEPA Filter Assemblies		

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1550-2.5.5	524.	In providing fire protection for the HEPA filters, the design shall separate prefilters or fire screens equipped with water spray sufficiently from the HEPA filters to restrict impingement of moisture on the HEPA filters. Under conditions of limited separation, moisture eliminators or other means of reducing entrained moisture shall be provided.	NA	The CSB does not have water sprayed prefilters or ember screens.
1550-2.5.5	525.	The HEPA filter fire protection system shall be activated in a manner consistent with the fire protection system in the room or building in which the filters are located and as directed by the cognizant DOE fire protection authority.	C	Automatic, fusible-link fire dampers and duct-mounted smoke detectors provide for worker safety. Fire dampers are spring-loaded, duct-mounted collapsible dampers that automatically extend and seal off the HVAC ducts when the air temperature melts the fusible link. Fire dampers and smoke detectors are placed to alert operators of a fire, send a fire alarm signal to the central fire station and to limit air flows. These controls minimize air flow to the fire. The operating area, during a fire, is maintained at a negative pressure with respect to the support area and the outside atmosphere.
1550-2.5.6		Ductwork Systems		
1550-2.5.6	526.	Ductwork systems shall be designed to meet the leakage rate requirements of SMACNA HVAC Air Duct Leakage Test Manual.	C	HVAC ductwork for the CSB is designed to meet SMACNA leakage requirements. (Ref: HNF-3553, Section A2.7.2). CSB Specification Section 15840, Ductwork and Accessories

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1550-2.5.6	527.	Ductwork, accessories, and support systems shall be designed to comply with the following: - ASHRAE Fundamentals handbook - SMACNA HVAC Duct Construction Standards - Metal and Flexible - SMACNA Fibrous Glass Duct Construction Standards - SMACNA Round Industrial Duct Construction Standards - SMACNA HVAC Duct Design Manual - ACGIH Industrial Ventilation Manual - NFPA 45 - ERDA 76-21	C	The ductwork, accessories, and support systems are designed to comply with SMACNA duct construction standards, the SMACNA HVAC duct design manual, and the SMACNA round industrial and fibrous glass duct construction standards, ASHRAE fundamentals handbook, NFPA 45, and ERDA 76-21. (Ref: HNF-3553, Section A2.7.2).
1550-2.5.6	528.	Ductwork shall also be designed to comply with NFPA 90A, including specification and installation of smoke and fire dampers at fire wall penetrations and smoke pressurization/containment dampers as required for smoke pressurization/evacuation systems.	C	The ducting is designed to comply with NFPA 90A standards for energy conservation in a new building.
1550-2.5.6	529.	Fire dampers shall not be used on exhaust system ducting if it is required to maintain confinement of hazardous materials during and after a fire event.	NA	Note response to # 525. The HVAC system is not relied on for confinement during or after a fire event. (Ref: HNF-3553, Section A2.7.2).
1550-2.5.6	530.	Exhaust ductwork shall comply with NFPA 91.	C	The CSB HVAC system complies with NFPA 91 exhaust and air blower standards. (Ref: HNF-3553, Section A2.7.2).
1550-2.5.6	531.	Ductwork shall be designed to resist corrosive contaminants if present.	NA	The CSB does not process or handle corrosive contaminants.

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1550-2.5.6	532.	Ductwork thermal insulation shall comply with ASHRAE Standard 90A. Ductwork shall be acoustically insulated to meet acceptable noise criteria.	C	ASHRAE Standard 90A, energy conservation in new building design, was used in designing the ductwork and ductwork insulation. Noise level measurements after construction verified that the design meets noise criteria.
1550-2.5.6	533.	Ductwork systems shall have testing and balancing dampers and accessories specified and installed as discussed in Section 1550-3.2, Testing and Balancing Devices.	C	The CSB HVAC design provides testing and balancing dampers and accessories. See item # 535. (Ref: HNF-3553, Section A2.7.2). CSB Specification Section 15840, Ductwork and Accessories
1550-3		Testing, Adjusting and Balancing		
1550-3.1		System Performance Tests		
1550-3.1	534.	The design professional shall specify system performance tests for mechanical air distribution and HVAC water distribution systems to verify compliance with DOE project criteria. These tests shall be performed by an independent AABC testing organization in accordance with the guidelines contained in ASHRAE Systems handbook and AABC Volume A-82 or by others as dictated in project-specific criteria.	C	The CSB HVAC design media specifies and requires HVAC system performance tests. Testing of the CSB HVAC design was performed by Penn-Air, an independent AABC testing contractor. The CSB does not have any HVAC water distribution systems.
1550-3.2		Testing and Balancing Devices		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-3.2	535.	HVAC air and water distribution systems shall be provided with permanently installed calibrated testing and balancing devices and access as needed to accurately measure and adjust water flows or air flows, pressures, or temperatures as required. The design professional shall provide as a minimum the balancing devices in Table 1550-3.2a and Table 1550-3.2b, (DOE 6430.1A). Test devices shall be located and installed according to AABC Volume A-82.	C	The CSB HVAC design requires balancing devices. This includes a combination of manually adjustable dampers, air flow controllers and temperature monitoring and controlling devices. The instruments are calibrated periodically. These devices, including dampers and test ports, meet the minimum requirements of Table 1550-3,2a. The CSB design does not have water or steam distribution systems. CSB Specification Section 15840, Ductwork and Accessories
1550-99		Special Facilities		
1550-99.0		Nonreactor Nuclear Facilities - General		
1550-99.0.1		General Ventilation and Offgas Criteria		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.1	536.	These criteria cover ventilation and offgas systems, or portions of them, that are classified as safety class items in accordance with Section 1300-3.2, Safety Class items.	NA	There are no safety class (SC) HVAC systems at CSB. The exhaust system for the sample/weld hoods is safety significant because airflow must be established before sampling can be initiated. The other exhaust systems are classified as General Service because they are not required to prevent or mitigate an accident or to operate after an accident and provides only a limited function in protecting the facility worker from industrial and radiological hazards. Failure of the Operating Area (OA) HVAC subsystem may allow the air temperature in the OA to become unacceptable for working over the deck for long periods of time, but no significant releases will result from failure of the OA HVAC. Failure of the Support Area (SA) HVAC may result in undesirable working temperature, but no releases will result from a failure of the SA HVAC.
1550-99.0.1	537.	Ventilation systems shall be designed to provide a continuous airflow pattern from the environment into the building and then from non-contaminated areas of the building to potentially contaminated areas and then to normally contaminated areas. Thus, the air flow is toward areas of higher radioactive or hazardous material contamination.	NA	There are no Safety Class ventilation systems in the CSB, however, the CSB HVAC design flow is from areas of lesser contamination to areas of greater potential contamination. There are no normally contaminated areas. The HVAC system keeps the operating area and the support building at negative pressure with respect to the environment. (Ref: HNF-3353, Section A2.7.2)
1550-99.0.1	538.	Dampers shall be located so that cross-contamination will not occur in case of a localized release of material.	NA	There are no Safety Class ventilation systems in the CSB, however, HEPA filtered exhausters are provided at points where the MCO is being sampled or welded. (Ref: HNF-3353, Section A4.0)

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.1	539.	Electronic air cleaners shall not be used in systems recirculating air.	NA	There are no Safety Class ventilation systems in the CSB, however, the CSB HVAC design does not use an electronic air cleaner in the recirculating air system (Ref: HNF-3353, Section A2.7.2)
1550-99.0.1	540.	Ventilation system balancing shall be specified to ensure that the building air pressure is always negative with respect to the outside atmosphere.	NA	There are no Safety Class ventilation systems in the CSB, however, the CSB HVAC design is specified and required to maintain the building air pressure negative with respect to the outside. (Ref: HNF-3353, Section A2.7.2).
1550-99.0.1	541.	Portions of ventilation and offgas systems that provide required functions following a seismic event shall be designed to be functional following a DBE.	NA	There are no Safety Class ventilation systems in the CSB.
1550-99.0.1	542.	The use of down draft ventilation within occupied process areas shall be considered as a means to reduce the potential inhalation of contamination.	NA	There are no Safety Class ventilation systems in the CSB, however, down draft ventilation is employed. See Item 51 Response
1550-99.0.1	543.	The failure of ventilation and offgas systems not designed as safety class systems shall not prevent other facility safety class systems from performing their required safety functions.	NA	See Item #536.
1550-99.0.1	544.	Hydrogen gas storage areas that use hydrogen shall have provisions for sufficient ventilation to ensure that under all conditions (normal operation, anticipated operational occurrences, and DBA conditions), the hydrogen concentration in the air and/or off-gas will never exceed 4 percent by volume.	NA	The CSB design does not include hydrogen gas storage areas. However, hydrogen may be present in some storage tubes (overpack storage tubes) and the design includes features to ensure that hydrogen does not build to 4 percent in air by volume.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.1	545.	Gas storage areas and process areas that use nonradioactive hazardous materials shall have ventilation systems designed to ensure that the hazardous material concentrations do not exceed the limits referenced in DOE 5480.10 and are ALARA in the workplace environment.	C	Ventilation systems are provided for the sample/weld hoods and the operating area.
1550-99.0.1	546.	Effective loss-of-ventilation alarms shall be provided in all of these area.	C	The oxygen level in the operating area is monitored to warn operators if the use of helium and argon (weld cover gas) causes an oxygen concentration decrease to less than 19.5%.
1550-99.0.1	547.	Suitable offgas stream pretreatment shall be provided upstream of the offgas cleanup system to remove or reduce the concentration of chemicals that would adversely affect system operation.	NA	There are no offgas streams in the CSB operations that require pretreatment to remove or reduce the concentration of chemicals. Gases vented from the Tube Vent and Purge Cart, and the Sample Cart are diluted with helium to keep hydrogen at safe levels.
1550-99.0.1	548.	Components of ventilation and offgas systems that require electric power to perform their safety functions shall be considered safety class loads.	NA	There are no Safety Class ventilation or off-gas systems in the CSB.
1550-99.0.1	549.	Adequate instrumentation and controls shall be provided to assess ventilation or offgas system performance and allow the necessary control of system operation.	NA	There are no Safety Class ventilation or off-gas systems in the CSB.
1550-99.0.1	550.	Equipment in ventilation and offgas systems shall be appropriately qualified to ensure reliable operation during normal operating conditions, anticipated operational occurrences, and during and following a DBE.	NA	There are no Safety Class ventilation or off-gas systems in the CSB.

