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1/2	1	Design Authority	L. H. Goldmann	2/2/99							
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SNF PROJECT'S MCO COMPLIANCE ASSESSMENT WITH DOE "GENERAL DESIGN CRITERIA," ORDER 6430.1A AND "SNF PROJECT MCO ADDITIONAL NRC REQUIREMENTS," HNF- SD-SNF-DB-005

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Abstract: This document presents the projects position on compliance
with DOE Order 6430.1A "General Design Criteria" and HNF-SD-SNF-DB-005
"SNF Project MCO additional NRC Requirements". As discussed in the text
and tables no non-compliances are shown. One item is open pending
closure by release of the Facility SARs.

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**SNF Project's MCO Compliance Assessment with
DOE "General Design Criteria," Order 6430.1A and
"SNF Project MCO Additional NRC Requirements," HNF-SD-SNF-DB-005**

December 1998

by

Louis H. Goldmann

This document is presented to demonstrate the MCO's compliance to the major design criteria invoked on the MCO. This document is broken down into a section for the MCO's evaluation against DOE Order 6430.1A "General Design Criteria" sixteen divisions and then the evaluation of the MCO against HNF-SD-SNF-DB-005 "Spent Nuclear Fuel Project Multi-Canister Overpack Additional NRC Requirements." The compliance assessment is presented as a matrix in tabular form.

The MCO is the primary container for the K-basin's spent nuclear fuel as it leaves the basin pools and through to the 40 year interim storage at the Canister Storage Building (CSB). The MCO and its components interface with;

- the K basins,
- shipping cask and transportation system,
- Cold Vacuum Drying facility individual process bays and equipment, and
- CSB facility including the MCO handling machine (MHM), the storage tubes, and the MCO work stations where sampling, welding, and inspection of the MCO is performed.

As the MCO is the primary boundary for handling, process, and storage, its main goals are to minimize the spread of its radiological contents to the outside of the MCO and provide for nuclear criticality control. The MCO contains personnel radiation shielding only on its upper end, in the form of a shield plug, where the process interfaces are located. Shielding beyond the shield plug is the responsibility of the using facilities.

The design of the MCO and its components is depicted in drawings H-2-828040 through H-2-828075. Not every drawing number in the sequence is used. The first drawing number, H-2-828040, is the drawing index for the MCO. The design performance specification for the MCO is HNF-S-0426, and was reviewed and approved by the interfacing design authorities, the safety, regulatory, and operations groups, and the local DOE office. The current revision for the design performance specification is revision 5. The designs of the MCO have been reviewed and approved in a similar way and the reports are published under HNF-SD-SNF-DR-003. Independent reviews also have been conducted.

As the MCO is an individual component, it is not a major facility. So the DOE general design criteria for facilities contain many requirements that go beyond the MCO's responsibility and are not directly applicable to the MCO. The NRC equivalency document was written for the MCO and also includes requirements common to the facility holding the MCO.

Discussion

The MCO is part of several systems and facilities as the MCOs moves through each of them on the MCOs' path to interim storage. The intention of this compliance matrix is to provide and demonstrate that the MCO has accomplished satisfactory compliance with the major design criteria. Other SNF subprojects will add the MCO's contribution to their various systems' and facilities' own compliance matrices. The MCO's contribution allows for its integration into the various facility users' own compliance matrices by adding to and filling out the various users' own compliance matrices.

DOE Order 6430.1A has 16 divisions listed with only four of them originally considered to apply to the MCO. The ones that apply are:

- Division 1 "General Requirements",
- Division 11, "Equipment",
- Division 13, "Special Facilities", and
- Division 15 "Mechanical".

These four divisions apply to the MCO in varying degrees. Their specific application and compliance is assessed in the attached Table 1, "Assessment of MCO compliance with DOE Order 6430.1A – General Design Criteria". A summary of the MCO compliance with these four divisions is briefly discussed below.

Division 1 is the general requirements division applicable to facilities in areas of fire, environmental, and physical protection, safety, structural requirements, construction facilities, construction closeout, special facilities, and quality assurance. The MCO is compliant with this division in the areas of Special Facilities and Quality Assurance. The remaining areas of this division are not applicable to the MCO.

Division 11 is the equipment division. This division is made up almost entirely of section 1161 "Enclosures." Although the MCO is not an enclosure the MCO is compliant with many of the 1161 sections. The sections discussing equipment maintenance, windows, glove ports, work stations, fire barriers, fire protection, and ventilation don't apply to the MCO. The MCO does comply with the general philosophy of this division in keeping the contents of the MCO inside the MCO during the normal operations. The General Considerations section and portions of the Construction section have been complied with.

Division 13 is the General Requirements for Special Facilities section. The MCO is compliant in the areas of section 1300 including General, Accidental Release, Safety Analysis, Safety Class Criteria, Equipment Environment Considerations, Nuclear Criticality Safety, Radiation Protection, Decontamination and Decommissioning, and Human Factors Engineering, to the extent practicable with the MCO as a component in a facility. The following sections of 1300 are not applicable to the MCO: Release, Shutdown, Controls, Maintenance, Testing, Criticality Monitoring, Communication, Safeguards, Alarm, Warning, and Annunciator Systems and Displays, Change Rooms etc., Lighting, and Noise etc. Sections 1304 Plutonium Processing and Handling Facilities, 1318 Uranium Enrichment Facilities, and 1319 Uranium Processing and Handling Facilities are not applicable to the MCO but the MCO has observed many of the requirements especially in the 1304 sections. Much of the 1320 section is applicable to the MCO except the areas of Special Design Features, Secondary Confinement System, and remaining sections of 1320. The remaining division 13 sections beyond 1320 are not applicable to the MCO.

Division 15 is "Mechanical" and, although it seems this division would probably apply to the MCO, the subject matter is directed toward the utilities in a facility. This division deals with Insulation, Fire protection, Plumbing and Service Piping, HVAC, Air Pollution Control, and Controls. As a result, nothing in Division 15 is applicable toward an MCO.

The portions of 6430.1A not applicable to the MCO are, by their nature, applicable in varying degrees to the facility holding the MCO. As a result of this review, the MCO is in compliance with these applicable sections of DOE Order 6430.1A. A detailed breakdown of the entire compliance matrix is presented in the attached matrix Table 1.

The evaluation of the NRC equivalency compliance is presented in the second matrix table attached as Table 2, "Assessment of MCO Compliance with SNF Project NRC Equivalency Criteria". This table is broken down into thirteen items directly extracted from the "SNF Project MCO Additional NRC requirements", HNF-SD-SNF-DB-005, Revision 3. The right hand column of the table is the discussion and evaluation, which demonstrates the compliance with the requirement or gives the status.

The MCO was found to be compliant with the thirteen NRC equivalency requirements, although some follow on work is needed by the SNF project on one open item indicated in the last item, number 13. This item has been taken as far as possible by the MCO Project and the close out of the item will be accomplished with the release of the SARs for the CVD and CSB. All of these thirteen NRC subject areas are discussed in the attached Table 2.

Conclusion

In conclusion, the review of the applicable portions of DOE order 6430.1A and the "Additional NRC Requirements" equivalency document revealed no non-compliances of the MCO. Some follow on work is needed to close item 13 of the NRC equivalency document. This closure will occur with the normal approval of the facility SARs.

**Table 1. Assessment of MCO Compliance with
DOE Order 6430.1A - General Design Criteria
Division 1**

C= Complies

NA= Not Applicable

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0101	Criteria Purpose and Application	C	The MCO is in compliance with this section as applicable to the MCO.	
0106	Regulatory Requirements	NA	Also, please see the NRC Equivalency Section Table 2 (at the end of the matrix).	
0110	Architectural and Special Design Requirements		Division 1 applies to Major architectural Structures. The MCO is a smaller, discreet component that is introduced from time to time into Facilities such as K Basins, CVD, and CSB. These major facilities (K Basins, CVD, and CSB) will therefore address the Division 1 requirements that apply to them, and then the MCO will be in compliance because it will be within those facilities.	
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: DOE 5500.1A	NA	Division 1 applies to Major architectural Structures. The MCO is a smaller, discreet component that is introduced from time to time into Facilities such as K Basins, CVD, and CSB. These major facilities (K Basins, CVD, and CSB) will therefore address the Division 1 requirements that apply to them, and then the MCO will be in compliance because it will be within those facilities.	
0110-5.1	DOE 5500.3			
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.	NA	The MCO is not a major facility.	
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.	NA	The MCO is not a major facility.	
0110-5.3	Emergency Preparedness Planning			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
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.	NA	The MCO is not a major facility.	
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 MCO is not a major facility.	
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 MCO is not a major facility.	
0110-6	Fire Protection			
0110-6.1	General			
0110-6.1	1. Facilities shall comply with the following: DOE 5480.4 Attachment 2, Section 2.C DOE 5480.7 Section 1530, Fire Protection	NA	The MCO is not a major facility.	
0110-6.1	2. 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.	NA	The MCO is not a major facility.	
0110-6.1	3. Definitions, fire resistance ratings, and types of construction shall be as contained in the UBC.	NA	The MCO is not a major facility.	
0110-6.1	4. 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 MCO is not a major facility.	
0110-6.1	5. The use of foamed plastics in construction shall be prohibited unless it fully complies with FM 1-57.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0110-6.2	Fire Protection Design Analysis			
0110-6.2	7. 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.	NA	The MCO is not a major facility.	
0110-6.2	8. 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.	NA	The MCO is not a major facility.	
0110-6.3	Fire Resistance Ratings			
0110-6.3	1. 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 exemptions are necessary for reasons of operations or equipment, exemption procedures shall comply with DOE 5480.7	NA	The MCO is not a major facility.	
0110-6.3	6. 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.	NA	The MCO is not a major facility.	
0110-6.4	Hazardous Areas			
0110-6.4	2. 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.	NA	The MCO is not a major facility.	
	3. The design of hazardous areas shall facilitate access by emergency			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0110-6.4	personnel from the exterior and, at the same time, shall maintain any required confinement or containment using air locks or other features.	NA	The MCO is not a major facility.	
0110-6.4	7. 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.	NA	The MCO is not a major facility.	
0110-7	Environmental Protection and Pollution Control			
0110-7	9. The construction of all DOE facilities shall comply with the environmental protection and pollution control portions of the following:	NA	The MCO is not a major facility.	
0110-7	· DOE 4700.1, Chapter V	NA	The MCO is not a major facility.	
0110-7	· DOE 5480.4	NA	The MCO is not a major facility.	
0110-7	· DOE 5480.1B	NA	The MCO is not a major facility.	
0110-7	· DOE 5440.1C	NA	The MCO is not a major facility.	
0110-12	Energy Conservation			
0110-12.2	General			
0110-12.2	1. For existing construction, ASHRAE Standard 100 shall apply	NA	The MCO is not a major facility.	
0110-12.2	2. HVAC design shall comply with ASHRAE Standard 62.	NA	The MCO is not a major facility.	
0110-13	Physical Protection			
0110-13.2	Access Control and Security Areas			
0110-13.2.1	General			
0110-13.2.1	4. Controls shall be established to prevent unauthorized access to security areas or removal of security interests. In general, the following apply:	NA	The MCO is not a major facility.	
0110-13.2.1	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.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0110-13.2.1	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.	NA	The MCO is not a major facility.	
0110-13.2.1	Door locks and latches used on security area perimeters shall comply with NFPA 101.	NA	The MCO is not a major facility.	
0110-99	Special Facilities			
0110-99.0	Nonreactor Nuclear Facilities – General			
0110-99.0	5. 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.	NA	The MCO is not a major facility.	
0110-99.0	6. All normal routes of egress shall be directed through exits that contain monitoring stations.	NA	The MCO is not a major facility.	
0110-99.0	7. Radioactive and hazardous materials (chemicals, feed wastes, etc.) shall be segregated from each other to minimize the generation of mixed waste.	NA	The MCO is not a major facility.	
0110-99.0	8. 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.	NA	The MCO is not a major facility.	
0110-99.0.2	Building Services and Distribution			
0110-99.0.2	1. Special facilities services and building utilities shall be planned to achieve maximum flexibility and ease of access.	NA	The MCO is not a major facility.	
0110-99.0.2	2. Priority shall be given to gravity-flow piped services and utilities and large air distribution and exhaust duct headers when analyzing the following:	NA	The MCO is not a major facility.	
0110-99.0.2	Establishment of zones (space) in vertical and horizontal service chases	NA	The MCO is not a major facility.	
0110-99.0.2	Determination of service header sizes	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0110-99.0.2	Assignment of spaces	NA	The MCO is not a major facility.	
0110-99.0.2	9. 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	The MCO is not a major facility.	
0110-99.0.2	10. Suitable access doors or removable panels shall be provided in service chases for access to valves, dampers, and so forth.	NA	The MCO is not a major facility.	
0110-99.0.2	3. 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.	NA	The MCO is not a major facility.	
0110-99.0.2	4. 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.	NA	The MCO is not a major facility.	
0110-99.0.2	11. 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.	NA	The MCO is not a major facility.	
0110-99.0.2	5. Where continuous services are required, service headers shall be looped and appropriately valved to maintain such services during routine maintenance or systems alterations.	NA	The MCO is not a major facility.	
0110-99.0.2	6. 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.	NA	The MCO is not a major facility.	
0110-99.0.2	7. All piping shall be located outside hazardous areas whenever possible to reduce personnel exposure during maintenance.	NA	The MCO is not a major facility.	
0110-99.0.4	Building Layout			
0110-99.0.4	12. The design of the facility shall include controlled access to areas of potential hazards within the facility.	NA	The MCO is not a major facility.	
0110-99.0.4	13. The facility layout shall provide for the segregation of	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	administrative and other support personnel from operations and process activities and areas.			
0110-99.0.4	14. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	15. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	16. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	17. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	18. 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 MCO is not a major facility.	
0110-99.0.4	19. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	20. The assured airflow through the barrier shall be in the direction opposite of exit travel.	NA	The MCO is not a major facility.	
0110-99.0.4	21. 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).	NA	The MCO is not a major facility.	
0110-99.0.4	22. The design shall minimize the hazard of handling flammable and	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	other hazardous materials.			
0110-99.0.4	23. In addition to the usual industrial safety features required in a nuclear facility, the design shall also include the following safety features, as appropriate: 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.	NA	The MCO is not a major facility.	
0110-99.0.4		NA	The MCO is not a major facility.	
0110-99.0.4	The provision of additional space shall be considered for temporary shielding or for additional shielding in the event radiation levels are higher than anticipated.	NA	The MCO is not a major facility.	
0110-99.0.4	24. Storage facilities shall be physically separated from process operations, areas for the storage of nonnuclear materials or equipment, and functions not directly required for storage operations.	NA	The MCO is not a major facility.	
0110-99.0.4	25. Physical protection of stored SNM shall comply with the DOE 5632 series.	NA	The MCO is not a major facility.	
0110-99.0.4	26. 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.	NA	The MCO is not a major facility.	
0110-99.0.4	27. 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.	NA	The MCO is not a major facility.	
0110-99.0.6	Fire Resistance	NA	The MCO is not a major facility.	
0110-99.0.6	8. 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).	NA	The MCO is not a major facility.	
0110-99.0.6	1. 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	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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).			
0110-99.0.6	9. 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.	NA	The MCO is not a major facility.	
0110-99.0.6	10. Penetrations in this shell shall incorporate, as a minimum, protection against DBF exposures unless greater protection is required by other sections of these criteria.	NA	The MCO is not a major facility.	
0110-99.0.7	Loss Limitations			
0110-99.0.7	11. 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 tornadoes) 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.	NA	The MCO is not a major facility.	
0110-99.0.8	Personnel and Public Safety			
0110-99.0.8	28. 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.	NA	The MCO is not a major facility.	
0110-99.0.8	1. 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).	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0110-99.0.8	2. 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).	NA	The MCO is not a major facility.	
0110-99.0.8	29. 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.	NA	The MCO is not a major facility.	
0111	Structural Design Requirements	NA	This section is for structural elements of Buildings.	
0111-1	General			
0111-1	2. 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.	NA	The MCO is not a major facility.	
0111-1	3. Where earthquake resistance is required, the cognizant DOE authority should consult LBL-9143 for practical guidelines for engineering earthquake safety and management planning and technical procedures for design of new facilities or evaluation of existing ones.	NA	The MCO is not a major facility.	
0111-2	Loads			
0111-2.1	General Requirements			
0111-2.1	4. Structures and their elements shall be designed for the loads prescribed in these criteria.	NA	The MCO is not a major facility.	
0111-2.2	Dead Loads			
0111-2.2.1	General			
0111-2.2.1	5. Dead loads are loads that remain permanently in place. They shall include the weights of all permanent materials and equipment.	NA	The MCO is not a major facility.	

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	including the structure's own weight, supported in, or on, a structure.			
0111-2.2.1	6. Load calculations shall include an allowance for any loadings anticipated to be added at a later date.	NA	The MCO is not a major facility.	
0111-2.2.3	Service Equipment			
0111-2.2.3	7. Design dead loads shall include the weight of all permanent service equipment.	NA	The MCO is not a major facility.	
0111-2.2.4	Allowance for Partition Loads			
0111-2.2.4	8. The minimum allowance for weights of partitions, where partitions are likely to be rearranged or relocated shall be as follows: 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 MCO is not a major facility.	
0111-2.3	Live Loads			
0111-2.3.1	General			
0111-2.3.1	9. Live loads shall include all loads resulting from the occupancy and use of the structure, whether acting vertically down, vertically up, or laterally.	NA	The MCO is not a major facility.	
0111-2.3.1	10. Live loads shall include neither dead loads nor loads from the environment, such as wind, tornado, earthquake, thermal forces, earth pressure, and fluid pressure.	NA	The MCO is not a major facility.	
0111-2.3.2	Buildings and Other Structures			
0111-2.3.1	11. Live loads for buildings and other structures shall be those produced by the intended use or occupancy.	NA	The MCO is not a major facility.	
0111-2.3.1	12. In no case shall they be less than the minimum uniform load or concentrated load stipulated in ANSI A58.1.	NA	The MCO is not a major facility.	
0111-2.3.1	13. 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.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0111-2.4	Wind Loads			
0111-2.4.1	General			
0111-2.4.1	14. The structural frame and exterior components of all buildings, signs, tanks, and other exposed structures shall be designed to resist pressures due to wind assumed to act from any direction.	NA	The MCO is not a major facility.	
0111-2.4.2	Buildings and Other Structures			
0111-2.4.2	15. 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.	NA	The MCO is not a major facility.	
0111-2.4.2	16. 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.	NA	The MCO is not a major facility.	
0111-2.4.2	17. 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).	NA	The MCO is not a major facility.	
0111-2.4.2	18. 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.	NA	The MCO is not a major facility.	
0111-2.4.2	19. 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	The MCO is not a major facility.	
0111-2.5	Tornado Loads			
0111-2.5	20. 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.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0111-2.5	21. 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.	NA	The MCO is not a major facility.	
0111-2.6	Internal Shock and Blast Loads			
0111-2.6	22. 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 MCO is not a major facility.	
0111-2.7	Earthquake Loads			
0111-2.7.1	Buildings and Other Structures			
0111-2.7.1	23. 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.	NA	The MCO is not a major facility.	
0111-2.7.1	24. Earthquake load design for buildings and other structures shall be determined in accordance with the procedures contained in UBC and UCRL 15910.	NA	The MCO is not a major facility.	
0111-2.7.1	25. The provisions and design procedures of TM 5-809-10 for the application of seismic loadings to conventional buildings shall also apply.	NA	The MCO is not a major facility.	
0111-2.7.1	26. For critical facilities, the provisions and design procedures of TM 5-809-10.1 shall be used.	NA	The MCO is not a major facility.	
0111-2.7.1	27. 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 application of dynamic analysis in determining structural requirements for earthquake loading as stipulated in Section 0111-	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	99.0, Non-reactor Nuclear Facilities - General.			
0111-2.7.1	28. 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.	NA	The MCO is not a major facility.	
0111-2.8	Other Loads for Buildings and Other Structures			
0111-2.8.1	Vibratory Loadings			
0111-2.8.1	29. 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.	NA	The MCO is not a major facility.	
0111-2.8.1	a. The operating frequency of supported equipment shall be determined from manufacturer's data prior to completion of structural design.	NA	The MCO is not a major facility.	
0111-2.8.1	b. 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.	NA	The MCO is not a major facility.	
0111-2.8.2	Earth and Groundwater Pressures			
0111-2.8.2	30. 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.	NA	The MCO is not a major facility.	
0111-2.8.2	31. Retaining walls shall be designed for earth pressures and potential groundwater levels producing the highest stresses and overturning moments.	NA	The MCO is not a major facility.	
0111-2.8.3	Fluid and Gas Pressure			
0111-2.8.3	32. The design of components of buildings and other structures shall	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	include the effects of fluid and gas pressures, both internal and external.			
0111-2.8.5	Creep and Shrinkage Forces			
0111-2.8.5	33. Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage.	NA	The MCO is not a major facility.	
0111-2.8.5	34. 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.	NA	The MCO is not a major facility.	
0111-2.10	Combination of Loads and Design Requirements for Buildings and Other Structures			
0111-2.10	35. 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.	NA	The MCO is not a major facility.	
0111-3	Structural Systems for Buildings and Other Structures			
0111-3.2	Floors			
0111-3.2	36. 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.	NA	The MCO is not a major facility.	
0111-3.2	37. A plastic vapor barrier shall be used under the slab where moisture conditions warrant.	NA	The MCO is not a major facility.	
0111-3.2	38. Excessive loads or equipment subject to vibration shall be supported by separate pads isolated from the rest of the floor slab with flexible joints.	NA	The MCO is not a major facility.	
0111-3.3	Control Joints			
0111-3.3	39. 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.	NA	The MCO is not a major facility.	

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0111-3.4	Foundations			
0111-3.4.1	General Requirements			
0111-3.4.1	40. 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.	NA	The MCO is not a major facility.	
0111-3.4.1	41. 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.	NA	The MCO is not a major facility.	
0111-3.4.2	Foundation Vibrations			
0111-3.4.2	42. 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	The MCO is not a major facility.	
0111-99	Special Facilities	C	The MCO supports this section. This section directs the MCO to Sections 1161 and 1300. The MCO does contain safety class equipment.	
0111-99.0	Nonreactor Nuclear Facilities - General			
0111-99.0.1	General			
0111-99.0.1	43. Safety class structures are sometimes required in special facilities for the following reasons:	NA	The MCO is not a major facility.	
0111-99.0.1	<ul style="list-style-type: none"> For nuclear criticality safety. 	NA	The MCO is not a major facility.	
0111-99.0.1	<ul style="list-style-type: none"> 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. 	NA	The MCO is not a major facility.	
0111-99.0.1	<ul style="list-style-type: none"> To achieve and maintain the facility in a safe shutdown condition. 	NA	The MCO is not a major facility.	
0111-99.0.1	44. Special facility structures that need not be designed to withstand severe natural phenomena or man-made events shall be designed to	NA	The MCO is not a major facility.	

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	the requirements in Section 0111-2, Loads.			
0111-99.1	30. 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.	NA	The MCO is not a major facility.	
0111-99.0.1	45. 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.	NA	The MCO is not a major facility.	
0111-99.0.1	46. 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, tornadoes, straight winds and floods shall be addressed.	NA	The MCO is not a major facility.	
0111-99.0.1	47. Where floor-mounted special facilities equipment will have a commonality of use, it shall be centrally located with respect to special facilities operations.	NA	The MCO is not a major facility.	
0111-99.0.1	48. 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.	NA	The MCO is not a major facility.	
0111-99.0.1	1. 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 MCO is not a major facility.	
0111-99.0.1	12. 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.	NA	The MCO is not a major facility.	
0111-99.0.2	Tornado and Extreme Wind			Please see Table 2 for discussion, as the facilities and transport cask provide the protection.

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	Determination of Design Basis Tornado			
0111-99.0.2	49. 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.	NA	The MCO is not a major facility.	
0111-99.0.2	50. If site-specific hazard model studies are not available, a hazard model shall be developed consistent with the approach used in UCRL 15910.	NA	The MCO is not a major facility.	
0111-99.0.2	51. In applying UCRL 53526, Rev. 1, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	NA	The MCO is not a major facility.	
0111-99.0.2	52. In designing for tornado or extreme wind resistance:	NA	The MCO is not a major facility.	
0111-99.0.2	<ul style="list-style-type: none"> The tornado rotational speed shall be appropriately combined with the translational speed. 	NA	The MCO is not a major facility.	
0111-99.0.2	<ul style="list-style-type: none"> 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. 	NA	The MCO is not a major facility.	
0111-99.0.2	<ul style="list-style-type: none"> 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. 	NA	The MCO is not a major facility.	
0111-99.0.2	<ul style="list-style-type: none"> The minimum wind speed used shall be 70 mph. 	NA	The MCO is not a major facility.	
0111-99.0.3	Floods		This is a facility function.	
0111-99.0.3	53. 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: <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	The MCO is not a major facility.	

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0111-99.0.4	Earthquakes			This is a facility function to withstand earthquakes.
	Seismic Analysis			The MCO capabilities go far beyond what an earthquake may offer to the MCO as far as acceleration are concerned. Section 4.19.2 of HNF-S-0426 so states.
0111-99.0.4	32. The use of earthquake experience is an acceptable approach to the seismic qualification of safety class items.	NA		The MCO is not a major facility.
0111-99.0.4	54. 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).	NA		The MCO is not a major facility.
0111-99.0.4	55. 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.	NA		The MCO is not a major facility.
0111-99.0.4	56. Site-specific seismic parameters shall be determined for a DBE. The SSE shall be equivalent to the DBE.	NA		The MCO is not a major facility.
0111-99.0.4	57. 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.	NA		The MCO is not a major facility.
0111-99.0.4	58. Design guidance in UCRL 15910 shall be used in applying UCRL 53582, Rev. 1.	NA		The MCO is not a major facility.
0111-99.0.4	59. The DBE shall be defined by design response spectra, appropriate for the site, or by acceleration time histories, representative of the anticipated ground motions.	NA		The MCO is not a major facility.
0111-99.0.4	31. 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.	NA		The MCO is not a major facility.
0111-99.0.4	60. The ratio of vertical-to-horizontal acceleration shall be two-thirds, unless site-specific data justify use of a different ratio.	NA		The MCO is not a major facility.
0111-99.0.5	Aircraft			Facility Task, see Table 2.
0111-99.0.5	61. Unless the safety analysis can demonstrate that the risk from an aircraft crashing into the facility is acceptable, potential aircraft crashes	NA		The MCO is not a major facility.

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	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.			
0111-99.0.6	Nearby Explosions and Externally Generated Missiles		Facility Task, see Table 2.	
0111-99.0.6	62. 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.	NA	The MCO is not a major facility.	
0111-99.0.7	Explosion, Internal Pressurization, Criticality, and Other DBA Causes		Facility Task, see Table 2.	
0111-99.0.7	63. 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.	NA	The MCO is not a major facility.	
0111-99.0.8	Load Combinations		Facility Task, see Table 2.	
0111-99.0.8	64. Safety class structures and structural members shall be designed to resist the appropriate load combinations provided in UCRL 15910.	NA	The MCO is not a major facility.	
0111-99.0.8	Concrete Structures		None.	
0111-99.0.8	65. 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.	NA	The MCO is not a major facility.	
0111-99.0.8	Steel Structures	NA	Facility task not applicable to MCO.	
0111-99.0.8	66. Safety class steel structures shall meet the design, fabrication, and erection requirements of AISI N690 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.	NA	The MCO is not a major facility.	
0140	Quality Assurance	NA	Please see below response.	
0140	10. A QA program shall be developed and implemented in compliance	NA	The MCO is not a major facility. But, the MCO subproject does have its own	

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	with DOE 5700.6b and using the elements of DOE 4700.1 and ANS ANS/ASME NQA-1.			QA program and it is described in the MCO performance specification, HNF-S-0426. The design report HNF-SD-SNF-DR-003 contains a fabrication specification, HNF-S-0453, for the components. The QA program for the components is included in the fabrication specifications for the MCOs and baskets. Also, QA is discussed in the MCO Topical Report, HNF-SD-SNF-SARR-005, chapter 13. These QA programs for the MCO design and fabrication exceed the DOE order 6450.1A, division 0104 requirements.
0150	Construction Facilities and Temporary Controls	NA		This section is for site development, temporary utilities, telephone, pollution, fencing, etc. and as such not applicable to MCO.
0170	Construction Contract Closeout	NA		This is related to the site for a building.
0200	Site Development	NA		This is for a construction site development and as such these requirements are not for the MCO.
0200-1	Facility Siting			
0200-1.2	Radiological Siting Requirements			
0200-1.2	11. 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.	NA		Division 2 applies to Siting of Major Facilities. The MCO is a smaller, discreet component that is introduced from time to time into Facilities such as K Basins, CVD, and CSB. These major facilities (K Basins, CVD, and CSB) will therefore address the Division 2 requirements that apply to them, and then the MCO will be in compliance because it will be within those facilities.
0200-1.2	12. 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^{-5} .	NA		The MCO is not a major facility.
0200-1.2	13. Radiation dose to an off-site individual receiving maximum exposure shall be evaluated.	NA		The MCO is not a major facility.
0200-1.2	14. Dose shall be calculated and compared to the dose guidelines established below. Comparisons shall be based on a 50-year committed effective dose-equivalent.	NA		The MCO is not a major facility.
0200-1.2	15. 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.	NA		The MCO is not a major facility.
0200-1.2	16. Meteorological conditions used in dose calculations shall be	NA		The MCO is not a major facility.

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	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.			
0200-1.2	17. Consideration shall be given to on-site individuals.	NA	The MCO is not a major facility.	
0200-1.2	18. 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.	NA	The MCO is not a major facility.	
0200-1.2	19. 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.	NA	The MCO is not a major facility.	
0200-1.3	Radiological Siting Guidelines			
0200-1.3	20. 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.	NA	The MCO is not a major facility.	
0200-1.3	21. 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.	NA	The MCO is not a major facility.	
0200-1.3	22. 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 weighting factors.	NA	The MCO is not a major facility.	
0200-99	Special Facilities			
0200-99.0	Nonreactor Nuclear Facilities -General			
0200-99.0.2	Other Facilities and Operations			
0200-99.0.2	33. 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.	NA	The MCO is not a major facility.	
0200-99.0.3	Services			
0200-99.0.3	8. Utility systems essential to the support of safety class items shall be	NA	The MCO is not a major facility.	

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	designed as safety class items.			
0201	Subsurface Investigations			
0201-1	General			
0201-1	67. For permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions.	NA	The MCO is not a major facility.	
0201-1	68. Subsurface investigations shall be made for critical facilities.	NA	The MCO is not a major facility.	
0201-1	69. A settlement analysis under differential design loads shall be performed where differential settlement may cause structural or architectural damage.	NA	The MCO is not a major facility.	
0201-4	Foundation Engineering Evaluation and Recommendations			
0201-4	70. The soils engineer shall analyze the information developed by investigations 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.	NA	The MCO is not a major facility.	
0201-4	71. The soils engineer shall submit a professional evaluation, recommended construction specifications, and recommendations including the following where applicable:	NA	The MCO is not a major facility.	
0201-4	<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 	NA	The MCO is not a major facility.	
0201-4	<ul style="list-style-type: none"> Soil material and compaction requirements for site fill, construction backfill, and for the support of structures and pavement 	NA	The MCO is not a major facility.	
0201-4	<ul style="list-style-type: none"> Recommendations and design criteria for shoring and underpinning systems 	NA	The MCO is not a major facility.	
0201-4	<ul style="list-style-type: none"> Seismic activity 	NA	The MCO is not a major facility.	
0201-4	<ul style="list-style-type: none"> Analysis of the effect of weather and construction equipment on soil during construction 	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0201-4	<ul style="list-style-type: none"> Analysis of soils to ascertain presence of dispersive potentially expansive, deleterious, chemically active or corrosive materials or conditions, or presence of gas 	NA	The MCO is not a major facility.	
0201-4	<ul style="list-style-type: none"> Recommendation of the most proper foundation system and other alternative workable systems 	NA	The MCO is not a major facility.	
0235	Building Foundations			
0235-3	Concrete			
0235-3	72. Concrete for building foundations shall be designed in accordance with Section 0330, Cast-In-Place Concrete.	NA	The MCO is not a major facility.	
0235-8	Equipment Foundations			
0235-8	73. Heavy, vibration-producing equipment, such as high-pressure air compressors, chillers, fire pumps and engine/generator sets, shall have separate, isolated foundations.	NA	The MCO is not a major facility.	
0260	Piped Utility Materials			
0260-2	Exterior Utilities			
0260-2	9. All water mains, supplying fire protection systems, fire hydrants, etc., shall be treated as fire mains and installed in accordance with NFPA 24.	NA	The MCO is not a major facility.	
0260-2 0260-2	10. Water storage facilities shall comply with NFPA 22.	NA	The MCO is not a major facility.	
0260-2	11. 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 MCO is not a major facility.	
0260-2	12. Domestic water supply lines shall comply with 40 CFR 141 and 40 CFR 142.	NA	The MCO is not a major facility.	
0262	Corrosion Control			
0262-3	Cathodic Protection System			
0262-3	13. The interior of steel water tanks shall be protected by cathodic	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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.			
0262-3	14. Cathodic protection for underground flammable/combustible liquid storage tanks and piping shall comply with NFPA 30.	NA	The MCO is not a major facility.	
0266	Water Distribution Systems			
0266-4	System Design Considerations			
0266-4	15. 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 MCO is not a major facility.	
0266-4	13. Each fire hydrant within the distribution system must be capable of delivering 1000 gpm at a residual pressure of not less than 10 psi.	NA	The MCO is not a major facility.	
0266-4	14. 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 MCO is not a major facility.	
0266-4	15. Fire hydrant branches (from main to hydrant) shall be not less than 6 inches in diameter and no longer than 300 feet.	NA	The MCO is not a major facility.	
0266-4	16. A gate valve shall be installed within each fire hydrant branch to facilitate maintenance.	NA	The MCO is not a major facility.	
0266-4	17. 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.	NA	The MCO is not a major facility.	
0266-4	18. Each building shall be protected by a minimum of two hydrants.	NA	The MCO is not a major facility.	
0266-4	16. Water mains shall have a minimum pressure rating of 150 psi.	NA	The MCO is not a major facility.	
0266-4	17. 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 MCO is not a major facility.	
0273	Water Pollution Controls			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0273-99	Special Facilities			
0273-99.0	Nonreactor Nuclear Facilities - General			
0273-99.0	18. There shall be no interconnections among storm water systems, the sanitary waste system and radioactive or other hazardous material handling systems or areas.	NA	The MCO is not a major facility.	
0273-99.0	19. 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.	NA	The MCO is not a major facility.	
0273-99.0	20. In addition, there shall be no interconnections between the potable water system, the sanitary waste system, and process systems.	NA	The MCO is not a major facility.	
0275	Industrial Wastewater Treatment			
0275-4	Control of Pollution from Other Sources			
0275-4	34. 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 MCO is not a major facility.	
0275-4	21. Structural requirements are found in:	NA	The MCO is not a major facility.	
0275-4	40 CFR 280.30 (draft), which details requirements for spill or overflow prevention devices on new and existing tank systems.	NA	The MCO is not a major facility.	
0275-4	40 CFR 264.193, which details requirements for secondary containment on new and existing hazardous waste tank systems.	NA	The MCO is not a major facility.	
0275-4	40 CFR 264.194, which also requires use of spill prevention controls (check valves), overflow prevention controls (sensing devices, cutoffs and bypasses), and maintaining sufficient freeboard.	NA	The MCO is not a major facility.	
0275-4	23. In 40 CFR 280.21 (draft) it is required that all existing tanks be	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	upgraded to meet the same performance standards as new tanks and piping within 10 years from the effective date to the final regulations (i.e., either be constructed out of materials to prevent corrosion, install cathodic protection, or close the tank). In 40 CFR 264.192 it is required that, for new hazardous waste tank systems, the written assessment of proposed tank systems (to be performed by an independent registered engineer) shall include design standards by which the tanks and ancillary equipment are to be constructed, characteristics of the wastes, and other installation considerations. Where any external metal component comes in contact with water or soil, a list of factors affecting potential for corrosion and type and degree of required external corrosion protection is required.			
0275-4	24. For existing tanks, 40 CFR 264.191 addresses requirements for system integrity. An assessment of each tank system without secondary containment must be made by 1/12/88, including an evaluation of existing corrosion protection.	NA	The MCO is not a major facility.	
0275-4	35. For hazardous waste tank systems, groundwater monitoring may be required in some instances when leaks have occurred, but will definitely be required under 40 CFR 264.197 and 40 CFR 265.197, which contain requirements for closure and post-closure care.	NA	The MCO is not a major facility.	
0275-99	Special Features			
0275-99.0	Nonreactor Nuclear Facilities - General			
0275-99.0.1	Industrial Wastes			
0275-99.0.1	22. 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.	NA	The MCO is not a major facility.	
0275-99.0.1	23. 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.	NA	The MCO is not a major facility.	
0275-99.0.1	3. The radioactivity monitor shall have an alarm that annunciates locally as well as in an occupied area where corrective action can be initiated.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0275-99.0.2	Process Wastes			
0275-99.0.2	24. 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.	NA	The MCO is not a major facility.	
0275-99.0.2	2. 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.	NA	The MCO is not a major facility.	
0275-99.0.2	4. Radiation, liquid level, or conductivity detectors shall be provided in collection systems.	NA	The MCO is not a major facility.	
0275-99.0.2	25. Transfer lines shall have inspection and collection pits at practical intervals into which leakage can drain by gravity.	NA	The MCO is not a major facility.	
0275-99.0.2	3. 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	The MCO is not a major facility.	
0275-99.0.2	4. 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	The MCO is not a major facility.	
0275-99.0.2	26. Nuclear criticality safety shall be considered in the design of liquid radioactive waste processing systems.	NA	The MCO is not a major facility.	