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2		Confinement Ventilation Systems		
1550-99.0.2	551.	The design of a confinement ventilation system shall ensure the ability to maintain desired air flow characteristics when personnel access doors or hatches are open.	C	<p>The operating area HVAC provides a confinement ventilation system. Personnel access is from the support building through airlocks to maintain air flow. The truck vestibule is air-locked by the telescoping door and the Megadoor™ to maintain air flow. (Ref: HNF-3353, Section A2.7.2)</p> <p>1.) S.D. Vault Cooling system</p>
1550-99.0.2	552.	The ventilation system design shall provide the required confinement capability under all credible circumstances with the addition of a single failure in the system.	C	<p>The CSB HVAC design ensures confinement capability by virtue of redundant HEPA filtered exhaust trains. (Ref: HNF-3353, Fig. A2-41)</p> <p>Also, on loss of power accidents, the MHM HEPA filter, the Sampling/Weld station HEPA filters and the Service Station Tent HEPA filters provide confinement for radionuclide particulates.</p>
1550-99.0.2	553.	If the maintenance of a controlled continuous confinement airflow is required, electrical equipment and components required to provide this airflow shall be supplied with safety class electric power and provided with an emergency power source.	NA	<p>The HVAC system is classified as General Service and does not require an electrical back-up emergency supply system. The Sample Hood and Weld Hoods provide Safety Significant confinement. It is not necessary to have safety significant electrical power because the loss of exhaust flow coincident with a system leak is not credible. (Ref: HNF-3353, Section A3.4.2.2.5 and HNF-3328). The HVAC system and the building structures provide additional confinement functions in protecting the facility worker from industrial and radiological hazards. Note item # 552, covering loss of power events.</p> <p>1.) HNF-SD-SNF-RPT-004</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	554.	Air cleanup systems shall be provided in confinement ventilation exhaust systems to limit the release of radioactive or other hazardous material to the environment and to minimize the spread of contamination within the facility as determined by the safety analysis. The following general cleanup system requirements shall be met, as appropriate, for confinement ventilation system design:	C	HEPA filtration is provided for the CSB ventilation systems. See items #555 - #570.
1550-99.0.2	555.	The level of radioactive material in confinement exhaust systems shall be continuously monitored. Alarms shall be provided that will annunciate in the event that activity levels above specified limits are detected in the exhaust stream.	C	<p>The CSB HVAC system design has alarms that will annunciate in the event that activity levels above specified limits are detected in the exhaust flow. The Gaseous Effluent Monitoring System (GEMS) (ref: HNF-3553, Section A2.7.4) would alarm/annunciate on high rad signal.</p> <p>In addition, the GEMS provides data for stack releases. There are no automatic shut down features for the HVAC, ventilation is designed to be constant providing a defense-in-depth confinement function for airborne radioactivity.</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	556.	Appropriate manual or automatic protective features (initiated by the alarm system) that prevent an uncontrolled release of radioactive material to the environment or workplace shall be provided.	C	<p>The portion of the HVAC system that is Safety Significant (SS) is the MCO Sample and Weld Hoods. They are designed to maintain a confinement barrier around the MCO top during sampling and welding operations, and under certain design basis events that could allow hydrogen detonation from a broken sample line, and a release of contaminants with SS consequences, or loss of confinement of tramp radionuclides near the weld zone that may be released due to the heat of welding. The Sample Hood is equipped with a HEPA filter that provides the confinement barrier preventing the release of particulate contamination.</p> <p>1.) SDD: MCO Sampling/Weld System 2.) H-2-125250, P&ID MCO Sampling/ Weld System</p>
1550-99.0.2	557.	To limit onsite doses and to reduce offsite doses by enhancing atmospheric dispersion, elevated confinement exhaust discharge locations are required. The height of the exhaust discharge location shall ensure that the calculated consequences of normal or accidental releases shall not exceed the radiological guidance in Section 1300-1.4, Guidance on Limiting Exposure of the Public. In addition, to the extent practical, all normal and accidental releases shall be maintained at ALARA levels.	C	<p>The CSB HVAC exhaust stack is elevated. Normal or accidental releases from the CSB are small enough to minimize concern relative to offsite exposures. (See HNF-3553, Chapter A3). The HVAC is categorized as General Service because there is no accident that the HVAC is needed for mitigation of the calculated releases. The HVAC HEPA filters, therefore, provide defense-in-depth to limit exposure of the public as required in Section 1300-1.4 of DOE Order 6430.1A; thus maintaining the normal and accidental releases ALARA.</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	558.	An elevated stack shall be used for confinement exhaust discharge. Provisions shall be made to ensure an adequate ventilation exhaust discharge path in the event of stack failure.	C	<p>There are two ventilation stack systems for the CSB. The HVAC has two subsystems, Operating Area and Support Area. They both exhaust through the same elevated exhaust stack -- the confinement exhaust discharge point -- where continuous radiation monitoring checks for contamination in the exhaust air. This system is classified as general service. Ventilation path adequacy in the event of stack failure is ensured through availability of support area exterior air sealed doorways.</p> <p>The MCO storage vault has an elevated stack system that supports the passive ventilation system for the storage vault. This is a Safety Class system because it maintains the concrete temperatures and SNF temperature within established safety limits. This is not a confinement gas discharge point.</p> <p>S.D.: HVAC System S.D.: Vault Cooling System</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	559.	The stack shall be located so that it can not fall on the facility or an adjacent facility containing safety class items. The alternative is the construction of a stack that shall remain functional following a DBE, severe natural phenomena, and man-made events. Stack location and height shall also consider intakes on the facility and adjacent facilities to preclude uptake.	C	<p>The HVAC exhaust stack can not fall onto any safety class items. If it falls, it hits the support area where there are no SC equipment items.</p> <p>The MCO storage vault has an elevated stack system that supports the passive ventilation system for the storage vault. This is a Safety Class system because it maintains the concrete temperatures and SNF temperature within established safety limits. This stack is designed with extra features to ensure that it does not fall, and to remain functional following a DBE or other severe natural phenomena. Man-made events, such as sabotage with explosives, are judged to be prevented by location of the facility and safeguards and security features of the stack design.</p> <p>It is a Safety Class condition if the inlet and outlet stack structures failed to allow continued convective cooling of the MCOs held within the storage tubes. This could result in SC level releases of radionuclides from damaged MCOs in the storage tubes, the service station, and/or in the MHM. The stacks have been designed to remain intact under all applicable Design Basis Accidents and Natural Hazards events.</p> <p>S.D.: Vault Cooling System</p>
1550-99.0.2	560.	Safety class air filtration units shall be designed to remain functional throughout DBAs and to retain radioactive collected materials after the accident.	NA	<p>There is no Safety Class air filtration associated with the CSB operations.</p> <p>S.D.: MCO Sampling/Weld System</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	561.	Air sampling locations shall meet ACGIH/ASHRAE criteria. Sample collecting devices shall be located as close to the sampling probe as possible.	C	The air sampling probe in the exhaust stack is centered in the stack. The sample collection system is located close to the exhaust fans in the support building directly below the sample probe. (See HNF-3553, Section A2.7.2). ACGIH/ASHRAE requirements for air sampling locations are met. S.D.: MCO Sampling/Weld System
1550-99.0.2	562.	The number of air filtration stages required for any area of a facility shall be determined by safety analysis based on the quantity and type of radioactive materials to be confined.	C	The number of exhaust filtration stages are sufficient to limit concentrations of airborne radioactive particulates released to the environment to less than the applicable limits at the point of discharge during all anticipated operating conditions. The filtration systems conform to ALARA principles and comply with DOE Order 5480.1A requirements during abnormal, accident, and DBA conditions. DBD, section 6, paragraph 6.3.4(2)
1550-99.0.2	563.	Air filtration units shall be installed as close as practical to the source of contaminants to minimize the contamination of ventilation system ductwork.	C	Air filtration units are designed and located within 30 feet of the source of contaminants and minimize contamination of ventilation system ductwork. DBD, section 6, paragraph 6.3.4(4)
1550-99.0.2	564.	Ducts shall be sized for the transport velocities needed to convey without settling all particulate contaminants.	C	The HVAC ducts are designed to meet the requirements of the Operations and Support Area ventilation requirements. See S.DD: HVAC System description, section 1.4. Transport velocities are sufficient to prevent settling of particulate contaminants.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	565.	Air filtration units shall be located and provided with appropriate radiation shielding to maintain occupational doses ALARA during operations and maintenance.	C	Expected levels of contamination do not require that additional shielding of HEPA filters, or other filtration units, be provided. Filter change-out will be based on an experience based combination of radiation monitoring and pressure drop monitoring. See item #563 above.
1550-99.0.2	566.	Air filtration units shall be designed for ease of recovery of fissile material and other materials capable of sustaining a chain reaction in case of an accident as well as during normal operations.	NA	No appreciable amounts of fissile materials will be collected on HEPA, or other, filters. (Ref: HNF-3553, Section A2.7.2).
1550-99.0.2	567.	The cleanup system shall have installed test and measuring devices and shall facilitate monitoring operations, maintenance, and periodic inspection and testing during equipment operation or shutdown, as appropriate.	NA	<p>Special cleanup systems are not required in CSB air filtration systems. See response to item #563.</p> <p>Appropriate radiation protection is provided to maintain occupational doses ALARA during operations and maintenance and the main building systems are designed so that a bank of filters can be completely isolated from the ventilation system during filter element replacement.</p> <p>DBD, section 6, paragraph 6.3.2(6)</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.2	568.	Where spaces, such as a control room, are to be occupied during abnormal events, safety class filtration systems shall be provided on the air inlets to protect the occupants. As a minimum, air inlets shall be filtered to limit the loading of exhaust filters with normal atmospheric dust.	NA	<p>No CSB spaces are required to be occupied during abnormal events. The safety analysis (Chapter A3) did not classify any of the HEPA filters as safety class.</p> <p>The CSB has one HVAC system which serves the Operating and Support Areas of the facility. Roughing filters are provided on the air inlets to the building ventilation system to limit the loading of exhaust filters. There are no safety requirements to occupy the Operating and Support areas following abnormal events or postulated accidents.</p> <p>The vault area is passively cooled and filtration is not required for this convective cooling process.</p> <p>SDD: HVAC Design Description, section 1.5.2</p>
1550-99.0.2	569.	Either HEPA filtration or fail-safe backflow prevention for process area intake ventilation systems shall be provided.	NA	<p>Note response to item # 568. The HVAC system, as designed is classified in the FSAR as General Service. (ref: HNF-3553, section A-5.)</p> <p>SDD: HVAC Design Description, section 1.5.2 HNF-SD-HNF-RPT-004, CSB Safety Analysis</p>
1550-99.0.2	570.	Consideration shall be given to providing roughing filters or prefilters upstream of a HEPA filter to maximize the useful life of the HEPA filter and reduce radioactive waste volume.	C	<p>The HEPA filtration systems are designed with prefilters installed upstream of HEPA filters to extend HEPA filter life.</p> <p>DBD, section 6, HVAC, paragraph 6.3.4(6)</p>
1550-99.0.3		Off-Gas systems		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.3	571.	The sources and characteristics of radioactive material in off-gas systems shall be identified.	C	The sources and characteristics of radioactive materials that could possibly be in the building ventilation system exhaust have been identified and are given in the NOC for the CSB. (Ref: DOE/RL-98-30)
1550-99.0.3	572.	The design of an off-gas system shall be commensurate with the characteristics of the radioactive material in the off-gas and the risk associated with its release as an effluent. The design of the off-gas system shall ensure that off-site doses resulting from normal system operation are maintained within the guidelines referenced in Section 1300-1.4.3, Routine Releases, and are ALARA. Portions of off-gas systems and components that are required to control or limit the release of radioactive material to the environment or for safe operation of the system shall be provided with redundancy.	C	The CSB off-gas system is the building HVAC exhaust system that includes a continuous airborne emissions monitoring system (CAEM). The CAEM includes flow and temperature measurement, a shrouded sampling probe flow temperature and two vacuum pumps (for redundancy) which draw the effluent sample through a flow splitter into two sample streams. One stream contains a record air sampler and the other stream contains the alpha/beta detector and the gamma ¹²⁹ I detector. The system is designed to provide continuous flow monitoring for radionuclides that contribute more than 10% of the anticipated offsite dose, monitor radionuclides that contribute 0.1 mrem/yr or more to the anticipated unabated offsite effective dose, monitor radionuclides that contribute 25% or more of the anticipated abated offsite effective dose, provide constant monitoring for alpha/beta particulates, and provide a minimum collection efficiency of 50% or more for 10 μ m sized particles. The electronics console for the stack emission monitoring system controls all functions of the HVAC stack monitoring system and provides alarms functions to the DCS.
1550-99.0.3	573.	Electrical equipment and components of off-gas systems that require electric power to perform their safety functions shall be considered safety class loads.	NA	The gaseous emissions monitoring system is classified general service and an emergency power supply system is not required. The uninterruptible power supply system provides temporary power for the emissions monitoring system during loss of normal power.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.3	574.	Adequate instrumentation shall be provided to monitor and assess system performance and to provide necessary alarms.	C	Note response to # 572.
1550-99.0.3	575.	Appropriate manual or automatic protective features shall be provided to prevent an uncontrolled release of radioactive material to the environment and to minimize the spread of contamination within the facility.	C	Uncontrolled release of radionuclides to the environment is prevented by the nature of the MCO storage system. No additional protective features are provided for normal MCOs. Overpack-stored MCOs may be leaking. The escape of radionuclides from Overpack-stored MCOs is prevented by manually secured, pressure retaining overpack tube plugs. Periodic surveillance of the overpack storage tubes is provided by the Tube Vent and Purge Cart. Note response to # 572.
1550-99.0.3	576.	The off-gas system shall be designed to allow periodic maintenance, inspection, and testing of components.	C	The designs for both the building ventilation and the emissions monitoring systems provides for maintenance, inspection and testing of their components.
1550-99.0.3	577.	The system's capacity shall be consistent with the needs for handling off-gas from components and systems during normal operations, anticipated operational occurrences, and DBA conditions.	C	Note response to # 572.
1550-99.0.3	578.	Process system tanks and other sealed components shall be vented to an off-gas system.	C	The vent flow from the sampling hood exhaust systems is designed to flow through a duct that connects to the exhaust ducting from the operating area. The exhaust from the tube vent and purge cart, the MHM cask, and the transportation cask service system is vented into the operating area exhaust stream. through HEPA filters.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1550-99.0.3	579.	The design of process confinement off-gas treatment systems shall preclude the accumulation of potentially flammable quantities of hydrogen generated by radiolysis or chemical reactions within process equipment.	C	No accumulation of potentially flammable gas mixtures are expected, however, locations where gas flows could potentially contain hydrogen are diluted with helium to safe concentrations before the gas is vented to the operating area or the exhaust ducts (for example, the cask service system, the tube vent and purge cart, and the sample hood exhaust system).
1550-99.0.3	580.	Vents from liquid components shall be provided with traps and drains to prevent inadvertent flooding of off-gas systems.	NA	The CSB has no systems with liquid components that need a trap or drain. HVAC condensate and condensate from the air compressors drain into the support building sumps.
1550-99.0.3	581.	Adequate shielding shall be provided for filters, absorbers, scrubbers, and other off-gas treatment system components to maintain occupational exposures within the limits specified in DOE 5480.11. In addition to the extent practical, the shielding design shall use ALARA principles to minimize overall exposures.	NA	There are no absorbers or scrubbers. Filters in the ventilation systems are to be monitored for radioactivity and pressure build up. Periodic surveillance of filters by the RCTs will provide for detection and exchange of filters before the dose rate can have an adverse effect on personnel exposure. The dose limits for the filters provides for ALARA control of personnel exposure.
1550-99.0.3	582.	Corrosive gases and particles from vats, scrubbers, and similar equipment in gloveboxes shall be neutralized prior to reaching the HEPA off-gas filters.	NA	There are no corrosive gases associated with planned CSB operations or design basis accidents.
1550-99.0.3	583.	Air ventilated gloveboxes shall have the ability to safely contain in-box contaminants when an access port is opened or a glove ruptures.	NA	There are no gloveboxes in the CSB. However, the sample hood and the weld hoods are open bottomed hoods that are designed to safely confine contaminants through face velocity of the airstream that could entrain contaminants.