**MASTER Table. DOE Order 6430.1A - General Design Criteria
Division 3 - 12**

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0301	General Requirements	NA	Division is for Concrete—not applicable to MCO.	
0301-1	Buildings and Other Structures			
0301-1	74. Concrete materials, design, and construction for buildings and other structures shall comply with ACI 318 and 40 CFR 249.	NA	Division 3 applies to Major Building Structures. The MCO is a smaller, discreet component that is introduced from time to time into Buildings such as K Basins, CVD, and CSB. These major facilities (K Basins, CVD, and CSB) will therefore address the Division 3 requirements that apply to them, and then the MCO will be in compliance because it will be within those facilities. The MCO is constructed of stainless steel. No concrete is used.	
0320	Concrete Reinforcement			
0320-1	Materials for Reinforcement			
0320-1	75. 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).	NA	The MCO is constructed of stainless steel. No concrete is used.	
0320-2	Detailing of Reinforcement			
0320-2	76. 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.	NA	The MCO is constructed of stainless steel. No concrete is used.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0330	Cast-In-Place Concrete			
0330-2	Materials, Testing, and Quality Control			
0330-2	77. 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.	NA		The MCO is constructed of Stainless Steel. No concrete is used.
0330-2	78. Tolerances for formed concrete shall be as suggested in ACI 347.	NA		The MCO is constructed of Stainless Steel. No concrete is used.
0330-3	Selecting Proportions for Concrete Mixes			
0330-3.1	Normal, Heavyweight, and Mass Concrete			
0330-3.1	79. The selection of proportions for concrete mixes for normal, heavyweight, and mass concrete shall comply with ACI 211.1.	NA		The MCO is constructed of Stainless Steel. No concrete is used.
0330-4	Mixing, Transporting, and Placing			
0330-4	80. The mixing, transporting, and placing of cast-in-place concrete shall comply with ACI 304.	NA		The MCO is constructed of Stainless Steel. No concrete is used.
0340	Precast Concrete			
0340-2	General			
0340-2	81. 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		The MCO is constructed of Stainless Steel. No concrete is used.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0370	Repair and Restoration of Concrete Structures			
0370-2	General			
0370-2	82. 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		The MCO is constructed of Stainless Steel. No concrete is used.
0400	Coverage	NA		Division 4 is for masonry—not applicable to the MCO.
0500	Coverage	NA		Division 5 is for metals related to Building Construction—not applicable to the MCO.
0600	Coverage	NA		Division 6 is for wood and plastics related to the building structure construction—not applicable to the MCO.
0700	Waterproofing	NA		Division 7 is for thermal and moisture protection related to building structure and is not applicable to the MCO. The MCO has considered corrosion by water in the design.
0710	Waterproofing			
0710-1	General			
0710-1.4	Capillary Water Barriers			
0710-1.4	83. 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.	NA		This requirement applies to building structures, not components such as the MCO.
0710-1.5	Penetrations			
0710-1.5	84. Penetrations below grade through slabs-at-grade and other horizontal building elements shall be	NA		This requirement applies to building structures, not components such as the MCO.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	limited to drains and structural elements.			
0727	Firestopping			
0727	19. Firestopping shall comply with NFPA 101, Chapter 6.	NA	The MCO is constructed of Stainless Steel. No fireproofing is necessary. This requirement applies building structures, not components such as the MCO.	
0727	20. 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.	NA	The MCO is constructed of Stainless Steel. No fireproofing is necessary. This requirement applies building structures, not components such as the MCO.	
0800	General	NA	Division 8 is for Building doors and windows.	
0800-1	Doors			
0800-1.2	Fire Protection			
0800-1.2	21. 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.	NA	There are no doors or windows in the MCO.	
0800-1.2	22. Fire doors, frames, and hardware shall be installed with label attached in accordance with NFPA 80.	NA	There are no doors or windows in the MCO.	
0910	Metal Support Systems	NA	Division 9 is for finishes of the Building Surfaces.	
0910-2	Ceiling Suspension Systems			
0910-2	85. Suspended ceilings shall be earthquake resistant. They shall comply with:	NA	There are no suspended ceiling systems in the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
0910-2	• UBC Standard No. 47-18	NA	There are no suspended ceiling systems in the MCO.	
0910-2	• ICBO Report 4071	NA	There are no suspended ceiling systems in the MCO.	
0910-2	• ASTM C635	NA	There are no suspended ceiling systems in the MCO.	
0910-2	• ASTM C636	NA	There are no suspended ceiling systems in the MCO.	
0910-2	• ASTM E580	NA	There are no suspended ceiling systems in the MCO.	
0910-2	86. Nonstructural suspended systems, including ceilings, electrical components, and equipment, shall be considered in terms of UCRL 15714, Section V.	NA	There are no suspended ceiling systems in the MCO.	
1000	Specialties	NA	Division 10 is for Building features—is not applicable to the MCO.	
1100	Equipment	C	Only portions of 1161 Enclosures are applicable to varying degrees.	
1161	Enclosures			
1161-1	General Considerations			
1161-1	5. Enclosures as used here are physical barriers (e.g., cubicles, glove boxes, 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	Structural containment of SNF is the primary purpose of the MCO. The requirements for the MCO are contained in HNF-S-0426. Refer to details in section 4 of HNF-S-0426. The MCO shall confine its contents and maintain containment capabilities during all normal operations	The MCO is designed to contain its contents during all normal operations and during design basis accidents. The confinement is met by a 304 L stainless steel shell that is closed with a mechanical seal between the shield plug and the shell. The vessel is designed to and fabricated in accordance with ASME Code Section III Division 1 Subsection NB. The process plugs are designed to couple with an operator tool, allowing then to be operated within a sealed environment. All seals and closures are designed with capabilities of leak tightness better than 1×10^{-3} sec/sec. The welded portion of the containment boundary is tested to demonstrate leak tightness better than 1×10^{-7} sec/sec. The field closure weld is leak tested

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
			and after being subjected to the DBAs described in Section 4.19.2.	providing a redundant seal to the mechanical seal. Confinement is demonstrated in HNF-SD-SNF-DR-003, "MCO Design Report" Appendices 4, 5, and 11. The MCO shall be designed to facilitate confinement while process connections are being made and in conjunction with process piping during process operations. This confinement requirement does not apply to a pressure relief discharge path during actuation of any MCO or CVD pressure relief device. During Hanford on-site transportation and process operations, the total gaseous leakage across the MCO pressure boundary, including process connection seals but excluding controlled flow through any port, shall not exceed 1×10^{-5} scc/sec. This gaseous leakage rate is based on a clean seal and a clean sealing surface at the final mechanical closure boundary and associated process boundaries. The MCO, when sealed by welding at the CSB weld station, shall be capable of not exceeding a maximum total leak rate of 1×10^{-7} scc/sec.
1161-1	6. 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	Normal operating conditions and environment are specified in HNF-S-0426, Section 4.7.	The MCO materials are fully compatible with environmental conditions specified. The selection of materials is documented in HNF-SD-SNF-DR-003, Appendix 2. Applicable stress values used for materials in the analysis (Appendices 4-12) ensure that the MCO and the fuel baskets are fully functional for the environmental conditions specified. All containment seals and process plug seals are also selected for these conditions.
1161-1	7. Also, DBAs such as fire, explosion, criticality, and natural phenomena shall be considered in the design of the enclosure.	C	The MCO is required to maintain containment and	Design Basis drop accidents analyses are documented in DR-003, Appendix 5, which shows the MCO meets drop conditions as

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1161-1	8. Enclosure stability during a seismic event shall be based on the seismic parameters described in Section 0111-99.0.4, Earthquakes.	C	As stated in section 4.19.2 of the performance specification, HNF-S-0426, the drop accelerations bound the imposed accelerations of the seismic events.	Design basis drop accident analyses are documented in DR-003, Appendix 5, which bound potential seismic parameters. No further action is required of the design report for this seismic requirement.
1161-1	9. 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	The performance specification describes the requirements for equipment inside the MCO. Only equipment functionally necessary for operations is placed inside the MCO as there is no access or opportunity for maintaining components inside	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). All the movable and replaceable components are located on the outside of the MCO and are accessible from the outside. The external components are designed to support the fuel loading, sealing, hauling, processing, and sampling operations planned for the MCO. The process valves and rupture disk may be replaced from the outside of the MCO. Once the cover cap is installed no parts may be replaced. Inside the MCO there are no moving or rotating

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
			the MCO once it is sealed.	components. The process components inside the MCO include only screens and metallic HEPA filters which are all designed of corrosion resistant materials and to not require maintenance. These items are suitable for radioactive materials contact and keep as much of the radioactive materials as possible inside the MCO during process.
1161-1	10. All equipment that must be located within the enclosure shall be designed to allow for in place maintenance and/or replacement.	NA	As stated in the performance specification for the MCO, maintenance is to be minimized.	The MCO is not an enclosure in the traditional sense, the components inside the MCO do not require maintenance or replacement.
1161-1	11. 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	The MCO is required to accommodate the process and sampling hardware. Sealing faces and bolt patterns are provided for the operators' attachment.	The MCO is constructed of corrosion resistant materials and is not connected to traditional fire protection systems. The MCO is provided with a pressure relief system for use by the using facilities as required. Preservation of the confinement boundary has been considered in the design of the MCO and assured through the availability of a pressure relief system on the MCO and an evaluation of the MCO drop accidents results in the design report. Additional drop analyses results are presented in the MCO topical report, HNF-SD-SNF-SARR-005.
1161-2	Construction			
1161-2	12. Noncombustible or fire-resistant materials shall be used for enclosures and, to the maximum extent practicable, for any required radiation shielding.	C	The requirements for the MCO are contained in HNF-S-0426. Refer to section 4.15 for Materials details.	The MCO is designed for fabrication entirely of stainless steel materials, including the shield plug, and as such it is considered to be "noncombustible or fire resistant".

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1161-2	13. 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.	NA	The requirements for the MCO are contained in HNF-S-0426. Refer to section 4.19.2 for Fire details.	Fire loading and risk analysis is usually addressed on a facility wide basis, so this section does really not apply to the MCO as a single component. The MCO design, as a component, has invoked reasonable measures to assure the MCO is a stable and reliable boundary for the radioactive contents. Thermal events have been addressed in the MCO topical report and in the facilities' safety analysis reports.
1161-2	14. Enclosures (except open-face hoods) shall be designed with the objective of being leak-tight.	C	The requirements for the MCO are contained in HNF-S-0426. Refer to section 4.3 for Containment details.	The MCO is designed to be fabricated and operated within prescribed leakage rates. The components are tested individually and as assemblies at the fabricators shop. The loaded MCOs are tested after loading at the CVD and after sealing at the CSB. The testing is performed with helium as the trace gas and measured with a mass spectrometer. Generally, the maximum acceptable leakage rates at the CVD are in the 10^{-3} sec/sec-atm (standard cubic centimeters of air per second at one atmosphere of differential pressure) range and in the 10^{-7} range at the CSB with the cover cap in place.
1161-2	15. Appropriately sized and located windows shall be part of the enclosure design to provide operators with visual access to the enclosure interior.	NA	The MCO does not contain windows.	
1161-2	16. Viewing windows in enclosures shall be as small as practicable.	NA	The MCO does not contain windows.	
1161-2	17. The windows shall be constructed of noncombustible or approved fire-resistant materials as specified in Section 0727, Firestopping.	NA	The MCO does not contain windows.	
1161-2	18. Window design shall be such that it will enable	NA	The MCO does not contain windows.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	replacement with minimum risk of releasing contamination to the working area.			
1161-2	19. The selection of appropriate window material shall be based on specific process, combustible loading, and radiological safety considerations.	NA	The MCO does not contain windows.	
1161-2	20. Glove ports shall be located to facilitate both operations and maintenance work inside the enclosure.	NA	The MCO does not contain glove ports.	
1161-2	21. They shall have flexible gloves attached to allow operating personnel access to all interior surfaces and equipment.	NA	The MCO does not contain glove ports.	
1161-2	22. They shall be designed to allow replacement of gloves without losing contamination control and with minimum exposure to the operator.	NA	The MCO does not contain glove ports.	
1161-2	23. When gloves are not in place, a noncombustible shield or cover for each glove port shall be provided.	NA	The MCO does not contain glove ports.	
1161-2	24. 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 requirements for the MCO are contained in HNF-S-0426. Refer to section 4.11 for Closure details.</p> <p>The following is based on and summarized from section 3.11 of the design report. Other information has supplemented this response. The closure welds of the cover cap and the device seals closure systems on the MCO, i.e. the main closure (helicoflex (TM)) seal, port appliance seals, the port cover plate seals, and the cover cap penetration seal, including the mating sealing surfaces for the seals, are all designed to support the minimum agreed-to leakage rates. These rates are discussed above and are provide for and supported in the MCO design.</p>	
1161-2	25. Such closures or seals shall have an integrity	C	The requirements for the MCO are	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	equal to or greater than the barrier itself.		contained in HNF-S-0426. Refer to section 4.11 for Closure details.	section 4 of the specification (HNFS-0426). The sealing systems in the MCO support agreed-to leakage rates and as such the leakage rates are adequate for confinement of the radioactive contents of the MCO. Through drop and structural analyses the sealing system have been shown to be adequate.
1161-2	26. Where pertinent to safety, the enclosure designs shall consider the heat generation in the enclosure.	C	The requirements for the MCO are contained in HNF-S-0426. Refer to section 4.9.2 for Temperature details. Also section 3.1.3.1 discusses the radioactive decay heat load maximum of 776 watts and section 4.7 lists the environmental conditions including temperature maximum of 132 C. Process conditions including the contributions of corrosion heat to thermal transients heat are discussed in the MCO topical report chapter 4. The sealed MCO is ASME code rated at 450 PSI at 132 C.	Section 3 of the design report (HNFS-DR-003 matches up with the requirements in section 4 of the specification (HNFS-0426). The design report discusses temperature in appendix 11 thermal stress evaluation. The evaluation shows the MCO to be adequate. However, the MCO materials are capable of temperatures of up to 375 C with a corresponding reduction in allowable pressure. In conclusion the design has considered heat generation from the various appropriate heat sources inside the MCO.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1161-2	27. 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.	NA	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.
1161-2	28. 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	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.
1161-2	29. 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	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.
1161-2	30. The fire barrier shall be capable of being opened or closed manually from the exterior and interior of the enclosure.	NA	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.
1161-2	31. Allowable open area around a fire barrier shall be minimized	NA	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.	This is a facility requirement to prevent the spread of fire between enclosures. During handling and process, the MCO are not connected and individually they are always in the cask, in the MHM, or at the MCO work stations. During storage at the CSB two MCOs share a CSB storage tube. Any needed separation, fire barriers, selection of barrier operation mode, and open areas for work stations and process areas are then the responsibility of the facility using and/or holding the MCOs.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1161-3	Fire Protection			
1161-3	23. 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 will not be fire suppression system capability inside of the MCOs.	
1161-3	24. 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.	NA	There will not be fire suppression system capability inside of the MCOs.	
1161-3	25. Where automatic systems are not required, fire detection shall be installed.	NA	There will not be fire suppression system capability inside of the MCOs.	
1161-3	26. Provisions shall also be made for manual fire suppression where deemed necessary.	NA	There will not be fire suppression system capability inside of the MCOs.	
1161-3	27. Fire detection systems shall be integrated with any central alarm location and any associated automatic fire suppression systems.	NA	There will not be fire suppression system capability inside of the MCOs.	
1161-4	Ventilation			
1161-4	3. 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.	NA	There will not be ventilation system capability inside of the MCOs.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1161-4	4. Open-face hoods shall be ventilated such that flow from the operating area into the hood is maintained.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	5. Safety class items of the ventilation system shall be supplied with emergency power.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	6. Failure of any single component or control function shall not compromise minimum adequate ventilation.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	7. 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.	NA		There will not be ventilation system capability inside of the MCOs. HEPAs inside the MCO are for process use and do limit the contamination of facility process piping.
1161-4	8. The system shall be designed to automatically ensure adequate inflow of air through a credible breach in the enclosure system.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	9. 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.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	10. The design of the enclosure ventilation flow pattern shall minimize the spread of fire, and fire screens shall be provided where necessary.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	11. For enclosures where over pressurization is possible, a system shall be provided to ensure that confinement is not breached.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	12. Small enclosure systems with positive-pressure	NA		There will not be ventilation system capability inside of the MCOs.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	supplied gases shall have positive-acting, pressure-relief devices (connected into the exhaust system) to prevent pressurization of the enclosure.			
1161-4	13. 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.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	14. 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.	NA		There will not be ventilation system capability inside of the MCOs.
1161-4	15. 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).	NA		There will not be ventilation system capability inside of the MCOs.
1200	Furnishings	NA		Division 12 is for interior furnishings of the building—not applicable to the MCO.

**MASTER Table. DOE Order 6430.1A - General Design Criteria
Division 13**

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300	General Requirements for Special Facilities	C	The MCO supports the goals of this Division 13. The needs are listed in the Specification and discussed in the Design Report. The facility will supply the needed control, alarms, and systems to demonstrate full compliance.	
1300-1	Coverage and Objectives			
1300-1.4	Guidance on Limiting Exposure of the Public			
1300-1.4.1	General			
1300-1.4.1	36. 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	The requirements for the MCO are contained in HNF-S-0426. Structural containment of SNF is the primary purpose of the MCO. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO has features to keep exterior dose rates low and the radiological source term material inside the MCO. These features (stepped outer MCO wall, shield plug, and HEPA filters) are discussed in the next text table, table 2--NRC equivalency compliance matrix. Item 12 of table 2 thoroughly discusses the MCOs features to minimize dose to the public. Other reports and documents discuss the design's accomplishment. The MCO topical report section 2.3.5 Radiological Protection, Chapter 5 Shielding Evaluation, and Chapter 10 Radiation Protection also discuss the design and its relation to dose reduction and its accomplishment. The MCO only does the first step of the minimization of dose task. The facilities have to complete the task.
1300-1.4.2	Accidental Releases			
1300-1.4.2	37. Releases of hazardous materials postulated to occur as a result of DBAs shall be limited by designing	C	The requirements for the MCO are	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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).		contained in HNF-S-0426. Structural containment of SNF is the primary purpose of the MCO. Refer specifically to section 4.2, 4.3, and 4.19.2 of HNF-S-0426 for details on Safety. These sections define the SNF confinement and containment requirements and the design basis accidents under which the performance must be met.	the specification (HNF-S-0426). The analyses discussed in section 3.19.2 of the design report, HNF-SD-SNF-DR-003, indicate that the MCO integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the prescribed bounding envelope of the DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident.
1300-1.4.2	38. 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	The requirements for the MCO are contained in HNF-S-0426. Structural containment of SNF is the primary purpose of the MCO. Refer specifically to section 4.19.2 of HNF-S-0426 for details on DBAs.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). This section is not really applicable to the MCO alone, it applies to the facility and the MCO supports the use of attenuation features to minimize public exposure. The MCO analysis work discussed in section 3.19.2 of the design report, HNF-SD-SNF-DR-003, indicates that the MCOs integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the agreed-to and prescribed bounding envelopes of these DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-1.4.3	Routine Releases			potential accident.
1300-1.4.3	39. 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.	NA		Annual dose applies to any releases from the facility(ies) that contain the MCO, not the MCO.
1300-1.4.3	40. 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.	NA		Annual dose applies to any releases from the facility(ies) that contain the MCO, not the MCO.
1300-1.4.4	Monitoring of Releases			
1300-1.4.4	41. Releases shall be monitored in accordance with the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series.	NA		Release limits apply to the facility(ies) that contain the MCO, not the MCO.
1300-2	Safety Analysis			
1300-2	25. Safety Analysis shall comply with DOE 5481.1B. See also Section 0110-5.2, Safety Analysis.	C		The facilities have their safety analysis reports to permit operations. In support of the facility SARs, the MCO has a "MCO Topical Report", HNF-SD-SNF-SARR-005, which includes discussion and items common to all the facilities and users of the MCO and MCO components. This topical report is used as a reference for the facility SARs.
1300-3	Safety Class Criteria			
1300-3.2	Safety Class Items			
1300-3.2	42. 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	C	MCO components providing fuel containment and criticality control are	The MCO shell (including the collar, shell wall, and bottom), the shield plug assembly (including the shield plug, locking & lifting ring, set screws, and rupture disk assembly located in port #4), the MCO

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	those systems, components, and structures with the following characteristics:		required to be safety class as identified in section 4.19.1 of HNF-S-0426.	cover cap, and the Mark IA baskets' stainless steel structures are designed as safety class components. The safety class hardware is designed to ASME section III subsection NB for pressure boundary and confinement hardware or subsection NG for criticality control hardware.
1300-3.2	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		See above.
1300-3.2	Those required to maintain operating parameters within the safety limits specified in the OSRs during normal operations and anticipated operational occurrences	C		See above.
1300-3.2	Those required for nuclear criticality safety	C		See above.
1300-3.2	Those required to monitor the release of radioactive materials to the environment during and after a DBA	NA		Monitoring is a facility function not conducted by the MCO.
1300-3.2	Those required to achieve and maintain the facility in a safe shutdown condition	NA		The MCO is a single component used through out the path forward to hold, process, transport, and contain the SNF materials. The DBAs do not damage the MCO to the point of breaching the pressure boundary or violating the criticality control contingencies. The MCO is equipped with over pressure protection for preserving the structural capability of the MCO pressure boundary. Features needed for "safe shutdown" are the responsibility of the facility.
1300-3.2	Those that control the safety class items described above	NA		The MCO has no control sensors, systems, drives, or actuators as part of the MCO design. This section is not applicable to the MCO.
	43. Safety class items shall be subject to appropriately		The requirements for	Section 3 of the design report (HNF-SD-SNF-DR-

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1300-3.2	higher-quality design, fabrication, and industrial test standards and codes such as those specified in Section 0106, Regulatory Requirements, and Section 0109, Reference Standards and Guides, to increase the reliability of the item and allow credit to be taken for its capabilities in a safety analysis.	C	the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.1 of HNF-S-0426 for details on Safety Classification.	003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Safety class items are designed to appropriate higher quality design criteria. Pressure boundary components have been designed and will be fabricated to ASME section III subsection NB and criticality control features to subsection NG.
1300-3.2	44. Safety class items shall be designed to the ASME Boiler and Pressure Vessel Code (Section III) or to other comparable safety-related codes and standards that are appropriate for the system being designed.	C	Sections 4.9, 1 and 4.12.1 of HNF-S-0426 requires the use of ASME section III subsection NB and NG respectively in the design of appropriate MCO components.	Compliance with the MCO performance specification is documented in section 3 of the MCO Design report, HNF-SD-SNF-DR-003.
1300-3.2	45. Safety class and nonsafety class items shall comply with Section 0140, Quality Assurance. The QA program for MCO safety class components exceeds the requirements of DOE 6431.1A section 0140 Quality Assurance. This information is in the MCO fabrication specifications and in the MCO topical report.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 5 of HNF-S-0426 for details on Quality Assurance.	Section 3.20 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The QA program for MCO safety class components exceeds the requirements of DOE 6431.1A section 0140 Quality Assurance. This information is in the MCO fabrication specifications and in the MCO topical report. Please see the discussion for section 0140 above of this table 1.
1300-3.2	46. In addition, their failure shall not prevent safety class items from performing their required functions.	C	Section 4.19.2 of the performance specification requires that items that result in failure of a safety class item to be designed to withstand DBAs and meet the same service level requirements of the safety class items.	The section 3.19.2 of the design report describes the compliance with the DBAs events. Further in the MCO Topical report, HNF-SD-SNF-SARR-005, there is a thorough discussion many analyzed drops (some beyond the performance specification DBAs events) utilizing service level D allowables. The confinement boundary and criticality control features adequately survive and maintain their safety function.

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1300-3.3	Single Failure Criterion and Redundancy			
1300-3.3	47. 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>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.1 of HNF-S-0426 for details on Safety Classification.</p> <p>Section 4.19.1 of the performance specification requires compliance with HNF-PRO-516, but this PRO has since been canceled. The classification was earlier done in accordance with the old safety manual 4-46 which was partially replaced by HNF-PRO-704.</p>	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>The classification of the MCO components as to safety class, safety significant, and general service is presented in the fabrication specification and in the design report for the MCO. The safety equipment list is also in the MCO Topical report. No single DBAs or other events were identified which impaired the safety function of the MCO safety class components. A complete discussion of the events are in chapter 3 of the MCO Topical Report.</p>
1300-3.3	48. 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	<p>Appropriate redundancy has been included in the design as a matter of good engineering practice. As an example the seals of the MCO port appliances may be backed up by bolted blind cover plates and seals to prevent higher than desired leakage rates. These seals are of different size so a common mode failure is not likely. Also, the eighteen set screws that develop the sealing force for the MCO main seal are torqued with individually tightening hydraulic motors, so the effects of a potential common mode failure are diminished in the area of insufficient sealing force for the main seal. And when the cover cap is finally put into place at the CSB, this cover cap backs up the MCO main seal with a welded seal to the MCO collar. During the sealing processes leakage rate tests are also performed to assure the seals and weld are installed properly</p>	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-3.4	Equipment Environment Considerations			
1300-3.4.2	Environmental Qualification of Equipment			
1300-3.4.2	49. Equipment qualification shall provide assurance that safety class items will be capable of performing required safety functions under DBA conditions.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to sections 4.7 and 4.19.2 of HNF-S-0426 for details on DBAs.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The analyses performed indicate that the MCO integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the prescribed bounding envelope of the DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident. The facilities have their safety analysis reports to permit operations. In support of the facility SARs, the MCO has a "MCO Topical Report", HNF-SD-SNF-SARR-005, which includes discussion and items common to all the facilities and users of the MCO and MCO components. This topical report also contains discussion of events beyond the DBAs and is used as a reference for the facility SARs. Also, the MCOs are compatible with the normal environmental conditions expected during the life cycle and during potential upsets to the environmental surroundings around the MCOs. The MCOs are made entirely of corrosion resistant stainless steels.
1300-3.4.2	50. The qualification shall demonstrate that the equipment can at least perform for the period of time that its safety functions are required.	C	The requirements for the MCO are contained in HNF-S-0426. Refer	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The analyses indicate the equipment survives

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
			specifically to sections 4.7 and 4.19.2 of HNF-S-0426 for details on DBAs.	adequately intact to preserve the safety functions. Please see the preceding discussion above. Also, the MCO design report, HNF-SD-SNF-DR-003, in addition to a discussion of the DBAs and how the MCO maintains containment through the DBAs, includes a materials evaluation section, which includes corrosion of MCO materials, in appendix 2. This discussion explains how corrosion inside the MCO is not appreciable and as a result corrosion will not significantly affect the performance of the MCO components related to containment and criticality control.
1300-3.5	Maintenance			
1300-3.5	51. Safety class items shall be designed to allow inspection, maintenance, and testing to ensure their continued functioning, readiness for operation, and accuracy.	NA		The MCO components are all produced and inspected in accordance with the fabrication specification and drawings prior to their shipment to the Hanford site. The fabricator tests include dimensional, welds, and leakage rate testing. During process on site the MCOs are design so be leakage rate testing may be performed as appropriate for the main seal, port cover plates, cover cap attachment weld, and the cover cap penetration. Also the cover cap attachment weld has been designed to accommodate ultrasonic testing and all the welds associated with the cover cap installation are capable of being dye penetrant tested. Testing of safety class components inside the MCO is not required as these components have no moving parts and there is no practical need to do so.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-3.5	52. The design of equipment that must be located within confinement systems shall allow for in-place maintenance or replacement.	NA	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.4 of HNF-S-0426 for details on Maintainability.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The port appliances such as rupture disk assembly, process plug valves, and plugs are replaced from the outside, at the top, of the MCO. Also the cover plate seals are replaced from the top of the MCO by removing the cover plate, replacing the seal in the cover plate cavity, and then rebolting the cover to the shield plug port opening. Inside the MCO there are not moving parts and as such no components inside the MCO require maintenance or replacement under normal operating conditions. The MCO components are all produced and inspected in accordance with the fabrication specification and drawings prior to their shipment to the Hautford site. The fabricator tests include dimensional, welds, and leakage rate testing. During process on site the MCOs are design so be leakage rate testing may be performed as appropriate for the main seal, port cover plates, cover cap attachment weld, and the cover cap penetration. Also the cover cap attachment weld has been designed to accommodate ultrasonic testing and all the welds associated with the cover cap installation are capable of being dye penetrant tested. Testing of safety class components inside the MCO is not required as these components have no moving parts and there is no practical need to do so.
1300-3.5	53. The capability shall be provided for the maintenance of contaminated equipment that cannot be repaired in place.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.4 of HNF-S-0426 for details on	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Although there is not a specific need to do maintenance of contaminated equipment the MCO is capable of supporting such maintenance at or around the MCO. The facilities and equipment would, or

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1300-3.5	54. This capability shall include the necessary provisions for confinement, ventilation, and waste control.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.4 of HNF-S-0426 for details on 'Maintainability.'	course, need to be furnished by others to do any of these tasks should the need arise. If an entire MCO were severely damaged the whole unit would likely be replaced. Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Although the referenced capability is intended for the facility, the MCOs design includes internal HEPA rated filters to keep gas borne particles inside the MCO during processing.
1300-3.5	55. The design of all process equipment shall include features to minimize self-contamination of the equipment piping, and confinement areas.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.14 of HNF-S-0426 for details on the Internal Process Filter.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Although the referenced capability is intended for the facility, the MCOs design includes internal HEPA rated filters to keep gas borne particles inside the MCO during process. The specification HNF-S-0556 is for the MCO internal filters. These filters will serve to minimize gas borne radiological contamination of the CVD process piping and the potential for airborne contamination outside of the MCO during the time the exiting gas process port operator is disconnected from the MCO shield plug.
1300-3.5	56. The design of process equipment shall also include features to minimize the spread of contamination out of local areas.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.14 of HNF-S-0426 for details on the Internal Process Filter.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Although the referenced capability is intended for the facility, the MCOs design includes internal HEPA rated filters to keep gas borne particles inside the MCO during process. The specification HNF-S-0556 is for the MCO internal filters. These filters will serve to minimize gas borne radiological contamination of

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
				the CVD process piping and the potential for airborne contamination outside of the MCO during the time the exiting gas process port operator is disconnected from the MCO shield plug.
1300-3.6	Testing			
1300-3.6	57. The design shall include provisions for periodic testing of monitoring, surveillance, and alarm systems.	NA		This criteria is directed toward the entire facility of which the MCO is the primary contamination control boundary. Each facility, where the fueled MCO resides, has technical operating requirements for process, handling and storage. When the MCO is in storage at the CSB facility, the CSB has a monitoring plan which includes surveillances, monitoring, alarms, and walk throughs of the building and grounds to assure that the entire facility is operating properly. While the MCOs are in the CSB, they do not have any actual online, monitoring equipment on-board connected directly to the CSB facility or systems. Additionally three MCO issue papers have been prepared and released into the system. These papers are: HNF-3312 "MCO Monitoring Activity Description", HNF-3354, "MCO Monitoring Issue Closure Package", and HNF-3398, "MCO Inservice Inspection and Maintenance". These papers thoroughly discuss the situations and various aspects and have determined the projects course in these regards.
1300-3.6	58. 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		The MCO has no monitoring, surveillance, and alarm systems. However, the MCO Monitoring Activity Description, HNF-3312 does detail the steps that will be taken to collect useful data about the MCOs. The pertinent safety class components in the MCO are passive structural components with no moving parts or sensors. These parts are all made to specification, are constructed of materials of which the desired properties are intrinsic to the materials and will not degrade significantly, and, as such, do not require further testing or certification.
1300-3.6	59. 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.	NA		DBAs involving the MCOs do not breach the MCO and, as such, the MCO has no systems for which credit must be taken. During our DBAs deformations are allowed and may occur, but the pressure boundary controlling the release stays intact. The CSB facility is providing attenuation features in the form of impact limiters to prevent excessive damage to the MCO during a potential down the

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-3.6	60. Safety class items shall be designed to be testable on a regular schedule.	NA	CSB storage tube drop from the MHM.	The MCO has no monitoring, surveillance, and alarm systems. However, the MCO Monitoring Activity Description, HNF-3312 does detail the steps that will be taken to collect useful data about the MCOs. The pertinent safety class components in the MCO are passive structural components with no moving parts or sensors. These parts are all made to specifications contained in the fabrication specifications and drawings, are constructed of materials of which the desired functional properties are intrinsic to the materials which do not significantly degrade in service, and, as such, do not require further testing or certification in service.
1300-3.6	61. The facility design shall allow for routine in-place testing of HEPA filtration systems as outlined by ASME N510.	NA		The MCO has no monitoring, surveillance, and alarm systems. The HEPA filters in the MCO are made of all stainless steel and are tested in the armored chamber in the shield plug at the fabricators plan. These filters are put in the MCO for process reasons and, as such, this requirement is not applicable to the MCO.
1300-4	Nuclear Criticality Safety			
1300-4	5. 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 AINS 8.3.	NA		This is not applicable to the MCO. The facility provides this system if needed.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	62. 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 AINS 8 series on Nuclear Criticality Safety.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). HNF-SD-SNF-CSER-003, the Criticality Safety Evaluation Report (CSER) for the MCO offers and represents the acceptable bounds for the design of the MCO criticality control components. The CSER represents the contract between the Design authority and the Nuclear Safety Group and this CSER complies with the criteria in the left column. The criticality control contingency features of these components are safety class by definition and are treated as such in their design and manufacture. They are made to the requirements of the fabrication specification and the drawings.
1300-4	63. 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	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality. Sections 4.19.3 is titled "Nuclear Criticality Safety" and discusses the required central void area for the MCO with Mark 1A fuel. Sections 4.9.5, "Diameter of the MCO" and 4.19.2, "Design Basis Accidents" also discuss the DBAs and	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The design report of the MCO discusses and demonstrates how the MCO complies with the MCO performance specification. The MCO topical report also discusses the many analyses performed on the MCO involving drops and accidents. The MCO performs adequately through all of the analyses presented in the topical report and the MCO remains critically safe. The two basic requirements are that the interior circumference of the MCO stays below 73.04 inches and the MCO center exclusion void shift no more than 2 inches from the assumed centroid of the MCO.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	64. 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	<p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.</p> <p>Sections 4.19.3 is titled "Nuclear Criticality Safety" and discusses the required central void area for the MCO with Mark IA fuel. Sections 4.9.5, "Diameter of the MCO" and 4.19.2, "Design Basis Accidents" also discuss the DBAs and dimensional requirements for the MCO.</p>	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>The design report of the MCO discusses and demonstrates how the MCO complies with the MCO performance specification. The MCO topical report also discusses the many analyses performed on the MCO involving drops and accidents. The MCO performs adequately through all of the analyses presented in the topical report and the MCO remains critically safe. The two basic requirements are that the interior circumference of the MCO stays below 73.04 inches and the MCO center exclusion void shift no more than 2 inches from the assumed centroid of the MCO. The MCO uses geometric controls and includes fully moderated and reflected MCOs in the analyses. So, there are no physical process restrictions other than the proximity of other MCOs in the CSER.</p>
1300-4	65. 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	<p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.</p>	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>Please see discussion above for explanation.</p>
	66. Process designs shall incorporate sufficient factors of		The requirements for	Section 3 of the design report (HNF-SD-SNF-DR-

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	safety so that at least two unlikely and independent concurrent changes must occur in process conditions before a criticality accident is possible.	C	the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.	003 matches up with the requirements in section 4 of the specification (HNF-S-0426). The CSER for the MCO analyses events of two independent failures in the loading of the MCO. This CSER included misloading of the fuel in the baskets and misloading of the MCO with the preloaded baskets from the loading queue. Also the basin fuel removal activity has considered the fuel removal order due to different enrichments in their removal campaigns. This two contingency policy has been observed in the analyses of potential accidents.
1300-4	67. 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 requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality. Sections 4.19.3 is titled "Nuclear Criticality Safety" and discusses the required central void area for the MCO with Mark 1A fuel. Sections 4.9.5, "Diameter of the MCO" and 4.19.2, "Design Basis Accidents" also discuss the DBAs and dimensional requirements for the MCO.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The design report of the MCO discusses and demonstrates how the MCO complies with the MCO performance specification. The MCO topical report also discusses the many analyses performed on the MCO involving drops and other accidents. The MCO performs adequately through all of the analyses presented in the topical report and the MCO remains critically safe. The two basic requirements are that the interior circumference of the MCO stays below 73.04 inches and the MCO center exclusion void shift no more than 2 inches from the MCOs assumed centroid. The MCO uses geometric controls and includes optimally moderated and fully reflected MCOs in the CSER analyses. No materials are used in the design of the MCO solely based on the neutron absorbing or neutron moderating properties of the materials. So, there are no physical process restrictions, in regard to criticality control, other than the proximity of other fueled MCOs in the CSER. The practicality of handling MCO in the casks and in the MHM shielding portion assures that the MCO are

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	68. 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	<p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.</p> <p>Sections 4.19.3 is titled "Nuclear Criticality Safety" and discusses the required central void area for the MCO with Mark IA fuel. Sections 4.9.5, "Diameter of the MCO" and 4.19.2, "Design Basis Accidents" also discuss the DBAs and dimensional requirements for the MCO.</p>	<p>separated sufficiently during their movement.</p> <p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>The design report of the MCO discusses and demonstrates how the MCO complies with the MCO performance specification. The MCO topical report also discusses the many analyses performed on the MCO involving drops and other accidents. The MCO performs adequately through all of the analyses presented in the topical report and the MCO remains critically safe. The two basic requirements are that the interior circumference of the MCO stays below 73.04 inches and the MCO center exclusion void shift no more than 2 inches from the assumed centroid of the MCO. The MCO uses geometric controls and includes optimally moderated and fully reflected MCOs in the CSER analyses. No materials are used in the design of the MCO solely based on the neutron absorbing or neutron moderating properties of the materials. So, there are no physical process restrictions other than the proximity of other fueled MCOs in the CSER. The practicality of handling MCOs in the casks and in the MHM shielding cask portion effectively assures that the MCO are separated sufficiently during their movement. Administrative controls are invoked only as a last resort.</p>
1300-4	69. The design of the facility shall emphasize engineered safeguards and shall not rely strictly on administrative controls.	NA	<p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section</p>	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>The MCO fully supports this policy. Please see discussion above.</p>

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	70. 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 requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.3 of HNF-S-0426 for details on Criticality.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO design includes HEPA filters and 2 mm screens to prevent unreasonable migration of materials out of the MCO. This confinement of radioactive materials to the interior of the MCO has been thoughtfully and reasonably accomplished to accommodate the processing and safety functions of the MCO. The facility has to provide for criticality control of materials removed from the MCO.
1300-4	71. 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.	NA		This criteria and task relies upon the facility for execution. Port number one and two are unlikely candidates for putting solid materials into the MCO, due to the internal HEPA filters inside the MCO. Port number three, which could be used to put solid radionuclides into the MCO after mechanical sealing is normally used for bulk water removal and gas injection during process. It would also be used for reflooding the MCO with water should the need arise. Putting a back flow preventer inside the MCO would not be appropriate because back flow into the MCO is needed for some process steps. Port four is the rupture disk port and would also be used as a backup non HEPA filtered exhaust should the need arise. This #4 port does not serve as a port for introduction of materials into the MCO and is not normally connected to a plumbed source of material.
1300-4	72. 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.	NA		Flooding of the MCO with water is perfectly acceptable from a criticality control standpoint.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-4	73. Where frequency estimates for a specific operation at a specific location shows the frequency of a criticality accident to exceed 10^{-5} per year, the combination of shield design and facility layout shall minimize radiation doses to adjacent work stations and exit routes.	NA	This is a facility requirement.	
1300-4	74. Egress routes shall be provided that take into account the locations where postulated criticality accidents would normally be expected to occur.	NA	This is a facility requirement.	
1300-4	75. 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	This is a facility requirement.	
1300-5	Source and Special Nuclear Material.			
1300-5	76. 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.	NA	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.12 of HNF-S-0426 for details on Fuel Baskets.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Bulk fuel is not removed from, nor replaced in the MCO during the process at CVD or CSB. Activities of FRS are controlled by a separate OSER not related to the MCO.
1300-6	Radiation Protection			
1300-6.1	General			
1300-6.1	77. 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	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.13 of HNF-S-0426 for details on MCO	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see Table 2 (NRC Equivalency criteria at the end of this document), items 12 and 13 for a discussion of this subject area.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.2	Shielding Design		Shield Plug.	
1300-6.2	32. 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.	NA	No concrete is used in the MCO.	
1300-6.2	33. Straight-line penetration of shield walls shall be avoided to prevent radiation streaming.	C	Please see Table 2, items 12 and 13 for discussion.	
1300-6.2	78. 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	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.13 of HNF-S-0426 for details on MCO Shield Plug.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility designs and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hr. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO.
1300-6.2	79. Within this design basis, personnel exposures shall be maintained ALARA.	C	The requirements for the MCO are contained in HNF-S-0426. Refer	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.2	80. 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	<p>specifically to section 4.13 of HNF-S-0426 for details on MCO Shield Plug.</p> <p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.13 of HNF-S-0426 for details on MCO Shield Plug.</p>	<p>Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility designs and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hour. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO.</p> <p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility designs and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hour. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO.</p>