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1550-99.0.3	584.	Traps shall be designed for nuclear criticality safety under conditions of design loading of fissile or other materials capable of sustaining a chain reaction. The design shall also minimize the spread of contamination during replacement.	NA	Nuclear criticality safety designed traps are not required in the design of the CSB.
1550-99.0.3	585.	All vent streams having the potential of containing significant quantities of radioactive material shall be processed by an off-gas cleanup system before being exhausted to the environment.	C	The sample cart off-gas is HEPA filtered before it is delivered to the building ventilation system. The tube vent and purge cart, and the cask servicing system exhausts are HEPA filtered before potentially contaminated gases are vented to the building ventilation system.
1550-99.0.3	586.	The cleanup systems shall be designed to remove particulates and noxious chemicals and control the release of gaseous radionuclides.	C	Releases of particulate contaminants, noxious chemicals and gaseous radionuclides are controlled by MCO and other equipment design. The building ventilation system is designed to dilute any escaping Kr-85 from up to 400 MCOs to acceptable work environment levels. See statement #585. The HVAC HEPA filters are designed to remove radioactive particulates from the exhaust flow.
1589		Air Pollution Control		
1589-1		General		
1589-1	587.	These criteria shall be applied to the control, treatment, and subsequent disposal of all airborne and gaseous wastes to assure compliance with the following:	C	See items #588 - #591.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1589-1	588.	. DOE 5400.1	C	This DOE Order was used as the general environmental protection program. Each System Design Description specified the applicable environmental requirement for that system (see SDD section 1.5.4)
1589-1	589.	. DOE 5440.1C	C	Implementation of the National Environmental Policy Act for the entire SNF Project, including the CSB, was accomplished through completion of an Environmental Impact Statement for Management of Spent Nuclear Fuel from the K Basins at the Hanford Site.
1589-1	590.	. DOE 5480.4	C	General Health Protection Standards were applied to CSB design. Note Section A2.7.3 of the CSB FSAR.
1589-1	591.	. Federal, State and local standards including restrictions on sulfur content of fuel and other requirements specifically related to the control of air pollutants, as referred to in Executive Order 12088.	C	With regard to the use of sulfur containing fuels, this item is NA for the CSB. Other environmental requirements of EO 12088 were met by the NOC and air discharge permit processes.
1589-2		Improved Risk Concept		