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.2	81. In addition, appropriate shielding shall be installed, if necessary, to minimize nonpenetrating external radiation exposures to the skin and lens of the eye of the worker.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.13 of HNF-S-0426 for details on MCO Shield Plug.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility design and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hr. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO. Additionally, the MCO has internal HEPA filters to minimize the potential for release of airborne contamination outside of the MCO.
1300-6.2	82. 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.	NA		This is a facility requirement.
1300-6.3	Hand and Forearm Protection			
1300-6.3	34. 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		Please see Table 2, items 12 and 13 for a discussion and 3 blocks above.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.4	Internal Radiation Exposure			
1300-6.4	26. The design shall ensure that occupied operating areas do not exceed the airborne concentration limits of the DOE 5480 series for normal operating conditions.	NA	This is a facility requirement.	
1300-6.4	27. 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>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.14 of HNF-S-0426 for details on Internal Process Filter.</p> <p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility designs and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hour. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO. Additionally, the MCO has internal HEPA filters to minimize the potential for release of airborne contamination outside of the MCO. The MCO does not have ventilation systems in the traditional sense. The MCO components and assembly are leakage rate tested at the fabricators and in process during the fuel removal campaigns.</p>	

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1300-6.4	28. The design shall ensure that respirators are not required to meet the dose limits for normal operations.	NA	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.14 of HNF-S-0426 for details on Internal Process Filter.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). This is a facility requirement and includes process equipment. The MCO supports the goal of not needing respirators for operations.
1300-6.4	29. Engineered controls and features shall also be provided to minimize potential inhalation of radioactive and other hazardous materials under all conditions.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.14 of HNF-S-0426 for details on Internal Process Filter.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see table 2 items 12 and 13 for a discussion. In practice the occupational exposure analyses are done as part of the facility designs and planning. Also the SAR for the facilities will discuss this. The MCO topical also discusses the dose results from the shielding analyses. The average contact dose rate of a 1 cm diameter detector across the made up MCO shield plug assembly face with highest output source term fuel inside the MCO is approximately 8 mrem/hour. The peak rate for the 1 cm detector was 23 mrem/hr. With average fuel these peak rates are reduced to 25%. These dose rates are acceptable for extremity dose and also these rates drop off very rapidly for whole body dose. The MCO supports ALARA and has minimized the dose rates coming through the shield plug of the MCO. Additionally, the MCO has internal HEPA filters to minimize the potential for release of airborne contamination outside of the MCO. The MCO does not have ventilation systems in the traditional sense. The MCO components and assembly are leakage rate tested at the fabricators and in process during the fuel removal campaigns.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.5	Monitoring, Warning, and Alarm Systems			The MCO has no monitoring, warnings, or alarm systems.
1300-6.5.1	6. All monitoring systems shall be calibrated annually with appropriate national standards to ensure validity of reported values.	NA		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO. All of the division 1300-6.5, -6.6, -6.8, and -6.9 items are associated with the facility monitoring plan. No direct or online monitoring is planned for the MCOs as no such safety or regulatory requirements exist to do so.
1300-6.5.1	7. 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.	NA		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.
1300-6.5.2	Air Monitoring and Warning Systems			
1300-6.5.2	8. 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		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.
1300-6.5.2	9. Air sampling heads shall be located to provide a representative sample of potential airborne radioactive materials being breathed.	NA		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.
1300-6.5.2	10. Air monitoring systems shall comply with ANSI N13.1.	NA		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.
1300-6.5.3	Personnel Monitoring and Warning Devices			
1300-6.5.3	11. Provisions shall be made for personnel monitoring devices, such as hand and foot counters, in the vicinity	NA		No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.

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	of workstations. Installed monitors (supplemented with personal monitoring methods if necessary) shall be used to monitor personnel exiting an operating area through access ways.			
1300-6.5.3	12. CAMSs shall be provided to detect and to alarm at prescribed airborne radioactivity levels.	NA	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	
1300-6.5.4	Ionizing Radiation Monitoring System			
1300-6.5.4	13. 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.	NA	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	
1300-6.5.5	Warning and Alarm Systems Features			
1300-6.5.5	14. 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.	NA	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	
1300-6.5.5	15. Evacuation alarm systems shall comply with ANSI N2.3.	NA	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	
1300-6.5.6	Nuclear Accident Dosimetry			
1300-6.5.6	16. 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	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	
1300-6.5.7	Central Radiation Monitoring and Alarm Readout			
1300-6.5.7	17. 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	NA	No Monitoring, Warning, and/or Alarm Systems are used directly on the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-6.6	monitoring office) readout and alarm panels that are accessible after a DBA to evaluate internal conditions. Decontamination of Personnel			
1300-6.6	84. Design shall provide for personnel decontamination facilities close to areas that represent sources of potential contamination.	NA	The MCO is a component, and not a major Facility.	
1300-6.8	Change Rooms			
1300-6.8	85. 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.	NA	The MCO is a component, and not a major Facility.	
1300-6.9	Breathing Air System			
1300-6.9	27. Breathing air supply systems shall comply with ANSI Z88.2 and 29 CFR 1910.134.	NA	The MCO is a component, and not a major Facility.	
1300-7	Confinement Systems		The MCO supports the objectives of this Section.	
1300-7.2	General			
1300-7.2	35. 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 noncontaminated areas of the building to potentially contaminated areas, and then to normally	NA	The MCO is a component, and not a major Facility. Air flow patterns are addressed as part of the facility and process equipment design.	

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	contaminated areas.			
1300-7.2	36. 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.	NA		The MCO is a component, and not a major Facility. This section is not really applicable to the MCO alone, it applies to the facility and the MCO supports the use of attenuation features to minimize public exposure. The MCO analysis work indicates that the MCOs integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the agreed-to and prescribed bounding envelopes of these DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident. The MCO supports this policy.
1300-7.2	37. The adequacy of the design of these confinement systems to effectively perform their required functions shall be demonstrated by the safety analysis.	NA		The MCO is a component, and not a major Facility. This section is not really applicable to the MCO alone, it applies to the facility and the MCO supports the use of attenuation features to minimize public exposure. The MCO analysis work indicates that the MCOs integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the agreed-to and prescribed bounding envelopes of these DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident. The MCO supports this policy. The section of the MCO design report describes the compliance with the DBA events. Further discussion in the topical report includes analyzed drops and accidents involving the MCO. These events (some beyond the performance specification DBA events) utilize ASME service level D allowables. As a result, the confinement and criticality control features adequately survive and maintain their safety functions.
1300-7.2	38. Design of confinement areas shall provide adequate means for decontamination of the areas prior to entry or breaching for maintenance and repair purposes.	NA		The MCO is a component, and not a major Facility. This section does not apply to the MCO but the MCO has taken reasonable measures to support the potential decontamination of the MCO exterior in the event it is needed. We have made the exterior of the MCO reasonably smooth and free of cracks and crevices.

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1300-7.3	Access Ways			
1300-7.3	86. Provision for normal and emergency equipment shall be provided in or adjacent to the access ways.	NA	The MCO is a component, and not a major Facility.	
1300-7.4	Transfer Pipes and Encasements			
1300-7.4	39. 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 MCO is a component, and not a major Facility.	
1300-7.4	18. Leakage monitoring shall be provided to detect leakage into the space between the primary pipe and the secondary confinement barrier.	NA	The MCO is a component, and not a major Facility.	
1300-8	Waste Management	NA		
1300-8.1	General			
1300-8.1	87. The process systems shall minimize the production of wastes at the sources and minimize the mixing of radioactive and nonradioactive hazardous wastes.	NA	The MCO is a component, and not a major Facility.	
1300-8.1	88. The waste management systems shall provide facilities and equipment (or incorporate existing facilities and equipment) to handle those wastes safely and effectively.	NA	The MCO is a component, and not a major Facility.	
1300-8.1	89. 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.	NA	The MCO is a component, and not a major Facility.	
1300-8.1	90. 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.	NA	The MCO is a component, and not a major Facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-8.4	Waste Segregation			
1300-8.4	91. 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.	NA	The MCO is a component, and not a major Facility.	
1300-8.5	Spill Prevention and Control			
1300-8.5	92. 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.	NA	The MCO is a component, and not a major Facility.	
1300-8.6	Approvals and Permits			
1300-8.6	30. Environmental discharges of any effluent, including hazardous and nonhazardous wastes, shall meet applicable Federal and State laws and regulations and DOE orders.	NA	The MCO is a component, and not a major Facility.	
1300-9	Effluent Control Monitoring	NA		
1300-9	31. 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.	NA	The MCO is a component, and not a major Facility.	
1300-9	32. Emphasis shall be placed on reducing total quantities of effluents (both radioactive and nonradioactive) released to the environment.	NA	The MCO is a component, and not a major Facility.	
1300-9	33. 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.	NA	The MCO is a component, and not a major Facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-9	34. 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.	NA	The MCO is a component, and not a major Facility.	
1300-9	35. The guidance on radioactive protection referenced in Section 1300-1.4.3, Routine Releases, shall also apply to effluent treatment and discharge systems.	NA	The MCO is a component, and not a major Facility.	
1300-9	36. 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.	NA	The MCO is a component, and not a major Facility.	
1300-9	19. Sampling and monitoring shall ensure adequate and accurate measurements under normal operations, anticipated operational occurrences, and DBA conditions.	NA	The MCO is a component, and not a major Facility.	
1300-9	20. 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.	NA	The MCO is a component, and not a major Facility.	
1300-9	37. 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.	NA	The MCO is a component, and not a major Facility.	
1300-10	Physical Protection, Safeguards, Storage		The MCO is a component and supports this section.	
1300-11	Decontamination and Decommissioning		The MCO supports this section.	
1300-11.1	Decontamination			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-11.1	93. 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		The MCO is a component, and not a major Facility. This MCO has complied with this section and the MCO has taken reasonable measures to support the potential decontamination of the MCO exterior in the event it is needed. As the MCO surrounds the main radiological sources when it is in equipment and facilities it is possible for the exterior to be contaminated. We have made the exterior of the MCO reasonably smooth and free of cracks and crevices to aid in the decontamination of the MCO.
1300-11.1	94. Such items as service piping, conduits, and ductwork shall be kept to a minimum in these areas and shall be arranged to facilitate decontamination.	NA		The MCO is a component, and not a major Facility.
1300-11.1	95. Filters shall be positioned in ventilation systems in locations that minimize contamination of ductwork.	NA		The MCO is a component, and not a major Facility.
1300-11.1	96. Walls, ceilings, and floors shall be finished with washable or strippable coverings.	NA		The MCO is a component, and not a major Facility.
1300-11.1	97. In some areas, metal liners shall be required.	NA		The MCO is a component, and not a major Facility.
1300-11.1	98. 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 MCO is a component, and not a major Facility. This MCO has complied with this section and the MCO has taken reasonable measures to support the potential decontamination of the MCO exterior in the event it is needed. As the MCO surrounds the main radiological sources when it is in equipment and facilities it is possible for the exterior to be contaminated. We have made the exterior of the MCO reasonably smooth and free of cracks and crevices to aid in the decontamination of the MCO. Some cracks are inevitable as the top of the MCO is sealed with cover plates in pockets over the ports, these however may be removed on the decontamination performed. Also the cracks around the locking & lifting ring will be difficult to decontaminate, but a tight fitting process hood furnished by the facility and sealed to the shield plug will minimize the risk of a contaminated locking & lifting ring.
1300-11.1	99. Finishes shall comply with Section 0900-99, Special Facilities.	NA		The MCO is a component, and not a major Facility.
1300-11.2	Decommissioning			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-11.2	100. 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.	NA		The MCO is a component, and not a major Facility.
1300-11.2	101. 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.	NA		The MCO is a component, and not a major Facility.
1300-12	Human Factors Engineering			
1300-12.1	Coverage			
1300-12.1	102. 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		<p>The MCO is a component, and not a major Facility. However, the design of the MCO includes the evaluation and use of the components at the facilities. The design reviews included Facility and operations representatives.</p> <p>The MCO is designed for interface with the operators at the various stages of component utilization during production. Human factors has been invoked on the overall integrated handling, assembly, and use of the MCO components. The components and port interfaces are marked, to the greatest extent practicable, with easily identifiable alpha/numeric markings.</p> <p>The MCO component packaging from the fabricators is included in the planning for warehousing and handling of the components. A warehouse plan has been developed early-on in the design process and has been maintained. The plan includes the handling and use of the components and their introduction into the production operations at the K-basins and the canister storage building. During fuel retrieval system (FRS) operations the baskets are designed so the operators can see the individual pockets in the whole fuel baskets. These pockets are in a fuel rack plate and whole fuel elements will be placed into these pockets. The design allows for easy recognition of which pockets are filled and which are open.</p> <p>During assembly of the MCO components, human factors have also been applied. The shield plug lift fixture is designed to minimize operator strain</p>

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
				<p>during the handling and placement of the shield plug. The MCO main seal is held in position with clips. The shield plug assembly equipment for the long axial process tube's insertion and the tightening of it into the shield plug includes a weight balancing cup to prevent operator strain and wrench flats on the tube to positively assist in the manual nearby tightening of the process tube. The handling of the lifting and handling of the locking and lifting (L & L) ring also has considered Human factors. The design of the ring also considered the handling machine interface and allowed features for a counter balanced gripper design. The subsequent handling machine for the ring allows for the threading of the L & L ring into the collar with very minimal forces supplied manually by the operator.</p> <p>Much of the interface with the assembled MCO lies on the operating face of the shield plug. Features such as cross drilled appliances which allow for the bleed down of pressure with out removal of the appliance and for all appliances include a 1 5/16 inch hex head interfaces for commonality. The interface with the shield plug also allows for the use of remote tools and operators if needed. The cover plate bolts are all cone head to allow for ease of placement of the socket tools directly by the operator or with long handled or remote tools. The bolts also feature "pilot" ends for their easy starting in the shield plug and are also designed so they are "captured" with the cover plate and stay with the cover plate as the assembly is removed from the MCO. The cover plate seal snaps into place by use of elliptical shaped seals. The port three cover plate/operator interface has been designated as a five bolt pattern as opposed to four bolt on the remaining ports. This is done to prevent a miss-connection during process as port three is the long process tube access with it ending at the bottom of the MCO.</p> <p>Finally the placement and welding of the cover cap at the canister storage building is operator friendly. The cover cap has an integral centering/backing ring built into the cap design, so the placement and centering of the cover cap on the MCO collar at the canister storage building (CSB) work stations is very easy. The MCO cover cap's design also allows for a very easy placement, set up, and alignment of the welding machine for the cap to collar attachment weld as the machine is allowed to index from the cover cap.</p>
1300-12.3.3	Requirements Analyses			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-12.3.3	103. 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 requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.5 of HNF-S-0426 for details on Human Factors.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). Please see discussion above line #102.
1300-12.3.3	104. 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.	NA		The MCO is a component, and not a major Facility. However, the MCO interfaces are designed for hands on, remote, and machine. The choice of operation attachment and motive force is up to the facility and operation personnel.
1300-12.3.3	105. 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.	NA		The MCO is a component, and not a major Facility. However, the MCO interfaces are designed for hands on, remote, and machine. The choice of operation, attachment method, and motive force is up to the facility and operation personnel.
1300-12.3.4	Process System Design Interfaces			
1300-12.3.4	106. 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		The MCO is a component, and not a major Facility. However, the MCO interfaces are designed for hands on, remote, and machine. The choice of operation, attachment method, and motive force is up to the facility and operation personnel. Please see line 102 above.
1300-12.4	General Human Factors Implementation Criteria and Consideration			
1300-12.4.1	General			
1300-12.4.1	21. 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	NA		The MCO is a component, and not a major Facility. The MCO is a component, and not a major Facility. However, the MCO interfaces are designed for hands on, remote, and machine. The choice of operation and motive force is up to the

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	maintenance.		facility and operation personnel.	
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	107. 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.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Emergency Lighting			
1300-12.4.3	108. 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.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	109. The emergency lighting system for vital areas shall be an electrically independent system that is not degraded by failure of the normal lighting system.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	110. Control room emergency lighting levels shall be in accordance with NUREG 0700, Section 6.1.5.4.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Noise			
1300-12.4.3	111. Acoustic design shall:	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Minimize noise levels where practical and ensure that the limits of DOE 5480.10 are not exceeded	NA	The MCO is a component, and not a major Facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-12.4.3	Ensure that verbal communications are not impaired.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Ensure that auditory signals are readily detectable.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Minimize auditory distraction and irritation that can cause operator fatigue.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	112. For further noise level and protection considerations, see NUREG 0700, Section 6, and UCRL 15673, Section 3.2.4.2.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.3	Vibration			
1300-12.4.3	113. 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.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.4	Component Arrangement			
1300-12.4.4	22. 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.	NA	The MCO is a component, and not a major Facility.	
1300-12.4.4	23. Components shall be grouped together on the basis of specific criteria appropriate for the required task or tasks.	NA	The MCO is a specific component, and not a major grouping.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1300-12.4.4	24. 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.	NA	The MCO is a specific component, and not a major grouping.	
1300-12.4.4	25. Components shall not be hidden within component groupings.	NA	The MCO is a specific component, and not a major grouping.	
1300-12.4.4	26. Matrices of components shall have labeled axes to identify any component in the grid.	NA	The MCO is a specific component, and not a major grouping.	
1300-12.4.4	27. Mirror image arrangements of components shall be avoided.	NA	The MCO is a specific component, and not a major grouping.	
1300-12.4.4	28. 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.	NA	The MCO is a specific component, and not a major grouping.	
1300-12.4.5	Protective Equipment			
1300-12.4.5	114. 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.	NA	The MCO is a specific non-accessed component, and not subject to this detail. However, the MCO is designed to support the ready access to the working face on the shield plug. Appliances and components whether protective or not are installed at the ports with axial threads or use attachment bolts which are axially threaded. Visual access for inspection of the appliances and components at the ports is available. The means of replacement may be manually by hand and possible by the operator with the proper work area, equipment, and environment provided by the facility.	
1300-12.4.5	115. 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.	NA	The MCO is a specific non-accessed component, and not subject to this detail. However, the MCO is designed to support the ready access to the working face on the shield plug. Appliances and components whether protective or not are installed at the ports with axial threads or use attachment bolts which are axially threaded. Visual access for inspection of the appliances and components at the ports is available. The means of replacement may be manually by hand and possible by the operator with the proper work area, equipment, and environment provided by the facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document provided by the facility.	Implementation
1300-12.4.6	Display Devices			
1300-12.4.6	29. 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.	NA	The MCO is not a display device.	
1300-12.4.6	30. 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.	NA	The MCO is not a display device.	
1300-12.4.8	Warning and Annunciator Systems			
1300-12.4.8	31. 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.	NA	The MCO is not a warning/annunciator system.	
1300-12.4.8	32. 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.	NA	The MCO is not a warning/annunciator system.	
1300-12.4.8	33. 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	NA	The MCO is not a warning/annunciator system.	