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1589-2	592.	At a minimum, facility confinement systems, including filters and ventilation systems shall comply with the "improved risk" criteria defined in DOE 5480.7 and shall preclude offsite release of greater than TLV amounts of toxic materials during the maximum credible fire loss conditions.	C	See response to 1530-2.1 (#435) above, the improved risk criteria are met. The DBF is a standard industrial type fire involving diesel fuel, and truck and semi-trailer tires. Confinement systems, particularly the building shell and its associated ventilation system, are designed with the capability of retaining the confinement function during a DBF. The building's exhaust is designed to continue to operate during the DBF. The building's exhaust is HEPA filtered. (Ref: HNF-3553, A2.7.2) SAR analysis has verified that off-site releases are not greater than TLV. DBD, Fire Protection System, section 11, paragraph 11.10, Fire Barriers
1589		Air Pollution Control		
1589-99		Special Facilities		
1589-99.0		Nonreactor Nuclear Facilities - General		
1589-99.0.1		Radioactive Airborne Effluents		
1589-99.0.1	593.	All exhaust ducts (or stacks) that may contain radioactive airborne effluents shall be provided with effluent monitoring systems that are designed in accordance with the applicable requirements contained in the directive on Radioactive Protection of the Public and the Environment in the DOE 5400 series and the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series.	C	A gaseous emissions monitoring system was installed in the CSB HVAC exhaust stack. This system samples radioactive particulate contaminants. The minimum collection efficiency is 50 percent or more for 10 micron sized particles. A shrouded probe, designed for the 9,000 cubic feet per minute stack flow rate, is used to extract the sample. DOE/RL-98-30, Rev. 0, (06/98) Notice of Construction for the CSB.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1589-99.0.1	594.	Backup capability for monitoring systems shall be considered in the design of each system (e.g., redundant detectors, additional sample line ports, additional sampler trains, etc.).	C	GEMS is redundant except for the single shrouded sample probe. A deviation request covering the design of this system has been approved by RL (98-SFD-060.) HNF-SD-SNF-RPT-004
1589-99.0.1	595.	Continuous stack sampling and continuous radiation detection shall be considered. Sampling systems shall be designed in accordance with ANSI N13.1 and associated appendixes to ensure representative sampling of the effluent stream. Isokinetic sampling shall be provided for effluent streams that are expected to contain particulate radionuclides. The range capability of continuous monitors shall cover from routine to potential DBA releases of radionuclides.	C	See statement #593 above. The sampling system complies with ANSI N13.1. The effluent monitoring system also monitors the stack discharge during a DBA.
1589-99.0.1	596.	Nuclear criticality safety shall be considered in the design of equipment used to treat and discharge radioactive airborne effluents.	C	There is no possibility of criticality in the CSB due to accumulation of fissile materials in the building ventilation equipment. The safety analysis report considered nuclear criticality as a set of the bounding and credible analyses that are applicable to the CSB facility (see SAR section 6.3) HNF-SD-SNF-RPT-004 section 6.0, prevention of inadvertent criticality.
1589-99.0.2		Nonradioactive Airborne Effluents		

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1589-99.0.2	597.	Nonradioactive gaseous or airborne effluent releases shall not exceed the guidelines contained in DOE 5400.1 and shall comply with all other applicable Federal, State, and local requirements. To the extent practical, ALARA principles shall be applied to minimize adverse impacts to the public and the environment.	C	No airborne effluents or nonradioactive gases are identified as associated with the CSB operations. There are no hazardous nonradioactive materials being used or planned for use in the CSB. Application of ALARA principles has minimized adverse impacts to the public or the environment. DOE/RL-98-30, Rev. 0, (06/98) Notice of Construction for the CSB.
1595		Controls		
1595-1		General		
1595-1	598.	Control systems shall be designed to use the closed-loop feedback method of control. Open-loop systems shall not be used. Proportional-type control shall be used for all control systems; other type control systems shall be used as needed according to the degree of control required.	C	Distributed Control System is designed to serve as the central monitoring system for CSB facility and system conditions (particularly the Health Physics monitoring system). The HVAC has a self contained proportional-type control separate from the DCS system. The MHM control system is also separate from the DCS. SDD: Distributed Control System Description
1595-1	599.	All control equipment shall be easily accessible. One temperature control panel shall be provided for each system, complete with panel-face-mounted indicators, switches, pilot lights, and tags. All control interlocks shall be through HOA switches.	C	Control equipment is easily accessible. Temperature control panels are provided as appropriate. HOA switches are provided.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1595-1	600.	Control air compressors shall be duplex non-lubricated type with oil lubricated crankcase and distance piece. Air shall be filtered and dried using refrigerated air dryers for dew point of 15 degrees F and regenerative silica type for dew point below 15 degrees F.	C	Air compressors are of the duplex non-lubricated type. CSB compressed air is oil free. The air compressors installed exceed this criterion of 6430.1A. SDD: Instrument/service Air system
1595-1	601.	Copper piping shall be used for high pressure air in inaccessible locations (plastic piping may be used if installed in conduit). Air leakage shall not exceed 5 percent of pressure in 24 hours. Transmitters shall be capable of field calibration and thermometers or pressure gauges shall be provided at transmitters. All controllers and thermostats shall be pilot-bleed type.	Open	There are no high pressure air connections in inaccessible locations. Air leakage is to be confirmed compliant during full system operation/startup. Note response to #600.
1595-6		Control of Air Handling Systems		
1595-6.1		Mechanical Ventilation Control		
1595-6.1	602.	All supply, return, and exhaust ventilation systems shall be equipped with automatic and manual control of fan operation to shut off the fan when ventilation is not required.	C	The HVAC control system is designed to ensure that necessary exhaust fans are functioning correctly before any supply fans for the affected building or area are started so that correct zone pressures and confinement are maintained. Appropriate manual and automatic control of fan operation is provided. DBD: Section 6, HVAC, paragraph 6.3.3(2)