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	alarms, priority coding such as "first in/out" shall be used to assist in determining message significance.			
1300-12.4.8	34. False alarms and nuisance alarms shall be removed. Set point determination shall allow sufficient response time to the operator.	NA		The MCO is not a warning/annunciator system.
1300-12.4.8	35. Provision shall be made for active acknowledgment and for silencing of auditory alarms after they have been acknowledged.	NA		The MCO is not a warning/annunciator system.
1300-12.4.8	36. 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.	NA		The MCO is not a warning/annunciator system.
	37. 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.	NA		The MCO is not a warning/annunciator system.
1300-12.4.9	Communication Systems			
1300-12.4.9	38. 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.	NA		The MCO is not a communications system.
1300-12.4.10	Maintainability			By design maintenance on the MCO is very low.
1300-12.4.10	116. UCRL 15673 shall be considered for system design.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.4 of HNF-S-0426 for details on	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The performance specification describes the requirements for equipment inside the MCO. Only equipment functionally necessary for operations is placed inside the MCO as there is no access or opportunity for

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			Maintainability.	maintaining components inside the MCO once it is sealed. As stated in the performance specification for the MCO, maintenance is to be minimized. All the movable and replaceable components are located on the outside of the MCO and are accessible from the outside. The external components are designed to support the fuel loading, sealing, hauling, processing, and sampling operations planned for the MCO. The process valves and rupture disk may be replaced from the outside of the MCO. Once the cover cap is installed no parts may be replaced. Inside the MCO there are no moving or rotating components. The process components inside the MCO include only screens and metallic HEPA filters which are all designed of corrosion resistant materials and to not require maintenance. These items are suitable for radioactive materials contact and keep as much of the radioactive materials as possible inside the MCO during process. UCRL 15673 is titled "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" and was published in 1985. The document leans very heavy toward control/instrument panels and their use. There is a small section, 3.2.4.6 "Nuclear Radiation Levels and Protection" with possible applicability to the MCO, but our "state of the art" is well beyond what is written in this Guideline. In accordance with this 6430.1A section 1300-12.4.10, this guideline has been considered.
1300-12.4.11	Labels			
1300-12.4.11	117. Equipment and any parts of that equipment to be used by personnel shall be identified with appropriate labels.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). During fabrication of the all the MCO pieces, the material is "tracked". When the MCO components are put together into

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			4.6 of HNF-S-0426 for details on Interchangeability and Marking.	assemblies, shells, baskets, etc. the appropriate numbering is applied to the discreet unit. Serial numbers are placed on the shell assembly (which is the collar, shell wall and bottom cap), the shield plug assembly, the locking & lifting ring, the cover cap, and the individual baskets. The labeling plan has been agreed to in advance with operations and found to be suitable and appropriate for the function of the unit. The labeling information is in the fabrication specification, HNF-S-0453, section 6.4.3.3 with the actual location being indicated on the drawings for the particular component. Additional index marking of MCO components is planned to assist in the production loading, assembly, and process orientation of the MCO components during the fuel removal campaigns.
1300-12.4.11	118. The label shall indicate clearly and concisely the function and purpose of the item being labeled.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.6 of HNF-S-0426 for details on Interchangeability and Marking.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). During fabrication of the all the MCO pieces, the material is "tracked". When the MCO components are put together into assemblies, shells, baskets, etc. the appropriate numbering is applied to the discreet unit. Serial numbers are placed on the shell assembly (which is the collar, shell wall and bottom cap), the shield plug assembly, the locking & lifting ring, the cover cap, and the individual baskets. The labeling plan has been agreed to in advance with operations and found to be suitable and appropriate for the function of the unit. The labeling information is in the fabrication specification, HNF-S-0453, section 6.4.3.3 with the actual location being indicated on the drawings for the particular component. Additional index marking of MCO components is planned to assist in the production loading, assembly, and process orientation of the MCO components during

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				the fuel removal campaigns.
1300-12.4.11	119. Label design shall be consistent.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.6 of HNF-S-0426 for details on Interchangeability and Marking.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). During fabrication of the all the MCO pieces, the material is "tracked". When the MCO components are put together into assemblies, shells, baskets, etc. the appropriate numbering is applied to the discreet unit. Serial numbers are placed on the shell assembly (which is the collar, shell wall and bottom cap), the shield plug assembly, the locking & lifting ring, the cover cap, and the individual baskets. The labeling plan has been agreed to in advance with operations and found to be suitable and appropriate for the function of the unit. The labeling information is in the fabrication specification, HNF-S-0453, section 6.4.3.3 with the actual location being indicated on the drawings for the particular component. Additional index marking of MCO components is planned to assist in the production loading, assembly, and process orientation of the MCO components during the fuel removal campaigns.
1300-12.4.11	120. 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	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.6 of HNF-S-0426 for details on Interchangeability and Marking.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). During fabrication of the all the MCO pieces, the material is "tracked". When the MCO components are put together into assemblies, shells, baskets, etc. the appropriate numbering is applied to the discreet unit. Serial numbers are placed on the shell assembly (which is the collar, shell wall and bottom cap), the shield plug assembly, the locking & lifting ring, the cover cap.

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				and the individual baskets. The labeling plan has been agreed to in advance with operations and found to be suitable and appropriate for the function of the unit. The labeling information is in the fabrication specification, HNF-S-0453, section 6.4.3 with the actual location being indicated on the drawings for the particular component. Additional index marking of MCO components is planned to assist in the production loading, assembly, and process orientation of the MCO components during the fuel removal campaigns.
1304	Plutonium Processing and Handling Facilities			The MCO is not a PPHE, therefore, all of 1304 does not apply.
1304-2	Objectives			
1304-2	38. The design objective shall be to ensure that conservatively estimated consequences of normal operations and credible accidents are limited in accordance with the guidelines contained in Section 1300-1.4, Guidance on Limiting Exposure of the Public.	NA		The MCO is a component and not a Facility.
1304-3	Nuclear Criticality Safety			
1304-3	39. Enclosures and material transport and transfer control systems shall be designed so that plutonium and moderating material in excess of posted limits cannot be added to otherwise criticality-favorable enclosures or areas.	NA		The MCO is a component and not a Facility.
1304-4	Radiation Protection			
1304-4	39. Facility design shall provide for the continuous monitoring of external radiation exposure levels in process areas such as hot cells and canyons during entries required for maintenance or repair operation.	NA		The MCO is a component and not a Facility.

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1304-4	40. The design professional shall consider the criteria provided in USNRC R.G. 3.35 for applicability to PPHFs.	NA	The MCO is a component and not a Facility.	
1304-4	41. Neutron shields in the form of water jackets shall be monitored for water loss.	NA	The MCO is a component and not a Facility.	
1304-4	42. Installed (fixed) air monitors for radioactive materials shall be designed with a minimum sensitivity of 8 DAC-hours	NA	The MCO is a component and not a Facility.	
1304-5	Special Design Features			
1304-5	121. No natural gas for heating purposes shall be used unless the heating occurs in a separate building that is clearly isolated from the primary facility.	NA	The MCO is a component and not a Facility.	
1304-5	28. Those flammable gases that are necessary for a process shall be provided by a hard-piped system with the gas supply located outside of the facility in cylinders rather than from large capacity sources so as to limit the total quantity available in the event of a fire or explosion.	NA	The MCO is a component and not a Facility.	
1304-5	40. Pipes or other conduits for the transfer of plutonium in a product or waste liquid shall be at least double-walled or run within an enclosure that shall provide a second leak-tight barrier in the event of a DBA.	NA	The MCO is a component and not a Facility.	
1304-5	41. Leakage from the primary pipe shall be collected in a geometrically favorable location. It shall be continuously detectable by a liquid-detection system or by a radiation-detection system.	NA	The MCO is a component and not a Facility.	
1304-5	16. Exhaust ventilation systems shall be provided with HEPA filtration to minimize the release of plutonium and other hazardous material through the exhaust path.	NA	The MCO is a component and not a Facility.	

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1304-5	17. In addition, intake ventilation systems shall also be provided with either HEPA filtration or fail-safe backflow prevention to minimize the release of plutonium and other hazardous material through the inlet path.	NA	The MCO is a component and not a Facility.	
1304-5	87. Structures housing safety class items such as emergency diesel generators, the UPS, and the exhaust ventilation filtration system shall be designed to withstand the DBAs postulated for the PPHF.	NA	The MCO is a component and not a Facility.	
1304-6	Confinement Systems			
1304-6.1	General			
1304-6.1	42. The effectiveness of each confinement barrier shall be checked analytically against all challenges it is expected to withstand without loss of function.	C	<p>The MCO is a component and not a Facility.</p> <p>The MCO is the primary confinement for the SNF. The analyses performed indicate that the MCO integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the prescribed bounding envelope of the DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident.</p> <p>The facilities have their safety analysis reports to permit operations. In support of the facility SARs, the MCO has a "MCO Topical Report", HNF-SD-SNF-SARR-005, which includes discussion and items common to all the facilities and users of the MCO and MCO components. This topical report also contains discussion of events beyond the DBAs and is used as a reference for the facility SARs. Also, the MCOs are compatible with the normal environmental conditions expected during the life cycle and during potential upsets to the environmental surroundings around the MCOs. The MCOs are made entirely of corrosion resistant stainless steels and are found analytically to maintain confinement.</p>	

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1304-6.1	43. Operation of support and protection systems such as the fire protection system shall not promote a failure of the principal confinement systems. Confinement systems shall be designed in accordance with ALARA concepts.	C	The MCO is a component and not a Facility. The MCO are designed to function in a water flooded environment in the short term. The alara aspects of the design have been previously and adequately discussed in this table and in table 2 items 12 and 13.	
1304-6.2	Primary Confinement System			
1304-6.2	44. Primary confinement shall consist of barriers, enclosures, glove boxes, piping, vessels, tanks, and the like that contain plutonium.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO is the first and primary boundary surrounding the SNF in its journey from the basins water flooded load out pits through the interim storage time period at the CSB. The MCO is designed to confine the SNF during all normal handling, processing, and storage during design basis accidents. The MCO is first made up with a mechanical closure which will have a maximum leakage rate of 10-5 scc/second. Later the cover cap is welded on with a leakage rate maximum of 10-7 scc/sec. The boundary is all 304L stainless steel and is fabricated to the ASME section III subsection NB requirements. The MCO is designed so that process connections may be reliably attached to the shield plug. An internal HEPA filter is connected to the #2 process port to minimize the spread of contamination to facility piping and equipment connected to the MCO.
1304-6.2	45. Primary confinement of plutonium processes that involves readily dispensable forms (e.g., solutions, powder or small fragments, gases) shall be provided by glove boxes or other fully confining enclosures.	NA	The MCO does not contain a readily dispensable form of pure Plutonium. However, the MCO is equipped with internal HEPA filters to minimize the spread of contamination outside the MCO.	
1304-6.2	46. Primary confinement shall be designed, fabricated, tested, and maintained to a degree of quality assurance commensurate with its importance.	C	The requirements for the MCO are contained in HNF-S-	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).

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			0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement. Section 5 of the performance specification details out the QA requirements.	The MCO project QA requirements were established early on in the design of the MCO. The resulting fabrication specifications for the MCO and baskets exceed the MCO performance specification and the DOE 6430.1A section 0140 requirements. The safety class components have more QA requirements.
1304-6.2	47. QA criteria shall be specified at the preliminary design stage.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO project QA requirements were established early on in the design of the MCO. The resulting fabrication specifications for the MCO and baskets exceed the MCO performance specification and the DOE 6430.1A section 0140 requirements. The safety class components have more QA requirements.
1304-6.2	48. Design features incorporated into the confinement system shall have been proven effective by extensive experience in similar applications or by formal prototype testing.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO design has been tested and testing includes prototypic mechanical closure system, process valves, cover plate sealing systems, and underwater basket insertion tests. The testing will continue with three training and testing MCOs which will be used for production testing of the MCO, of MCO assembly tools and of interface with components and facility handling equipment.
1304-6.2	49. The integrity of the primary confinement system shall be maintainable through all normal operations, anticipated operational occurrences, and any DBA the primary barrier is required to withstand.	C	The requirements for the MCO are contained in HNF-S-0426. Refer	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO is the primary confinement for the SNF.

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			specifically to section 4.2 of HNF-S-0426 for details on Confinement.	<p>The analyses performed indicate that the MCO integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the prescribed bounding envelope of the DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident.</p> <p>The facilities have their safety analysis reports to permit operations. In support of the facility SARs, the MCO has a "MCO Topical Report", HNF-SD-SNF-SARR-005, which includes discussion and items common to all the facilities and users of the MCO and MCO components. This topical report also contains discussion of events beyond the DBAs and is used as a reference for the facility SARs. Also, the MCOs are compatible with the normal environmental conditions expected during the life cycle and during potential upsets to the environmental surroundings around the MCOs. The MCOs are made entirely of corrosion resistant stainless steels and are found analytically to maintain confinement.</p>
1304-6.2	50. Breaches in the primary confinement barrier that cannot be totally avoided or ruled out (e.g., due to glove or seal failure) must be compensated for by provision of adequate inflow of air or safe collection of spilled liquid.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>The MCO main closure contains a mechanical seal. The seal is manufactured by helicoflex (TM) and is made entirely of metal. This seal is elastically compliant, well captured in the seal cavity, plated with silver, and environmentally well suited for the surroundings. No appreciable corrosion is expected in service which would breach the MCO boundary.</p>

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				When the MCO is sealed by the cover cap, it is attached by welding.
1304-6.2	51. Occasional breaches that are required for anticipated maintenance shall be made only under carefully controlled conditions.	NA	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The section applies to the facility and although no maintenance is planned on the MCO, the MCO supports the need of "carefully controlled conditions" through the design of the MCOs.
1304-6.2	52. Provisions shall be made for storage of in-process material elsewhere, for temporary alternative barriers, and for adequate inflow of air to ensure contamination control.	NA		The process of material storage is only accomplished at the Basins by FRS and MCO Loading System.
1304-6.2	18. The exhaust ventilation system shall be sized to ensure radiological doses are maintained at ALARA levels in the event of the largest credible breach.	NA	The MCO has no exhaust ventilation.	
1304-6.2	53. The process equipment and the process itself shall be designed to minimize the probability of fire, explosion, or corrosion that might breach the confinement barrier.	C	The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.19.2 of HNF-S-0426 for details on DBAs.	Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426). The MCO is the primary confinement for the SNF. The analyses performed indicate that the MCO integrity is maintained as discussed and defined through the DBAs in the performance specification sections 4.2, 4.3 and 4.19.2. These DBAs include fire, earthquake, tornado, hydrogen deflagration, and four drops. Accidents outside the prescribed bounding envelope of the DBAs, by their nature, have to be analyzed by the facility. Accidents outside of the DBAs may require the facility to mitigate the

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
				<p>accident, prevent the accident, or get an appropriate waiver to allow operations under the possible circumstance of the potential accident.</p> <p>The facilities have their safety analysis reports to permit operations. In support of the facility SARs, the MCO has a "MCO Topical Report", HNF-SD-SNF-SARR-005, which includes discussion and items common to all the facilities and users of the MCO and MCO components. This topical report also contains discussion of events beyond the DBAs and is used as a reference for the facility SARs. Also, the MCOs are compatible with the normal environmental conditions expected during the life cycle and during potential upsets to the environmental surroundings around the MCOs. The MCOs are made entirely of corrosion resistant stainless steels and are found analytically to maintain confinement.</p> <p>The MCO supports need to minimize accidents involving the MCO. Doing so, of course, will be up to the facilities and operations during the fuel removal campaigns.</p>
1304-6.2	54. Confinement enclosures for combustible metals shall provide self-contained fire detection and extinguishing capability.	NA	<p>The requirements for the MCO are contained in HNF-S-0426. Refer specifically to section 4.2 of HNF-S-0426 for details on Confinement.</p>	<p>Section 3 of the design report (HNF-SD-SNF-DR-003) matches up with the requirements in section 4 of the specification (HNF-S-0426).</p> <p>This section is for traditional enclosures used to handle combustible metals and by the nature of having no maintenance or physical access inside the MCO and its reliable long term storage mission, the MCO does not contain any instrumentation or sensors. The MCO does have ports which are suitable for facilities to connect to in the event of needed process sensing of material introduction into or sampling of the MCOs. The ports may be used for combustion products sensing and introduction of extinguishing agents into the MCO if needed. The related DBAs have been analyzed and published and the MCO is designed to</p>

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1304-6.2	55. An inert atmosphere shall be required when pyrophoric forms (e.g., chips, filings, dust) of materials are being handled in the confinement enclosure.	C		maintain confinement. The detailed process accidents are discussed in the facility SARs and in the MCO topical report.
1304-6.2	56. Halon systems shall not be used for enclosures handling pyrophoric metals due to its oxidizing reaction with the hot metal.	NA		The MCO is designed for inerting through the process ports. It is the MCO projects understanding that the CVD will inert the MCO with helium after their process is complete.
1304-6.2	57. Primary confinement barrier(s) shall be provided between the process material and any auxiliary system (e.g., a cooling system) in a manner that minimizes risk of material transfer to an unsafe location or introduction of an undesirable medium into the process area. Differential pressure across the barrier(s) shall be used where appropriate.	NA		The MCO does not employ Halon.
1304-6.2	58. The confinement philosophy represented by the foregoing requirements shall also be applied to other components that serve a primary confinement function, such as conveyor systems, material transfer stations, and ventilation/off-gas systems.	C		The MCO is the primary confinement boundary, as previously discussed. Cooling water is applied to the exterior of the MCO, as appropriate, in the process facilities.
1304-6.2	Secondary Confinement System Process Hood and Local Exhaust	NA		The MCO provides a confinement boundary for process use.
1304-6.3	59. The secondary confinement system shall consist of the confinement barriers and associated ventilation systems that confine any potential release of hazardous material from primary confinement.	NA		This section is directed toward the holding facility, so all of the 1304-6.3 and 1304-6.4 sections are not applicable to the MCO. The MCO does provide a confinement boundary which has been shown as adequate for the process facilities use. Secondary and tertiary confinement systems, if required, are the responsibility of the facilities holding the MCO.
1304-6.3		NA		The MCO is a component not a major facility.

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1304-6.3	60. Because plutonium processing commonly is conducted in gloveboxes as the primary confinement, the functional requirements below refer to the operating area boundary and the ventilation system serving the operating area as the secondary confinement system.	NA	The MCO is a component not a major facility.	
1304-6.3	61. The integrity of the secondary confinement shall be maintainable through all normal operations, anticipated operational occurrences, and any DBA the secondary barrier is required to withstand.	NA	The MCO is a component not a major facility.	
1304-6.3	62. If the secondary barrier is required to withstand the DBE, it shall be designed in accordance with criteria in Section 0111-99.0, Nonreactor Nuclear Facilities-General.	NA	The MCO is a component not a major facility.	
1304-6.3	63. Design features incorporated into the confinement system shall have been proven effective by extensive experience in similar applications or by formal prototype testing.	NA	The MCO is a component not a major facility.	
1304-6.3	64. Penetrations of the secondary barrier shall have positive seals on permanent penetrations (e.g., pipes, ducts) or double closure with controlled secondary to primary leakage on pass-through penetrations (e.g., personnel airlocks and enclosed vestibules).	NA	The MCO is a component not a major facility.	
1304-6.3	43. Continuous monitoring capability shall be provided to detect loss of proper differential pressure with respect to the process area.	NA	The MCO is a component not a major facility.	
1304-6.3	44. Release of hazardous material to the operating area shall also be continuously monitored.	NA	The MCO is a component not a major facility.	

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1304-6.3	19. Ventilation systems associated with confinement shall be designed with adequate capacity to ensure proper direction and velocity of air flow in the event of the largest credible breach in the barrier.	NA		The MCO is a component not a major facility.
1304-6.4	Tertiary Confinement System	NA		This section is directed toward the holding facility, so all of the 1304-6.3 and 1304-6.4 sections are not applicable to the MCO. The MCO does provide a confinement boundary which has been shown as adequate for the process facilities use. Secondary and tertiary confinement systems, if required, are the responsibility of the facilities holding the MCO.
1304-6.4	65. Tertiary confinement shall be provided by the building or outer structure of the facility.	NA		The MCO is a component not a major facility.
1304-6.4	66. The integrity of the tertiary confinement system shall be maintainable throughout normal operations, anticipated operational occurrences, and any DBA the tertiary barrier is required to withstand.	NA		The MCO is a component not a major facility.
1304-7	Effluent Control and Monitoring			
1304-7.1	Radioactive Solid Waste	NA		
1304-7.1	122. Plutonium-contaminated solid waste shall be collected and handled in a location specifically designed to provide favorable geometry for criticality safety and means for packing and safe transfer of TRU waste.	NA		The MCO is a component not a major facility.
1304-7.2	Radioactive Liquid Waste	NA		
1304-7.2	123. Plutonium-contaminated liquid waste shall be collected in favorable geometry tanks with stirrers or other accepted mixing methods, sampling devices, and volume measuring devices.	NA		The MCO is a component not a major facility.
1304-7.2	124. An appropriate transfer system shall be provided that includes sufficient holdup capacity to allow	NA		The MCO is a component not a major facility.

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	conclusive sampling before transfer to treatment locations.			
1304-7.2	40. Appropriate design, monitoring, and administrative controls shall ensure that liquid effluent radioactive concentrations are below the limits on discharge specified in the directive in the DOE Order 5480 series on Radiation Protection of the Public and the Environment.	NA		The MCO is a component not a major facility.
1304-7.2	125. The design professional shall consider the criteria provided in USNRC R.G. 3.10 for applicability to PPHFs.	NA		The MCO is a component not a major facility.
1304-7.3	Effluents	NA		
1304-7.3.1	Airborne Effluents	NA		
1304-7.3.1	20. The design of airborne effluent systems shall consider and minimize plutonium holdup at locations in off-gas and ventilation ductwork and include provisions to detect and monitor the buildup of material and for its recovery.	NA		The MCO is a component not a major facility.
1304-7.3.1	45. Appropriate nuclear criticality safety provisions shall be applied to the airborne effluent systems.	NA		The MCO is a component not a major facility.
1304-7.3.1	126. Effluent monitoring and controls shall comply with the requirements of 40 CFR 61, the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series; the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series; and all applicable Federal, State, and local requirements. In addition, releases of airborne effluents shall be minimized by application of ALARA design principles.	NA		The MCO is a component not a major facility.

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1304-7.3.1	46. All exhaust outlets that may contain plutonium contaminants shall be provided with two monitoring systems.	NA	The MCO is a component not a major facility.	
1304-7.3.1	47. These monitoring systems shall comply with Section 1589-99.0.1, Radioactive Airborne Effluents.	NA	The MCO is a component not a major facility.	
1304-7.3.1	48. The monitoring capability shall cover the range from normal effluent concentrations to the maximum concentration expected from a credible accidental release.	NA	The MCO is a component not a major facility.	
1304-8	Decontamination and Decommissioning			
1304-8	127. The PPHF shall include a decontamination area within the process or operating area.	NA	The MCO is a component not a major facility.	
1304-8	128. This area shall be furnished with all necessary cleaning equipment, radioactivity monitors, waste handling capability, and safety features to safely perform equipment-cleaning tasks.	NA	The MCO is a component not a major facility.	
1304-8	129. Air cleaning devices shall be located as close to the source of contamination as practicable to avoid the unnecessary spreading of the contamination into ducts, conveyors, or other process areas.	NA	The MCO is a component not a major facility.	
1304-8	130. Protection shall be provided for bare floors, walls, and ceilings, particularly for structurally important parts of the building.	NA	The MCO is a component not a major facility.	
1304-8	131. Protection shall be in the form of strippable coatings or durable coatings for which effective cleaning methods have been developed.	NA	The MCO is a component not a major facility.	
1304-8	132. Surfaces in operating or process areas shall have no seams, cracks, or rough or absorbent surfaces.	C	The MCO is a component not a major facility. But the MCO has adopted this in the design.	

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1304-8	133. In areas that are most likely to become contaminated, adequate access shall be provided, such as crawl spaces, piping tunnels, and hatches into ductwork, to facilitate decontamination.	NA	The MCO is a component not a major facility.	
1304-8	134. The design of equipment shall include features and characteristics to minimize its contamination and facilitate decontamination.	C	The MCO is a component not a major facility. But the MCO has adopted this in the design.	
1318	Uranium Enrichment Facilities	NA	Not applicable to the MCO.	
1319	Uranium Processing and Handling Facilities	NA	Not applicable to the MCO.	
1320	Irradiated Fissile Material Storage Facilities			
1320-3	Nuclear Criticality Safety		The MCO is a component. It does support this section.	
1320-3	135. Favorable geometry, as implemented by storage rack design, is the preferred method of implementing nuclear criticality safety.	C	The MCO is a component not a major facility. However, the MCO does use geometric controls.	
1320-3	136. 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.	NA	The MCO is a component not a major facility. The MCO does not use "neutron absorbers" per se.	
1320-3	137. Storage racks shall be designed as safety class items and shall maintain their integrity during and following a DBA.	C	The MCO is a component not a major facility. The MCO component responsible for criticality control are safety class, and maintain their functional integrity after DBAs.	
1320-4	Special Design Features			
1320-4	29. 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	NA	The MCO is a component not a major facility. However, the MCO is designed for passive cooling at the CSB.	

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	be designed as a safety class system.			
1320-4	138. 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:	NA	The MCO is a component not a major facility.	
1320-4	The system shall allow for the sampling of coolant such that an individual leaking assembly can be identified.	NA	The MCO is a component not a major facility.	
1320-4	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.	NA	The MCO is a component not a major facility.	
1320-4	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.	NA	The MCO is a component not a major facility.	
1320-4	The design professional of the IFMSF shall consider provisions that allow for the interim canning of leaking assemblies until disposal.	NA	The MCO is a component not a major facility.	
1320-4	139. The Design professional shall consider the criteria provided in 10 CFR 72 and the following guides for applicability to IFMSFs:	NA	The MCO is a component not a major facility.	
1320-4	R.G. 3.49	NA	The MCO is a component not a major facility.	
1320-4	R.G. 3.54	NA	The MCO is a component not a major facility.	
1320-5	Confinement Systems		The MCO is a component and it supports this section	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1320-5.1	General			
1320-5.1	67. 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 a component not a major facility. The MCO is the primary confinement.	
1320-5.2	Primary Confinement Systems			
1320-5.2	68. The IFM cladding or cans, as appropriate, shall provide primary confinement during normal and anticipated operational occurrences.	C	The MCO is a component not a major facility. The MCO provides primary confinement for normal operations and DBAs.	
1320-5.2	69. 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 is a component not a major facility. The MCO provides primary confinement for normal operations and DBAs. The MCOs are made of corrosion resistant materials all 304 L or better stainless steels.	
1320-5.3	Secondary Confinement System	NA	This section is directed toward the holding facility, so all of the 1320-5.3 section is not applicable to the MCO. The MCO does provide a confinement boundary which has been shown as adequate for the process facilities use. Secondary and tertiary confinement systems, if required, are the responsibility of the facilities holding the MCO.	
1320-5.3	70. The facility building, and ventilation make up the secondary confinement system.	NA	The MCO is a component not a major facility.	
1320-5.3	71. The secondary confinement system shall be designed to function during normal operations and anticipated operational occurrences.	NA	The MCO is a component not a major facility.	
1320-5.3	72. It shall also be capable of performing its necessary safety functions during and following the DBAs it is required to withstand.	NA	The MCO is a component not a major facility.	
1320-5.3	73. Penetrations of the secondary confinement barrier shall have positive seals to prevent the migration of	NA	The MCO is a component not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	contamination.			
1320-5.3	74. 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.	NA	The MCO is a component not a major facility.	
1320-5.3	21. 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.	NA	The MCO is a component not a major facility.	
1320-5.3	22. Recirculated air in the main storage building shall be filtered through a HEPA filter to reduce the buildup of radioactive material in the air.	NA	The MCO is a component not a major facility.	
1320-5.3	23. Areas with higher potential airborne radioactive contamination (e.g., pool water purification and waste treatment system areas) shall use only once-through airflow.	NA	The MCO is a component not a major facility.	
1320-5.3	24. Supply air to these facilities shall be drawn from the main storage building if such design is feasible.	NA	The MCO is a component not a major facility.	
1320-5.3	25. Exhaust air shall be HEPA filtered prior to release.	NA	The MCO is a component not a major facility.	
1320-5.3	26. 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 MCO is a component not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1320-5.3	27. Airflow shall be from areas of lower contamination to higher contamination and areas of higher potential airborne contamination shall be kept less than atmospheric pressure.	NA	The MCO is a component not a major facility.	
1320-6	Effluent Control and Monitoring	NA		
1320-6.1	Radioactive Solid Waste	NA		
1320-6.1	140. 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.	NA	The MCO is a component not a major facility.	
1320-6.1	141. Nuclear criticality safety shall be considered in the design of the radioactive solid waste processing facility.	NA	The MCO is a component not a major facility.	
1320-6.2	Radioactive Liquid Waste	NA		
1320-6.2.1	Process Wastes	NA		
1320-6.2.1	142. 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.	NA	The MCO is a component not a major facility.	
1320-6.2.1	143. Nuclear criticality safety shall be considered in the design of the liquid radioactive waste processing facility.	NA	The MCO is a component not a major facility.	
1320-6.3	Effluents	NA		
1320-6.3.1	Airborne Effluents	NA		
1320-6.3.1	144. The airborne radioactive wastes typically associated with IFMSFs that shall be considered during the	NA	The MCO is a component not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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.			
1320-6.3.1	145. All exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems.	NA	The MCO is a component not a major facility.	
1320-6.3.1	146. These monitoring systems shall comply with Section 1589-99.0.1, Radioactive Airborne Effluents.	NA	The MCO is a component not a major facility.	
1320-6.3.1	75. 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.	NA	The MCO is a component not a major facility.	
1320-6.3.1	76. All exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems.	NA	The MCO is a component not a major facility.	
1320-6.3.1	77. These monitoring systems shall comply with Section 1589-99.0.1, Radioactive Airborne Effluents.	NA	The MCO is a component not a major facility.	
1320-7	Decontamination and Decommissioning.	NA		
1320-7	147. Decommissioning of the IFMSF is of utmost Importance. The facility design shall include features that will facilitate decontamination for future decommissioning.	NA	The MCO is a component, not a major facility.	
1321	Reprocessing Facilities	NA	Not applicable to the MCO.	
1322	Uranium Conversion and Recovery Facilities	NA	Not applicable to the MCO.	
1323	Radioactive Liquid Waste Facilities	NA	Not applicable to the MCO.	
1324	Radioactive Solid Waste Facilities	NA	Not applicable to the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1325	Laboratory Facilities	NA	Not applicable to the MCO.	
1326	Tritium Facilities	NA	Not applicable to the MCO.	
1328	Fusion Test Facilities	NA	Not applicable to the MCO.	
1400	Conveying System	NA	Not applicable to the MCO.	

MASTER Table. DOE Order 6430.1A - General Design Criteria
Division 15 & 16

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1525	Mechanical Insulation	NA	Not applicable to the MCO.	
1525-1	Applicability			
1525-1	148. 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).	NA	There are no insulating materials used with the MCO.	
1525-4	Safe Surface Temperatures			
1525-4	149. 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.	NA	There are no insulating materials used with the MCO.	
1530	Fire Protection	NA		
1530-1	General	NA		
1530-1	28. Fire protection systems shall comply with DOE Order 5480.7.	NA	There are no fire protection systems with the MCO.	
1530-2	Improved Risk Concept for Fire Protection Systems	NA	There are no fire protection systems with the MCO.	
1530-2.1	General	NA		

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1530-2.1	29. 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.	NA	There are no fire protection systems with the MCO.	
1530-2.2	Vital Programs			
1530-2.2	30. Fire protection systems for vital programs shall incorporate a "higher standard of protection" than the "improved risk" level as directed by DOE Order 5480.7	NA	There are no fire protection systems with the MCO.	
1530-2.3	Maximum Possible Fire Loss	NA		
1530-2.3.1	General			
1530-2.3.1	31. The application of these criteria shall be considered by an experienced fire protection engineer.	NA	There are no fire protection systems with the MCO.	
1530-2.3.2	Criterion I			
1530-2.3.2	32. Whenever the maximum possible fire loss exceeds \$1 million, automatic fire suppression systems shall be provided.	NA	There are no fire protection systems with the MCO.	
1530-2.3.3	Criterion II			
1530-2.3.3	33. The need for automatic fire suppression systems shall be considered when the maximum possible fire loss is below \$1 million.	NA	There are no fire protection systems with the MCO.	
1530-2.3.4	Criterion III			
1530-2.3.4	34. Automatic fire suppression systems are not required if all of the following conditions are satisfied: 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	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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).			
1530-2.3.5	Criterion IV	NA		
1530-2.3.5	35. 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	There are no fire protection systems with the MCO.	
1530-2.3.6	Criterion V			
1530-2.3.6	36. 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.	NA	There are no fire protection systems with the MCO.	
1530-3	Waterflow and Pressure Requirements for Fire Protection	NA		
1530-3.1	General			
1530-3.1	37. 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.	NA	There are no fire protection systems with the MCO.	
1530-3.1	38. All sprinkler or other automatic fire suppression system components shall be UL- or FM-approved for the	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	particular application chosen.			
1530-3.2	Occupancy Hazard Classification			
1530-3.2	39. NFPA 13 shall be used to determine the Occupancy Hazard Classification for any facility. Light hazard occupancy rules are prohibited.	NA	There are no fire protection systems with the MCO.	
1530-3.3	Water Demands for Sprinklered Facilities	NA		
1530-3.3.1	Schedule-Designed Sprinkler Systems			
1530-3.3.1	40. 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	There are no fire protection systems with the MCO.	
1530-3.3.2	Hydraulically Designed Sprinkler Systems			
1530-3.3.2	41. NFPA 13 shall be used to determine water supply requirements for hose streams (gpm) and duration (min).	NA	There are no fire protection systems with the MCO.	
1530-3.3.2	42. 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.	NA	There are no fire protection systems with the MCO.	
1530-3.3.2	43. 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.	NA	There are no fire protection systems with the MCO.	
1530-3.3.3	Fire Hydrant Demand			
1530-3.3.3	44. 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	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	(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.			
1530-4	Automatic Sprinkler Protection	NA		
1530-4.1	General			
1530-4.1	45. All sprinkler systems shall comply with NFPA 13.	NA	There are no fire protection systems with the MCO.	
1530-4.2	Types of Sprinkler Systems			
1530-4.2	46. Sprinkler systems shall normally be wet pipe using pipe schedule sizes listed in NFPA 13 for ordinary installations.	NA	There are no fire protection systems with the MCO.	
1530-4.2	47. 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.	NA	There are no fire protection systems with the MCO.	
1530-4.2.3	Pretaction			
1530-4.2.3	48. A pretaction system shall be used where it is particularly important to prevent the accidental discharge of water.	NA	There are no fire protection systems with the MCO.	
1530-4.2.3	49. Need for a pretaction system shall be based on review by and recommendation of a professional fire protection engineer.	NA	There are no fire protection systems with the MCO.	
	50. The detection system chosen to activate the pretaction valve shall have high reliability and a separate alarm/supervisory signal to indicate status.	NA	There are no fire protection systems with the MCO.	
1530-5	Special Protection Systems	NA		
1530-5.1	General			
1530-5.1	51. Special protection systems may be used to extinguish or control fire in easily ignited, fast burning substances such	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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.			
1530-5.1	52. Special 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		There are no fire protection systems with the MCO.
1530-5.2	Types of Special Suppression Systems			
1530-5.2.1	Water Spray			
1530-5.2.1	53. Installation of water spray systems shall comply with NFPA 15.	NA		There are no fire protection systems with the MCO.
1530-5.2.2	Carbon Dioxide			
1530-5.2.2	54. [Carbon dioxide] agent quantity requirements and installation procedures shall comply with NFPA 12.	NA		There are no fire protection systems with the MCO.
1530-5.2.3	Dry Chemical			
1530-5.2.3	55. [Dry chemical] systems shall comply with NFPA 17.	NA		There are no fire protection systems with the MCO.
1530-5.2.4	Foam			
1530-5.2.4	56. Foam systems shall comply with NFPA 11, 11A, 16, 16A, and NFPA 409.	NA		There are no fire protection systems with the MCO.
1530-5.2.5	Halon			
1530-5.2.5	57. The installation of Halon 1301 systems and Halon 1211 systems shall comply with NFPA 12A and NFPA 12B, respectively.	NA		There are no fire protection systems with the MCO.
1530-6	Standpipes and Hose Systems			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1530-6	58. Installation of standpipe systems shall comply with NFPA 14.	NA	There are no fire protection systems with the MCO.	
1530-7	Portable Fire Extinguishers			
1530-7	59. Portable fire extinguishers shall comply with NFPA 10.	NA	There are no fire protection systems with the MCO.	
1530-8	Fire Detection and Alarm Systems			
1530-8.1	General			
1530-8.1	60. All fire detection and alarm devices shall have UL-listed components or be FM-approved.	NA	There are no fire protection systems with the MCO.	
1530-8.1	61. 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.	NA	There are no fire protection systems with the MCO.	
1530-8.2	Alarm Systems			
1530-8.2.1	General			
1530-8.2.1	62. Fire alarm systems shall have the following basic features: 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	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	each condition shall be separate and distinct from the other two.			
1530-8.2.1	63. Fire alarm systems for new DOE buildings shall be compatible with those for the DOE complex where the new building is to be located.	NA	There are no fire protection systems with the MCO.	
1530-8.2.2	Alarm Actuating Devices			
1530-8.2.2	64. 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.	NA	There are no fire protection systems with the MCO.	
1530-8.2.2	65. A manual fire notification method such as manual fire alarm boxes shall be provided and located in accordance with the appropriate NFPA standard.	NA	There are no fire protection systems with the MCO.	
1530-8.2.2	66. Combined watch reporting and fire alarm systems, if used, shall be in accordance with the appropriate NFPA standard.	NA	There are no fire protection systems with the MCO.	
1530-8.3	Automatic Fire Detection Systems			
1530-8.3.1	General			
1530-8.3.1	67. Automatic fire detectors shall comply with NFPA 72E. Detector spacing shall be in accordance with NFPA 72E, Appendices A, B, and C.	NA	There are no fire protection systems with the MCO.	
1530-8.3.4	Smoke Detectors			
1530-8.3.4	68. Smoke detectors shall be installed in all areas where required by the appropriate NFPA standard or by the cognizant DOE fire protection authority.	NA	There are no fire protection systems with the MCO.	
1530-8.3.4	69. 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	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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.			
1530-9	Water Storage and Distribution			
1530-9	70. 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.	NA		There are no fire protection systems with the MCO.
1530-9	71. 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		There are no fire protection systems with the MCO.
1530-9	72. 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.	NA		There are no fire protection systems with the MCO.
1530-9	73. 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.	NA		There are no fire protection systems with the MCO.
1530-9	74. 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		There are no fire protection systems with the MCO.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1530-9	75. 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.	NA		There are no fire protection systems with the MCO.
1530-9	76. 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.	NA		There are no fire protection systems with the MCO.
1530-9	77. 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.	NA		There are no fire protection systems with the MCO.
1530-9	78. 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.	NA		There are no fire protection systems with the MCO.
1530-99	Special Facilities			
1530-99.0	General			
1530-99.0	79. 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.	NA		There are no fire protection systems with the MCO.
1530-99.0	80. A fire protection engineer or person knowledgeable in applying the principles of fire protection shall develop the fire protection system.	NA		There are no fire protection systems with the MCO.
1530-99.0	81. To maximize the protection against fire, the system shall contain an appropriate integration of fire prevention, detection, and suppression features.	NA		There are no fire protection systems with the MCO.
1530-99.0	82. 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.	NA		There are no fire protection systems with the MCO.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1530-99.0	83. Total reliance shall not be placed on a single fire suppression system. Appropriate backup capability shall be provided.	NA	There are no fire protection systems with the MCO.	
1530-99.0	150. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	84. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	85. 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	There are no fire protection systems with the MCO.	
1530-99.0	78. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	86. 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	There are no fire protection systems with the MCO.	
1530-99.0	87. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	88. Fire protection systems and components shall have fail	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	safe features and audible and visual alarms for operability and trouble indications.			
1530-99.0	89. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	90. 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).	NA	There are no fire protection systems with the MCO.	
1530-99.0	91. 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.	NA	There are no fire protection systems with the MCO.	
1530-99.0	92. 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.	NA	There are no fire protection systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1530-99.0	<p>93. 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 <p>The introduction of the extinguishing agent in a way that does not result in overpressurization of the confinement barriers</p>	NA	There are no fire protection systems with the MCO.	
1530-99.0	<p>94. 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.</p>	NA	There are no fire protection systems with the MCO.	
1530-99.0	<p>95. 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).</p>	NA	There are no fire protection systems with the MCO.	
1530-99.0	<p>96. 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.</p>	NA	There are no fire protection systems with the MCO.	
1540	Plumbing/Service Piping	NA		