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1595-6.1	603.	These systems shall also be provided with manual gravity-operated or automatic control of dampers for outside air intake and exhaust or relief to prevent introduction of outside air when ventilation is not required.	C	Both gravity-operated and automatic control of dampers are included in the building ventilation system design.
1595-6.1	604.	Systems that circulate air shall be provided with minimum outdoor air damper position control to assure that the minimum outdoor air quantity is being introduced to the system.	C	Appropriate damper control of outside air is provided.
1595-6.1	605.	Automatic dampers should fail open for return air and fail closed for outside air.	C	The automatic return and outside air damper control for AH-003 (CD-3) regulates outside air from 42 to 100% of total flow and regulates return air from 0 to 58% of total flow. The automatic damper fails in the 42% position (outside air) and 58% position (return air) to provide minimum air flow for the support area rooms. FSAR: Figure A2-47
1595-6.3		Automatic Control Dampers		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1595-6.3	606.	Automatic air control dampers shall be specified to be the low-leakage type with a maximum leakage of 6 CFM/square foot at maximum system velocity of 1500 FPM and 1-inch w.c. pressure differential. The dampers shall be opposed-blade type for modulating control, but may be parallel-blade type for two-position control. Dampers shall be sized for at least 20 percent of the total ductwork resistance pressure drop. Return air dampers shall never be sized less than 1500 FPM. Pilot positioners and operators shall be out of airstream.	C	Automatic air control dampers are designed with a maximum leakage of 6 cfm per square foot of damper area, at a maximum velocity of 1,500 fpm. The dampers are an opposed-blade type for modulating control. Pilot positioners and operators are out of the air stream. Dampers account for at least 20 percent of the total ductwork resistance pressure drop. Return air dampers allow at least 1500 fpm flow. DBD: Section 6, HVAC, paragraph 6.4.4(8)
1595-6.5		Fire and Smoke Detection and Protection Controls		
1595-6.5	607.	Engineered smoke pressurization and evacuation systems shall comply with the following: <ul style="list-style-type: none"> • NFPA 90A • NFPA 72E • ASHRAE Manual, Design of Smoke Control Systems for Buildings • ASHRAE Systems handbook 	NA	The CSB does not have an engineered smoke pressurization and evacuation system.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1595-6.5	608.	All air handling systems shall be provided with the smoke and fire protection controls required by NFPA 101.	C	Smoke detectors in the operating area (VESDA), in the HVAC return duct, and in the support area HVAC recirculation duct all comply with NFPA 101. The smoke detectors, upon sensing smoke, signal relays that automatically shut down the inlet air handlers, activate the building fire alarm system and transmit a fire alarm signal to the central fire station.
1595-6.5	609.	All supply, return, relief, and exhaust air ventilation systems shall have interlock controls that interface with fire and smoke detection system controls and either turn off or selectively operate fans and dampers to prevent the spread of smoke and fire throughout the building. These controls shall comply with NFPA 90A.	C	Controls are compliant with NFPA 90A. Note response to # 608.
1595-6.5	610.	Special exhaust systems shall be designed to include fire and smoke safety controls as required by NFPA 91.	NA	There are no special exhaust systems identified in the CSB design.
1605		Electrical Materials and Methods		
1605-1		General		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-1	611.	All systems shall comply with NFPA 70 and ANSI C2.	C	<p>The electrical system's governing regulations for this part of the CSB project are the NFPA 70 and ANSI C2 codes and standards in addition to all other codes and standards that are specified in DOE Order 6430.1A. The normal power systems are designed General Service and are designed to normal industrial requirements (NEC 1993).</p> <p>DBD: Section 5, Electrical, paragraph 5.2.2</p>
1605-1	612.	Electrical systems shall be designed so that all components operate within their capacities for initial and projected loads.	C	<p>The electrical system is designed for continuous reliable service and allows CSB components to operate within their rated capacities for initial and projected loads.</p> <p>DBD: Section 5, Electrical, paragraph 5.4.1</p>
1605-1	613.	Preferred standard voltages in conformance with ANSI C84.1.	C	<p>Voltage levels are utilized in the CSB facility in accordance with ANSI C84.1</p> <p>DBD: Section 5, Electrical, paragraph 5.4.2</p>
1605-1	614.	Electrical materials and equipment shall be UL- or FM-tested, with label attached, for the purpose intended, whenever such products are available. Where there are no UL- or FM- listed products of the type, testing and certification by another nationally recognized testing agency may be acceptable.	Open	<p>Designed and installed electrical materials and equipment are UL- or FM-tested, with label attached, for the purpose intended. Regarding the MHM, UL inspector found items to be corrected and will issue a certification of compliance for the MHM following system energization.</p> <p>DBD: Section 5, Electrical, paragraph 5.4.7(1)</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-1	615.	Onsite acceptance testing shall be required for each major electrical system. Tests shall be specified to demonstrate that each function and important parameter is implemented. Specific criteria shall be included to determine pass/fail acceptance. Tests shall be performed in the presence of a government representative. Copies of all test results shall be submitted for approval.	Open	Electrical equipment, components and materials will be new, readily available and of proven design for the intended application. The DBD does require onsite acceptance testing for each major electrical system (see requirements in paragraph 5.5 of the DBD). Onsite testing of major electrical systems (except for the MHM) has been performed by the construction contractor (Mowat/Power City Electric) and documented. MHM electrical testing is ongoing. DBD: Section 5, Electrical, paragraph 5.4.7(2)
1605-2		Wiring System		
1605-2.1		Raceways		
1605-2.1.1		General		
1605-2.1.1	616.	Raceways that penetrate fire-rated assemblies shall be noncombustible.	C	Raceways that penetrate fire rated assemblies are non-combustible. The complete installations are sealed to maintain the established fire ratings as defined in UL Building Materials Directory and UL 1479. DBD: Section 5, Electrical, paragraph 5.15.1(2)
1605-2.1.1	617.	The complete installation shall be suitably sealed to maintain the established fire ratings as defined in UL Building Materials Directory and UL 1479.	C	Electrical penetrations through fire walls are suitably sealed. See statement #616 above.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-2.1.1	618.	Raceways shall be ½-inch minimum in diameter. Raceways embedded in concrete or masonry shall be ¾-inch minimum and shall be adequate in number and capacity for the initial and projected facility requirements.	C	The ½" requirement is for aboveground conduits: At the CSB, the minimum conduit size for all aboveground installations is ¾ inch, with the exception of instrument connections which may be as small as ½ inch. Embedded conduits are ¾" minimum. DBD: Section 5, Electrical, paragraph 5.15.3.(2)
1605-2.1.2		Electrical Metallic Tubing		
1605-2.1.2	619.	Electrical Metallic Tubing (EMT) shall be used to enclose circuit power conductors, alarm and signal circuits in nonhazardous and noncorrosive locations. It shall not be installed where subjected to physical damages during installation or while in service. EMT shall not be installed underground and shall not be encased in concrete. When EMT is used outdoors or in damp locations, compression type (rain tight) fittings must be used.	C	EMT is not used in the CSB. Intermediate metal conduit was used instead. IMC is superior in all performance measures to EMT and is rain tight. DBD: Section 5, Electrical, paragraph 5.15.3.(3), (4), (8),(9), and (10). Approved deviation letter 92-PMD-253 dated 7/13/92.
1605-2.1.3		Flexible Steel Conduit		
1605-2.1.3	620.	Flexible steel conduit shall be used for connection to equipment subject to vibration and connection from junction boxes to recessed lighting fixtures.	C	Flexible steel conduit is used when connecting power to motors, compressors and other rotating equipment. Recessed lighting fixtures were not used.
1605-2.1.4		Rigid Steel Conduit and Intermediate Metal Conduit		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-2.1.4	621.	Rigid steel conduit or intermediate metal conduit shall be used in locations classified as hazardous by NFPA 70.	C	IMC was used throughout the CSB. Raceways (conduits) that pass through or from a Class I or II hazardous area to a non-hazardous area are installed per NFPA 70. DBD: Section 5, Electrical, paragraph 5.15.1.(5)
1605-2.1.5		Aluminum		
1605-2.1.5	622.	Aluminum conduit shall be used for high-frequency circuits where steel will cause magnetic problems or in atmospheres where steel conduit is unsuitable. Aluminum conduit shall not be installed underground, encased in concrete, or where the atmosphere is corrosive to aluminum.	NA	There are no high frequency circuits used within the CSB.
1605-2.1.6		Nonmetallic Conduit		
1605-2.1.6	623.	Nonmetallic conduit shall be used only where allowed by NFPA 70.	C	Nonmetallic conduit encased in concrete was used in the duct bank to the CSB utilities supply transformer as permitted by NFPA 70.
1605-2.1.7		Surface-Metal or Nonmetallic Systems		
1605-2.1.7	624.	Except for vertical routings to source or termination points, surface-metal or nonmetallic raceways and multi-outlet assemblies shall be used only where allowed by NFPA 70.	NA	There are no surface-mounted electrical systems in the CSB. The CSB electrical systems were designed using NFPA 70 standards.

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1605-2.1.7	625.	Surface-metal raceways passing from one floor to another shall have mechanical protection to a height of 4 feet above the floor level.	NA	No surface-mounted electrical systems. Not applicable to the CSB because there is only one floor. There are no electrical connections into the vaults.
1605-2.1.8		Cable Trays		
1605-2.1.8	626.	The use of cable trays shall be considered for large multiple-cable applications in both interior and exterior locations.	C	Cable trays are used in appropriate applications in the CSB electrical system design.
1605-2.2		Conductors		
1605-2.2.1		General		
1605-2.2.1	627.	Conductors for interior electrical systems shall be copper, except that aluminum conductors size No. 4 AWG and larger may be used. Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG.	C	All conductors for interior electrical systems are stranded copper wire 12 AWG or larger. DBD: Section 5, Electrical, paragraph 5.17.1
1605-2.2.1	628.	No. 10 and No. 12 AWG conductors for power and lighting branch circuits shall be solid.	C	An approved waiver is in place that allows stranded copper wire for these applications. (Ref: RL letter # 9203853, dated 5/18/92)
1605-2.2.1	629.	No. 8 AWG conductors and larger shall be stranded.	C	No. 8 AWG and larger are stranded.
1605-2.2.1	630.	Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA 70.	C	Class 1 remote-control and signal circuits are enclosed in cable and are compliant with NFPA 70.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-2.2.1	631.	Conductors for Class 2 low-energy remote-control and signal circuits shall not be smaller than No. 18 AWG.	C	There are no class 2 circuits outside of vendor supplied cabinets. Class 2 conductors inside vendor furnished cabinets are no smaller than 16 AWG (for some instrument cables), or 14 AWG (for all other class 2 circuits). See Electrical Specification Section 16110, paragraph 2.1.6.
1605-2.2.1	632.	Power and lighting conductors shall be 600-volt, Type THW, XHHW, or THWN.	C	Power and lighting conductors are XHHW, or THHN/THWN rated.
1605-2.2.1	633.	Conductors required to be rated 90 degrees C in accordance with NFPA 70 shall be Type RHH, THW, or THHN.	C	Conductors required to be 90C rated are RHH, THW, or THHN in accordance with NFPA 70. DBD: Section 5, Electrical, paragraph 5.17.1(2)
1605-2.2.1	634.	Conductors in high-temperature areas shall be NEC Type FEP or TFE as required.	NA	There are no high temperature areas in the CSB through which conductors are routed.
1605-2.2.1	635.	Direct-burial conductors shall be Type UF, UL 493.	NA	There are no direct burial conductors used in the CSB design. Underground wiring, except for the grounding system, is encased in schedule 80 PVC conduit.
1605-2.2.1	636.	Bonding and grounding conductors shall be ASTM B1 solid, bare copper for sized No. 8 AWG and smaller and shall be ASTM B8 Class B stranded copper for wire sized No. 6 AWG and larger.	C	Bonding and grounding conductors are solid copper for No. 8 AWG and smaller and stranded copper for No. 6 AWG and larger. Bonding and grounding conductors are bare or with type XHHW or THWN insulation. ASTM B1 and ASTM B8 requirements are met. DBD: Section 5, Electrical, paragraph 5.17.1(3)
1605-2.2.3		Conductor Identification		

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1605-2.2.3	637.	Voltage levels, grounded conductors, equipment grounding conductors and ungrounded phase conductors shall be identified.	C	Identification of voltage levels, grounded conductors, etc., is provided in compliance with the Hanford color code system, GE-COLR-01.
1605-2.2.2	638.	Existing field center wire color-code systems shall be used. If no present field center wire color code exists, the following color-coding system shall be used:	C	Color coding is in compliance with the existing Hanford Site system, GE-COLR-01.
1605.2-3		Receptacles		
1630-2.3	639.	Receptacle circuits shall be provided with ground-fault circuit-interrupters as directed by NFPA 70.	C	All receptacle circuits are provided with ground-fault circuit interrupters in compliance with NFPA 70.
1630		Exterior Electrical Utility Service		
1630-1		General		
1630-1.3		Redundancy		
1630-1.3	640.	Facilities designated by the cognizant DOE authority as critical shall be served by dedicated, redundant circuits. The two services shall be separated by a 4-hour fire-rated barrier and shall be served from separate sources.	NA	The CSB has not been designated as a critical facility.

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1630-1.3	641.	In lieu of providing two separate services, a single service supplied from a loop-type transmission or distribution system having sectionalizing features may be provided when the reliability of the single service proves adequate when considered in conformance with IEEE 399 and IEEE 493.	NA	See statement #640. Although not required, the CSB design meets this 6430.1A requirement.
1630-2		Supply Equipment and Facilities		
1630-2.2		Power Supply Lines		
1630-2.2.1		General		
1630-2.2.1	642.	Circuits shall be arranged so that faults, failures, or maintenance on less critical circuits will not jeopardized critical loads. Protective devices shall be used and coordinated for sequential operation from the load to the source.	C	Hanford Utilities organization performs load balancing and load protection site wide. At the CSB there are no critical electrical circuits.
1630-2.2.1	643.	Line location shall be established in accordance with clearance requirements stated in ANSI C2 and shall be routed within established rights-of-way for each facility.	C	Hanford Utilities organization established line location for the CSB. The ANSI C2 standard was used in designing the line location for the CSB.
1630-2.2.1	644.	Minimum rights-of-way shall extend 5 feet beyond outside conductors.	C	Hanford Utilities has complied with this item. See response to item #643.
1630-2.3		Substations and Switching Stations		

C -- compliant
 NA -- Not applicable

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1630-2.3.3		Grounding		
1630-2.3.3	645.	Station grounding shall comply with Section 1639-2, Substations and Switching Station Grounding.	NA	There are no substations or switching stations that were designed as part of the CSB project.
1630-2.3.5		Oil-Filled Equipment		
1630-2.3.5	646.	Dikes and drainage provisions shall be built as required by the local SPCC in conformance with 40 CFR 112.	C	The main CSB electrical supply transformer is appropriately diked with drainage provided in conformance with 40 CFR 112.
1630-2.3.5	647.	PCB or PCB-contaminated electrical equipment and the treatment of PCB oil spills shall comply with 40 CFR 761. Oil-filled transformers installed near buildings shall comply with FM 5-4/14-8. Existing PCB or PCB-contaminated equipment shall be provided with warning signs and shall not be relocated or reused in other existing or new facilities.	C	There is no PCB-containing or PCB-contaminated equipment used at the CSB. The oil-filled main transformer is installed at the appropriate distance from the CSB buildings in compliance with FM 5-4/14.8.
1630-2.3.5	648.	Electrical equipment cooling material shall be handled in accordance with 29 CFR 1910.1200.	C	The hazards associated with electrical equipment cooling materials are communicated in accordance with 10 CFR 1910. 1200, <i>Hazard Communication</i> . It should be noted that CSB equipment is all new; there are no PCB, PCB-containing, or PCB-contaminated electrical items used at CSB.
1630-3		Power Supply for Exterior Lighting		
1630-3.2		Emergency Power		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1630-3.2	649.	Sites or facilities requiring continuous lighting for safety or security reasons shall have an emergency power source for such lighting.	C	Egress and security lighting is provided with batteries for backup power
1630-5		Lightning Protection		
1630-5	650.	Lightning protection systems shall comply with NFPA 78.	C	<p>A lightning and surge protection system is installed for personnel safety and to protect building and equipment from damage due to lightning strikes and/or surges caused by switching operations. A path to ground is provided via lightning arrestors and down conductors that tie to the building ground loop via a dedicated ground rod. The lightning protection is installed in accordance with NFPA 780, the replacement standard for NFPA 78.</p> <p>DBD: Section 5, Electrical, paragraph 5.19</p>
1630-5	651.	Lightning protection systems shall be considered for buildings containing facilities for the use, processing, and storage of radioactive, explosive, and similarly hazardous materials; for buildings over 50 feet in height; and for buildings containing valuable equipment. A risk assessment using the guide in Appendix I of NFPA 78 shall be made of these buildings to determine the risk of loss due to lightning.	C	<p>Lightning protection is installed for the CSB. See response to item #650.</p> <p>DBD: Section 5, Electrical, paragraph 5.19.1(2)</p>
	652.	Electric power and communication services to all buildings and facilities and to underground power cables, where connected by overhead power distribution lines, shall have lightning and surge protection.	C	Hanford Electric Utilities organization has complied with this requirement. See drawing H-2-122733, sheet 3 that shows design for surge arrestor placement.

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1639		Grounding		
1639-1		General		
1639-1	653.	Grounding systems shall comply with NFPA 70 and IEEE 142. A separate ground conductor shall be used. Raceway systems shall not be used as ground path.	C	Buried grounding loops around the pad-mounted transformer near the northeast corner of the support building are bonded to the under ground grounding loops around the CSB. All electrical systems and the lightning rods are bonded to this ground system in accordance with NFPA 70 and IEEE 142.
1639-2		Substation and Switching Station Grounding		
1639-2	654.	Substation and switching station grounding systems shall comply with IEEE 80. Grounding connections shall comply with IEEE 837.	NA	This requirement is not applicable to the CSB because a substation or switching station was not installed with this project.
1639-4		Isolated Ground Systems		
1639-4	655.	Isolated ground systems may be required to meet special instrumentation or other equipment needs. Such ground systems shall be clearly identified, protected against improper usage, and installed in conformance with NFPA 70.	NA	Not applicable to the CSB. There is no requirement for an isolated ground system.
1640		Interior Electrical Systems		
1640-1		General		
1640-1.4		Power System Reliability		

C -- compliant
 NA -- Not applicable

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1640-1.4	656.	The need for multiple transformer-switchgear service equipment, to ensure power supply continuity within the facility during scheduled or emergency equipment outages, shall also be considered.	NA	This is not applicable to the CSB because there is no need for multiple transformer-switchgear service equipment.
1640-1.5		Power Quality Requirements		
1640-1.5	657.	Sensitive electrical equipment, such as data processing equipment, shall be isolated as needed for protection. Uninterruptible power systems, motor-generator sets, or power conditioners may be used for isolation.	C	CSB equipment that cannot tolerate voltage spikes is isolated through the UPS system.
1640-1.6		System Protection		
1640-1.6	658.	System protection shall comply with IEEE 242.	C	The CSB facility is compliant with IEEE 242, <i>IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems</i> . This was confirmed by Electrical calculations.
1640-1.7		Ground Fault Protection		
1640-1.7	659.	Ground-fault protection shall comply with NFPA 70. See also Section 1605-2.3, Receptacles.	C	The CSB system protective devices are selected and applied to minimize damage to the electrical system. These devices limit the extent and duration of service interruptions due to overload or fault conditions. Ground-fault protection is provided in compliance with NFPA 70.

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1640-1.8		Neutral Conductors		
1640-1.8	660.	The neutral conductor for electric discharge lighting and for data processing and other similar equipment shall be sized in accordance with NFPA 70. Calculations shall include harmonic current.	C	<p>NFPA 70 standards were used in designing the neutral conductors for electric discharge lighting.</p> <p>When multiple power feeds share a common neutral, the heating affect of harmonics were evaluated. The present design allows for harmonic loading of over 400%. Worst case harmonic loading of a neutral conductor is 100%.</p>
1640-2		Service Equipment and Facilities		
1640-2.1		General		
1640-2.1	661.	Interior electrical systems shall comply with NFPA 70. Switchgear criteria shall comply with IEEE C37 series.	C	The design and installation of interior electrical systems comply with NFPA 70 and IEEE C37 standards. Design and installation of switchgear comply with IEEE C37 requirements.
1640-2.3		Transformers		
1640-2.3	662.	Interior service transformer installations shall comply with NFPA 70.	C	<p>Distribution transformers are indoor, dry-type, with 480 volt delta-connected primaries. Secondaries are 208Y/120 volt or 480Y/277 volt as required, three phase, with the neutral solidly grounded. Each transformer has four 2-1/2 percent full capacity taps, two above and two below rated primary voltage. NFPA 70 is the governing code/regulation that is complied with.</p> <p>DBD: Section 5, Electrical, paragraph 5.8.4, <u>Distribution Transformers</u></p>

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1640-2.3	663.	Transformer protection and appurtenances shall comply with IEEE C37.91.	C	Transformer protection and appurtenances are compliant with IEEE C37.91. DBD: Section 5, Electrical, paragraph 5.3 <u>General Considerations</u>
1640-2.3	664.	Transformer installation shall comply with FM 5-4/14-8.	C	CSB transformer installation is compliant with FM 5-4/14-8. DBD: Section 5, Electrical, paragraph 5.8.4(3)
1640-2.4		Motors		
1640-2.4	665.	Motors shall comply with NEMA MG-1, except that hermetic refrigerant motor compressors shall comply with UL 984.	C	Motors, incorporated into the CSB facility design, comply with NEMA MG-1, squirrel-cage induction type, with starting and running characteristics coordinated with the driven machine and the motor control equipment. The chiller motor for the sampling/weld stations is UL 984 compliant. DBD: Section 5, Electrical, paragraph 5.9, <u>Motors</u>
1640-2.5		Motor Control		
1640-2.5	666.	Control equipment shall comply with the NEMA ICS standards and UL 508.	C	The motor control centers comply with NEMA Class 1, Type B wiring per NEMA ICS2, Part ICS2-322. All electrical equipment is UL labeled. DBD: Section 5, Electrical, paragraph 5.2, <u>Codes and Standards</u> Motor Control Centers Specification: W-379-C-CSB-16482

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1640-2.5	667.	All motors shall be provided with fully coordinated control equipment to perform the functions required. Overcurrent devices shall be provided in each ungrounded conductor; overcurrent devices located in the motor or controller shall be rated in accordance with the manufacturer's instructions. Manually reset devices are recommended.	C	All motors are provided with fully coordinated control equipment, overcurrent devices, etc. as appropriate.
1640-2.5	668.	Control devices shall be of adequate voltage and current rating for the duty to be performed. Pilot control circuits shall operate with one side grounded, at no greater than 120 volts.	C	<p>The general requirement for control devices is for the normal, standby and emergency uninterruptible power supply distribution systems to meet a minimum design power factor of 0.95, which includes motors and variable speed controllers.</p> <p>Pilot control circuits are designed to operate with one side grounded, at no greater than 120 volts. (See Specification Section 16482)</p> <p>DBD: Section 5, Electrical, paragraph 5.10 DBD: Section 5, Electrical, paragraph 5.4.7(1)</p>
1640-2.5	669.	Where control power transformers are required, they shall be located inside the associated motor starter housing, shall be protected against faults and overload by properly sized over- current devices, and shall be of sufficient capacity to serve all devices connected to them without overload.	C	<p>Power control transformers are mounted inside the associated motor starter housings on the removable unit with no wiring behind the unit.</p> <p>Control transformers are connected to alternate phases of control center power buses to provide balancing of single phase loads. Control transformers are provided one standard size larger than is required for control devices, this provides extra protection from overloads.</p> <p>Specification W-379-C-CSB-16482B, Motor Control Centers</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1640-3		Power Service for Security, Communications, and Alarm Systems		
1640-3.1		General		
1640-3.1	670.	Electric power distribution systems shall be filtered to reduce emanation of detectable electromagnetic signals to acceptable levels as directed by the cognizant DOE telecommunications and security personnel. Installations shall comply with DOE 5300.2B, DOE 5300.3B, and DOE 5300.4B.	C	<p>Electromagnetic interference and radio frequency interference effects are considered in the selection and installation design of electronic instruments.</p> <p>Interferences within the CSB are "effectively filtered" by physical separation of emanating systems from sensitive systems.</p> <p>DBD: Section 7, Instruments and Control; paragraph 5.7.6.3</p>
1640-3.2		Primary Power Supply		
1640-3.2	671.	Normal primary power for protective alarm and communications systems shall come directly from the on-site power distribution system or, in the case of isolated facilities, shall come directly from the public utility. Where several primary power sources are available, the most reliable source shall be used.	C	<p>1. The 13.8 kV switchgear is supplied from existing overhead utility circuit number C8-L7 via a 1,000 KVA pad-mounted utility transformer.</p> <p>2. The CSB loads are radially fed from a service-entrance of 480 VAC, 3 phase, 4 wire switchgear, located in the Electrical Equipment Room.</p> <p>Hanford Site electric utilities are historically very reliable.</p> <p>DBD: Section 5, Electrical, paragraph 5.7.1, Normal Power</p>
1640-3.3		Standby or Emergency Power Supplies		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1640-3.3	672.	Standby or emergency power supplies for security, communications, and alarm systems shall be provided in accordance with Section 1660, Special Systems.	NA	Standby or emergency power is not required for any CSB operations or safety functions.
1660		Special Systems		
1660-1		General		
1660-1	673.	Standby and emergency systems shall serve loads set forth in NFPA 110. Additional standby or emergency systems shall be provided to support systems or equipment components whose operating continuity is determined to be vital by the cognizant DOE authorities for protection of health, life, property, and safeguards and security systems. Safety Class 1 items shall be provided with emergency power.	NA	There are no NFPA 110 loads identified for the CSB. There are no active safety class systems that require electricity to perform their function.
1660-1	674.	Optional standby systems shall be provided for production process operations in cases where the cognizant DOE authority determines that the process will become unstable on loss of power or that a severe monetary loss will result.	NA	There are no production process operations associated with CSB.
1660-1	675.	Uninterruptible power shall be provided for equipment that cannot sustain functions through the momentary power loss that occurs when an alternate power source comes on line and picks up the load. See Section 1660-3, Uninterruptible Power Systems.	C	A 20 KVA UPS is provided for selected electrical loads.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-1	676.	Emergency power shall be provided for protective alarm and communications systems as dictated by the system requirements. Switchover to emergency power shall be automatic on failure of the primary power source and shall be indicated on an annunciator panel. The annunciator shall be located in an occupied area and shall indicate any problems with the emergency system. Definition of "emergency systems," "legally required standby systems," and "optional standby systems" shall be in accordance with NFPA 70.	C	There is no emergency power requirement for the CSB. The subject equipment and systems are supported by the UPS or battery backup.
1660-1	677.	Emergency power equipment areas shall be ventilated to exhaust hazardous gases (if applicable) and to maintain satisfactory ambient temperatures for equipment operation or personnel access.	NA	No emergency power equipment in CSB.
1660-1	678.	Emergency or standby power shall service fire alarm, security alarm, and supervisory sensing devices designated essential by the cognizant DOE authority.	NA	No emergency power equipment in CSB. Fire and security systems are backed up by local battery systems.
1660-1	679.	Emergency power systems are further detailed in Section 1660-99, Special Facilities.	NA	No emergency power equipment in CSB.
1660-2		Emergency Power Systems		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-2	680.	<p>Emergency power systems shall comply with NFPA 37, NFPA 70, NFPA 101, NFPA 110, and IEEE 446. Emergency power systems shall be capable of maintaining full operation of emergency loads for the full time period specified by the cognizant DOE authority (nominally, a minimum of 24 hours). Such power sources shall have the necessary built-in features to facilitate operational testing on a periodic basis to verify their readiness.</p> <p>Application of diesel engines shall comply with FCC Technical Report No. 69.</p> <p>Batteries, when required, shall be rechargeable and shall be kept fully charged at all times when primary power is available. The charger shall automatically switch from float to fast charge rate at a preset drop in DC bus voltage. The charger shall be furnished with a capacity to charge the battery from a fully discharged state to not less than 85 percent of the rated ampere-hour capacity within 24 to 72 hours. See also IEEE 308.</p> <p>Emergency power systems legally required by NFPA 70 shall be installed to meet normal emergency power requirements. More stringent emergency power requirements shall be identified by the cognizant DOE authority on a case-by-case basis.</p>	NA	No emergency power equipment in CSB.
1660-3		Uninterruptible Power Systems		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-3	681.	Uninterruptible power supplies shall be provided for those loads requiring guaranteed continuous power.	C	The UPS supplies power for Radiological Control Technician equipment connected to power panels C or F record air samplers, and DCS work stations. CAMS and ARMS supplied with power from panel G are not backed up. Fire protection panels are provided with self contained battery backup.
1660-3	682.	Applications of UPSs shall comply with IEEE 446, as modified by the cognizant DOE authority.	C	The CSB UPS is IEEE 446 compliant.
1660-99		Special Facilities		
1660-99.0		Nonreactor Nuclear Facilities - General		
1660-99.0.1		Safety Class (Emergency) Electrical Systems		

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-99.0.1	683.	<p>For safety class items that require electric power to perform their safety functions, the design shall provide safety class emergency electric power systems (AC, DC, and their distribution systems). The design shall define the type, capacity, performance characteristics, and features of the safety class electric systems, including generator and batteries, required to meet safety class system needs.</p> <p>Safety class electric systems shall be provided with suitable redundancy and separation to ensure that adequate capacity and capability are available with the addition of a single failure. Redundant safety class electric systems shall be physically protected or separated to prevent a common external event from causing a failure of the redundant systems. IEEE 379 and IEEE 384 shall be used as redundancy and separation criteria.</p> <p>The connection of loads that do not require safety class power to safety class buses shall be minimized. Where such loads must be connected to a safety class electric power system, the loads shall be provided with suitable separation or devices that will prevent failures from affecting the safety class electric system.</p> <p>Safety class electric systems shall be qualified to the requirements in Section 1300-3.4, Equipment Environment Considerations, and, as appropriate, to the structural requirements imposed on safety class items in Section 0111-99, Special Facilities.</p> <p>Testing or a combination of testing and analysis shall be the preferred method of demonstrating the operability of instrumentation and electrical equipment that are required to operate during and following a DBE. The capability to periodically test safety class electric systems to verify system performance shall be provided.</p>	NA	No safety class items require electric power to perform safety functions at the CSB.

C -- compliant
NA -- Not applicable

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-99.0.2		Protection System and Instrumentation and Controls		
1660-99.0.2	684.	The protection system shall provide automatic initiation of protective actions that require rapid response and automatic control of interlocks that prevent unsafe operator actions.	C	<p>The CSB has protection systems and instrumentation and controls providing automatic initiation of protective actions including rapid response and automatic control of interlocks to prevent unsafe operator action. For example, the fire protection system is provided with automatic actuation. MHM and other interlocks associated with the MHM and the receiving crane are fail safe upon loss of electrical power.</p> <p>The accelerometer provided to disconnect the MHM and Receiving Crane electrical power is a protection device. The accelerometer design is in compliance with this requirement. Performance of the accelerometer has been confirmed by the manufacturer's seismic testing.</p> <p>DBD: Section 7, Instruments and Controls</p>
1660-99.0.2	685.	Protection systems shall be designed to sense potentially hazardous conditions and to initiate actions to ensure that specific acceptable design limits are not exceeded as a result of anticipated operational occurrences.	C	<p>The accelerometer design is in compliance with this requirement. Performance of the accelerometer has been confirmed by the manufacturer's seismic testing. (Ref: HNF-3553, Section A4.3.14)</p>
1660-99.0.2	686.	The protection system shall automatically activate safety class systems and components that are required to ensure the safety of operating personnel and the public. It shall provide audible and visual indication of system status.	C	<p>See statement #685 above. Indication of MHM power disconnect status is provided at the seismic detection panel. (Ref: HNF-3553, Figure A4-3). The fire protections system local panel includes audible and visual indication of system status.</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-99.0.2	687.	Automatically initiated protective actions shall be provided with a manually initiated backup.	C	Power to the receiving crane and the MHM can be disconnected manually.
1660-99.0.2	688.	The design of the protection system shall provide suitable redundancy and diversity to ensure that safety functions can be completed, when required, and that no single failure will result in the loss of the protective functions. The protection system shall be designed to fail in a safe state following a component or channel failure or loss of power (e.g., control air or electric power).	C	The Seismic Detection and MHM Power Disconnect System provides redundancy and is designed to be failsafe. The accelerometer design is in compliance with this requirement. Performance of the accelerometer has been confirmed by the manufacturer's seismic testing. (Ref: HNF-3553, Section A4.3.14)
1660-99.0.2	689.	Safety class instrumentation shall sense abnormal conditions affecting safety and subsequently provide an alarm, e.g., low differential pressure between HVAC zones, criticality monitoring.	C	<p>The safety class instrumentation on the MHM provides interlocks and alarms on the MHM operating console. The following items are classified as safety class and important-to-safety Category A:</p> <ul style="list-style-type: none"> • MHM interlocks that prevent turret rotation when the MCO hoist is not fully raised, • MHM seismic detection and power shutdown system, • MHM interlocks that prevent rotating the turret to the MCO position when over the maintenance pit, and • MHM interlocks the ensure the MHM turret is rotated to the "navigate" position before allowing power to the bridge or trolley drive motors. <p>The collision avoidance system (interlock P10) is safety significant. The accelerometer design is in compliance with this requirement. Performance of the accelerometer has been confirmed by the manufacturer's seismic testing.</p>

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-99.0.2	690.	Safety class instrumentation and control systems shall provide audible and visual alarms so that the operator can take timely corrective actions to ensure the safety of operating personnel and the public.	C	See statement #689 above
1660-99.0.2	691.	The safety class instrumentation shall be designed to monitor safety related variables and safety class systems over expected ranges for normal operation, anticipated operational occurrences, DBA conditions, and for safe shutdown. Safety class controls shall be provided when they are necessary to control these variables.	C	There is no safety class instrumentation required to monitor safety-related variables or safety class systems in the CSB. The only Safety Class control system in the CSB utilizes accelerometers to trip power to the MHM upon actuation caused by a 1/2 SSE earthquake. Local indication of accelerometer status is provided. (Ref: HNF-3553, Section A4.3.14).
1660-99.0.2	692.	The design of safety class instrumentation and controls shall provide suitable redundancy and diversity to ensure that safety functions can be completed, when required, and that no single failure will result in the loss of the protective functions.	C	See item #691. Safety class MHM interlocks provide needed redundancy and diversity to ensure that the MHM is safely shut down when required and that no single failure will result in the loss of the protective functions. (Ref: HNF-3553, Section A4.3.14)

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1660-99.0.2	693.	The safety class instrumentation and controls shall fail in a safe state following a component or channel failure or loss of power (e.g., control air, electric power).	C	<p>Safety class interlocks on the MHM are "fail safe" on loss of power.</p> <p>The MHM safety class instrumentation and interlocks upon loss of power are designed to return to the same state they were in before the loss of power occurred. None of the MHM interlocks is seismically qualified and they are not expected to perform their safety function during or after a seismic event. The seismic accelerometer, upon detecting a seismic event, shuts off power to the MHM which shuts down the MHM. With no movement of the MHM, the MCO hoist is locked in place and remains in the same position until power is restored or manual operation of the hoist moves an MCO to a safe position. Any MHM related accident initiated by the DBE will not place the MCO at significant risk.</p>
1660-99.0.3		Qualifications		
1660-99.0.3	694.	Protection systems and safety class instrumentation and control equipment shall be qualified to the environmental qualification requirements in Section 1300-3.4, Equipment Environment Considerations.	C	<p>CSB protection and safety class systems, such as the fire protection system and the MHM control system, are designed and specified for the environments to which they are exposed. CSB systems are not exposed to harsh environments as a result of normal operations or potential DBAs. (Ref: HNF-3553, Section A3.4.2).</p> <p>External events that could cause facility temperatures to increase are those associated with loss of power or seismic events. The MHM seismic trip is DBE qualified. Performance of the accelerometer has been confirmed by the manufacturer's seismic testing.</p>
1660-99.0.4		Separation and Physical Protection		

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1660-99.0.4	695.	Redundant protection system and safety class instrument channels shall be physically protected or separated to prevent a common external event or failure of one channel from causing a failure in the redundant channel.	C	<p>Instrumentation and controls are provided with suitable redundancy and diversity to ensure safety functions can be completed when required and no single point failure will cause loss of protective functions.</p> <p>Redundant electrical signals are physically protected or separated to prevent a common event from causing failure of the redundant signals. IEEE 379 is used for separation and redundancy criteria. Redundancy and diversity are indicated on the P&IDs/F&CDs. Instrumentation associated with safety related equipment will fail in a safe mode following a component or channel failure.</p> <p>DBD: Instruments and Controls, section 7.5.5, I&C Design Approach</p>
1660-99.0.4	696.	The safety class protection system and safety class instrumentation and control system shall be appropriately separated or isolated from other instrumentation and control systems to the extent that a failure (e.g. electrical, control air) in these other systems will not degrade the safety class systems to the extent that they are unable to perform their necessary safety functions.	C	Safety Class accelerometers are housed in a dedicated enclosure. (Ref: HNF-3553, Section A4.3.14). Safety Class MHM interlocks are provided with separate redundant channels. (Ref: HNF-3553, Section A4.3.10).
1660-99.0.5		Test and Calibration		

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1660-99.0.5	697.	The design of protection system and safety class instrumentation and control systems shall provide for the periodic in-place testing and calibration of instrument channels and interlocks.	C	Instrumentation initiating plant safety class protection functions include provisions for periodic testing (tripping interlocks) under simulated emergency conditions to ensure these devices operate properly under actual DBA conditions. (Ref: HNF-3553, Chapter A10.0) Instrument calibration is addressed in SNF Project Administrative Procedure AP 3-004, <i>Calibration of Instruments and M&TE</i> DBD: Instruments and Controls, section 7, I&C Design Approach, Subparagraph 7.5.2, <u>Protection System Testing</u> .
1660-99.0.5	698.	The design shall allow periodic testing of protective functions to determine whether failure or loss of redundancy may have occurred.	C	See statement #697 above.
1660-99.0.6		Power Sources		
1660-99.0.6	699.	An analysis shall be made to determine power requirements for safe shutdown of the process. Safety class electric power or a safety class control air system shall be provided unless adequate system performance including fail safe shutdown can be demonstrated when only the conventional power sources are used.	C	CSB systems are designed to fail safe on loss of power. A 20 KVA UPS and battery backup lighting and fire protection systems are also provided. A specific evaluation was performed to determine the need for backup power for safe CSB shutdown. Emergency power and Standby power were found to be unnecessary. The current set of representative and bounding accidents and their analysis for the welded seal MCO strategy do not identify any accidents that rely on continuity of electrical supply as a preventive or mitigative feature for safe shutdown of the CSB.
1660-99.0.7		Control Areas		

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1660-99.0.7	700.	Control areas or a control room shall be designed to allow occupancy and actions to be taken to operate the facility safely under normal conditions, anticipated operational occurrences, and DBA conditions to achieve and maintain a safe shutdown condition including the remote manual initiation and control of safety functions, if used.	C	The CSB control room is not used for control of safety functions. Because it is located in the support building which is qualified to withstand SC NPH events, it can be safely occupied during normal and abnormal conditions and during a DBA.
1660-99.0.7	701.	In the event that a control area or control room is disabled, there shall be sufficient redundancy and capability to allow the facility to be placed in a safe shutdown condition.	C	The control area/control room is used as a monitoring, rather than a control location. If the control room/area becomes disabled, the capability to place the facility into safe shutdown is retained at the location of the specific operations. See statement #700 above
1670		Exterior Communications and Alarm Systems		
1670-2		Fire Alarm and Supervisory Systems		
1670-2	702.	Fire alarm and supervisory systems shall comply with NFPA 71, NFPA 72A, NFPA 72B, NFPA 72C, NFPA 72D, NFPA 72E, NFPA 72F, NFPA 72G, NFPA 72H, NFPA 1221, and ANSI C2 as appropriate for the location.	C	The fire protection system has electric supervision of all circuits as required by the appropriate NFPA standard. DBD: Fire Protection System, section 11.9.1(5)
1670-2	703.	Fire alarm cables installed in underground ducts shall be distinctively marked within manholes and handholes that are shared with other communications cables and shall be kept physically separated from all power conductors.	NA	There are no underground fire alarm cables at the CSB.

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Applicable Section	Item #	Item Number/Criteria	Status	Implementation
1670-2	704.	Exterior fire alarm pull boxes and emergency-reporting telephones shall be installed in weatherproof housings manufactured specifically for the mechanism.	NA	There are no exterior fire alarm pull boxes or emergency telephones at the CSB.

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