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1540-1	Plumbing			
1540-1.5	Safety Devices			
1540-1.5	30. As directed by project criteria, emergency eye washes, emergency showers, or combination emergency eye washes shall be provided where corrosive or other skin or eye irritant chemicals are stored, handled, used, or dispensed.	NA	There are no plumbing systems with the MCO.	
1540-1.5	31. Equipment shall comply with ANSI Z358.1 and be serviced by the potable water system.	NA	There are no plumbing systems with the MCO.	
1540-1.5	32. Backflow preventors 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	There are no plumbing systems with the MCO.	
1540-99	Special Facilities			
1540-99.0	Nonreactor Nuclear Facilities - General			
1540-99.0.1	General Cooling Systems Criteria	NA	The MCO is passively cooled.	
1540-99.0.1	33. These criteria and requirements are for cooling water and water supply systems including all components that transfer heat from sources in the facility to the ultimate heat sink that are classified as safety class items in accordance with Section 1300-3.2, Safety Class Items. The function of the safety class water system is to provide a sufficient quantity of water to satisfy the safety needs of the following:	NA	There are no cooling systems with the MCO.	
1540-99.01	Cooling systems that remove heat from storage pools or process vessels that contain radioactive liquids Cooling needs of other equipment or systems requiring a supply of water to perform their safety functions	NA	There are no cooling systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1540-99.0.1	34. Water systems shall be designed to incorporate sufficient redundancy and independence to ensure that served systems and structures are adequately cooled and that adequate emergency supplies of water are available during normal operations, anticipated operational occurrences, and DBA conditions with the addition of a single failure of a component in the water system.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	35. The cooling water system shall have a heat utilization capability at least equal to the maximum heat load imposed under any mode of normal operations, anticipated operational occurrences, and DBA conditions.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	36. The water supply system shall be capable of supplying the long-term water needs of a facility following a loss of normal water supply or other accident.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	37. The water system shall be designed to a national piping code (i.e., ASME Boiler and Pressure Vessel Code, Section III or ASME B31.3). The design of systems that must provide cooling water following a DBE shall include the forces resulting from a DBE.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	38. The cooling water system shall be provided with at least two sources of motive power.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	39. The water system design shall include provisions for isolating leaking components such as heat exchangers.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	40. Adequate instrumentation and controls shall be provided to assess water system performance and allow the necessary control of system operation.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	41. Components of the water system that are powered by electricity only shall be considered as safety class loads.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	42. As required to provide necessary cooling, the water system and the ultimate heat sink shall be protected	NA	There are no cooling systems with the MCO.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	against the effects of severe natural phenomena and man-made events.			
1540-99.0.1	43. Equipment in the cooling water system shall be appropriately qualified to ensure reliable operation under normal operations, anticipated operational occurrences, and DBA conditions.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	44. The design of cooling and water supply systems shall require the following:	NA	There are no cooling systems with the MCO.	
1540-99.0.1	The performance of initial and periodic hydrostatic tests to verify system integrity	NA	There are no cooling systems with the MCO.	
1540-99.0.1	The performance of periodic operational tests of system performance	NA	There are no cooling systems with the MCO.	
1540-99.0.1	In-service inspection of system components	NA	There are no cooling systems with the MCO.	
1540-99.0.1	45. System redundancy requirements include the following:	NA	There are no cooling systems with the MCO.	
1540-99.0.1	The cooling system shall be composed of at least two water sources, each capable of performing the necessary safety functions, unless it can be demonstrated by safety analysis that there is an extremely low probability of losing the capability of a single source.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	46. Means shall be provided to detect and control leakage of radioactive material into the coolant. The consequences of such leakage shall not significantly degrade system performance or endanger personnel.	NA	There are no cooling systems with the MCO.	
1540-99.0.1	47. Leakage of coolant into waste storage vessels shall be detectable, and the volume of coolant that may enter the waste tank shall be controlled to prevent overflow.	NA	There are no cooling systems with the MCO.	
1540-99.0.2	Water Collection System	NA	The MCO has no collection system for fire fighting.	

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1540-99.0.2	151. Collection systems shall be provided for water runoff such as from fire fighting activities from areas within special facilities containing radioactive material.	NA	There are no water collection systems with the MCO.	
1540-99.0.2	152. 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	There are no water collection systems with the MCO.	
1540-99.0.2	153. 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	There are no water collection systems with the MCO.	
1540-99.0.2	154. 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	There are no water collection systems with the MCO.	
1540-99.0.2	155. 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: The maximum material mass loading that could be in the runoff system.	NA	There are no water collection systems with the MCO.	
1540-99.0.2	The most disadvantageous material concentrations, particle size, and material dispersion in the water slurry.	NA	There are no water collection systems with the MCO.	
1540-99.0.2	The change in concentration of material and geometric configuration of the slurry as the particulate matter settles out of the water.	NA	There are no water collection systems with the MCO.	
1540-99.0.3	Other Collection Systems			
1540-99.0.3	156. Safety shower water and personnel decontamination shower water shall drain to the contaminated process	NA	There are no water collection systems with the MCO.	

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	wastewater system.			
1540-99.0.4	Equipment Operability Qualification			
1540-99.0.4	48. 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.	NA	There are no systems like this on the MCO.	
1540-99.0.5	Water Supplies and Other Utility Services			
1540-99.0.5	49. The design of each utility service or cooling water system shall consider the demands for normal operations, anticipated operational occurrences, and DBA conditions.	NA	There are no utility systems with the MCO.	
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			
1550-1.5.5	28. 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.	NA	There are no HVAC systems with the MCO.	
1550-1.5.5	29. 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.	NA	There are no HVAC systems with the MCO.	
1550-1.5.5	30. Makeup air shall be provided in the quantities required to maintain required positive or negative room static	NA	There are no HVAC systems with the MCO.	

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	pressure requirements and to offset local exhaust air quantities. Makeup air shall be tempered.			
1550-1.5.6	Local Exhaust Systems			
1550-1.5.6	31. 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.	NA	There are no HVAC systems with the MCO.	
1550-1.5.7	Equipment Room Ventilation			
1550-1.5.7	32. 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.	NA	There are no HVAC systems with the MCO.	
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	High-Efficiency Particulate Air Filters			
1550-2.5.5	33. HEPA filter assemblies shall comply with ASME N509.	NA	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.	
1550-2.5.5	34. 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.	NA	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1550-2.5.5	35. 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.	NA	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.
1550-2.5.5	36. In-place testing design requirements shall meet all the recommendations of UL 586, ASME N510, and ERDA 76-21.	NA	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.	The HEPA filters inside of the MCO are for process reasons and are not filtering exhaust from a facility.
1550-2.5.5	37. HEPA filtration systems shall be designed with prefilters installed upstream of HEPA filters to extend the HEPA filter's life.	NA	The HEPA filters inside of the MCO are for process reasons not filtering exhaust from a facility.	The HEPA filters inside of the MCO are for process reasons not filtering exhaust from a facility.
1550-2.5.5	Air Cleaning Devices for Special Application.			
1550-2.5.5	38. Absorbers for nuclear or toxic applications should comply with ERDA 76-21, ASME N509, and ASME N510.	NA	There are no special application air cleaning devices with the MCO.	There are no special application air cleaning devices with the MCO.
1550-2.5.5	Fire Protection of HEPA Filter Assemblies			
1550-2.5.5	39. 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	There are no fire protection systems with the MCO.	There are no fire protection systems with the MCO.
1550-2.5.5	40. 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.	NA	There are no fire protection systems with the MCO.	There are no fire protection systems with the MCO.
1550-2.5.6	Ductwork Systems			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1550-2.5.6	41. Ductwork systems shall be designed to meet the leakage rate requirements of SMACNA HVAC Air Duct Leakage Test Manual.	NA	There are no duct systems with the MCO.	
1550-2.5.6	42. Ductwork, accessories, and support systems shall be designed to comply with the following: <ul style="list-style-type: none"> - 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 	NA	There are no duct systems with the MCO.	
1550-2.5.6	43. 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.	NA	There are no duct systems with the MCO.	
1550-2.5.6	44. 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	There are no duct systems with the MCO.	
1550-2.5.6	45. Exhaust ductwork shall comply with NFPA 91.	NA	There are no duct systems with the MCO.	
1550-2.5.6	46. Ductwork shall be designed to resist corrosive contaminants if present.	NA	There are no duct systems with the MCO.	
1550-2.5.6	47. Ductwork thermal insulation shall comply with ASHRAE Standard 90. Ductwork shall be acoustically insulated to meet acceptable noise criteria.	NA	There are no duct systems with the MCO.	
1550-2.5.6	48. Ductwork systems shall have testing and balancing dampers and accessories specified and installed as discussed in Section 1550-3.2, Testing and Balancing	NA	There are no duct systems with the MCO.	

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	Devices.			
1550-3	Testing, Adjusting and Balancing	NA	There are no mechanical air or HVAC water distribution systems in the MCO.	
1550-3.1	System Performance Tests			
1550-3.1	49. 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.	NA	There are no mechanical air or HVAC water distribution systems in the MCO.	
1550-3.2	Testing and Balancing Devices			
1550-3.2	50. 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.	NA	There are no duct systems with the MCO.	
1550-99	Special Facilities			
1550-99.0	Nonreactor Nuclear Facilities - General	NA	The MCO does not contain a ventilation or off gas system.	
1550-99.0.1	General Ventilation and Offgas Criteria	NA		
1550-99.0.1	51. 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	The MCO is not a major facility.	
1550-99.0.1	52. Ventilation systems shall be designed to provide a continuous airflow pattern from the environment into the	NA	The MCO is not a major facility.	

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	building and then from noncontaminated 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.			
1550-99.0.1	53. Dampers shall be located so that cross-contamination will not occur in case of a localized release of material.	NA	The MCO is not a major facility.	
1550-99.0.1	54. Electronic air cleaners shall not be used in systems recirculating air.	NA	The MCO is not a major facility.	
1550-99.0.1	55. Ventilation system balancing shall be specified to ensure that the building air pressure is always negative with respect to the outside atmosphere.	NA	The MCO is not a major facility.	
1550-99.0.1	56. Portions of ventilation and offgas systems that provide required functions following a seismic event shall be designed to be functional following a DBE.	NA	The MCO is not a major facility.	
1550-99.0.1	57. The use of down draft ventilation within occupied process areas shall be considered as a means to reduce the potential inhalation of contamination.	NA	The MCO is not a major facility.	
1550-99.0.1	58. 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	The MCO is not a major facility.	
1550-99.0.1	59. 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 MCO is not a major facility.	
1550-99.0.1	60. Gas storage areas and process areas that use nonradioactive hazardous materials shall have ventilation systems designed to ensure that the hazardous material	NA	The MCO is not a major facility.	

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	concentrations do not exceed the limits referenced in DOE 5480.10 and are ALARA in the workplace environment.			
1550-99.0.1	61. Effective loss-of-ventilation alarms shall be provided in all of this area.	NA	The MCO is not a major facility.	
1550-99.0.1	62. 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	The MCO is not a major facility.	
1550-99.0.1	63. Components of ventilation and offgas systems that require electric power to perform their safety functions shall be considered safety class loads.	NA	The MCO is not a major facility.	
1550-99.0.1	64. Adequate instrumentation and controls shall be provided to assess ventilation or offgas system performance and allow the necessary control of system operation.	NA	The MCO is not a major facility.	
1550-99.0.1	65. 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	The MCO is not a major facility.	
1550-99.0.2	Confinement Ventilation Systems	NA		
1550-99.0.2	66. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	67. The ventilation system design shall provide the required confinement capability under all credible circumstances with the addition of a single failure in the system.	NA	The MCO is not a major facility.	
1550-99.0.2	68. If the maintenance of a controlled continuous confinement airflow is required, electrical equipment and components required to provide this airflow shall be	NA	The MCO is not a major facility.	

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	supplied with safety class electric power and provided with an emergency power source.			
1550-99.0.2	69. 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:	NA	The MCO is not a major facility.	
1550-99.0.2	69a. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	69b. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	69c. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	69d. 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.	NA	The MCO is not a major facility.	

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1550-99.0.2	69e. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	69f. Safety class air filtration units shall be designed to remain functional throughout DBAs and to retain radioactive collected materials after the accident.	NA	The MCO is not a major facility.	
1550-99.0.2	69g. Air sampling locations shall meet ACGIN/ASHRAE criteria. Sample collecting devices shall be located as close to the sampling probe as possible.	NA	The MCO is not a major facility.	
1550-99.0.2	69h. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	69i. Air filtration units shall be installed as close as practical to the source of contaminants to minimize the contamination of ventilation system ductwork.	NA	The MCO is not a major facility.	
1550-99.0.2	69j. Ducts shall be sized for the transport velocities needed to convey without settling all particulate contaminants.	NA	The MCO is not a major facility.	
1550-99.0.2	69k. Air filtration units shall be located and provided with appropriate radiation shielding to maintain occupational doses ALARA during operations and maintenance.	NA	The MCO is not a major facility.	
1550-99.0.2	69l. 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	The MCO is not a major facility.	

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1550-99.0.2	69m. 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	The MCO is not a major facility.	
1550-99.0.2	69n. 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	The MCO is not a major facility.	
1550-99.0.2	69o. Either HEPA filtration or fail-safe backflow prevention for process area intake ventilation systems shall be provided.	NA	The MCO is not a major facility.	
1550-99.0.2	69p. 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.	NA	The MCO is not a major facility.	
1550-99.0.2	70. In facilities where plutonium or enriched uranium is processed, the following additional requirements shall be met.	NA	The MCO is not a major facility.	
1550-99.0.2	70a. Whenever possible, the designer shall provide enclosures for confining the process work on plutonium and enriched uranium. Design criteria for enclosures of radioactive and other hazardous materials are provided in Section 1161, Enclosures.	NA	The MCO is not a major facility.	
1550-99.0.2	70b. When these confinement enclosures are specified and designed, consideration shall be given to whether room ventilation air can be recirculated. If a recirculation ventilation system is provided, the design shall provide a suitable means for switching from the recirculation mode to a once-through ventilation system.	NA	The MCO is not a major facility.	

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1550-99.0.2	70c. A safety analysis under DOE direction shall establish the minimum acceptable performance requirements for the ventilation system and the response requirements of system components, instrumentation, and controls under normal operations, anticipated operational occurrences, and DBA conditions.	NA	The MCO is not a major facility.	
1550-99.0.2	70d. The safety analysis shall determine system requirements such as the need for redundant components, emergency power for fans, dampers, special filters, and fail-safe valve/damper positions.	NA	The MCO is not a major facility.	
1550-99.0.2	70e. The safety analysis and the guidelines provided by the cognizant DOE authority shall determine the type of exhaust filtration required for any area of the facility during normal operations, anticipated operational occurrences, and DBA conditions.	NA	The MCO is not a major facility.	
1550-99.0.2	70f. If advantageous to operations, maintenance, or emergency personnel, the ventilation system shall have provisions for independent shutdown.	NA	The MCO is not a major facility.	
1550-99.0.2	70g. When a system is shut down, positive means of controlling backflow of air to noncontaminated spaces shall be provided by positive shutoff dampers, blind flanges, or other devices.	NA	The MCO is not a major facility.	
1550-99.0.2	70h. Equipment to continuously monitor oxygen levels shall be provided for occupied working areas of facilities equipped with significant quantities of inerted or oxygen-deficient process glovebox lines.	NA	The MCO is not a major facility.	
1550-99.0.2	70i. The supply air to enclosures that confine the processing of plutonium and enriched uranium shall be filtered by HEPA filters at the ventilation inlets to the enclosures and area confinement barriers to prevent the transport of radioactive contamination in the event of a flow reversal.	NA	The MCO is not a major facility.	

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1550-99.0.2	70j. If room air is recirculated, at least one stage of HEPA filtration shall be provided in the recirculation circuit.	NA	The MCO is not a major facility.	
1550-99.0.2	70k. The design shall include redundant filter banks and fans that shall be located based on the results of the safety analysis.	NA	The MCO is not a major facility.	
1550-99.0.2	70l. If recirculation systems are used, a means shall be provided to prevent contaminated process enclosure air from exhausting into the working area rooms. Process enclosure air (from hoods, gloveboxes, etc.) shall be treated and exhausted without any potential for recirculation to occupied areas.	NA	The MCO is not a major facility.	
1550-99.0.2	70m. Ventilation system components and controls that require electric power to perform safety functions shall be supplied with a safety class UPS and/or emergency power supply as is determined to be required by a systems design/safety analysis.	NA	The MCO is not a major facility.	
1550-99.0.2	70n. The designer shall specify and locate components in the exhaust systems to remove radioactive materials and noxious chemicals before the air is discharged to the environment.	NA	The MCO is not a major facility.	
1550-99.0.2	70o. These components shall be capable of safely handling products of combustion. These systems shall be designed to operate under DBA conditions including the DBF. The exhaust system design shall ensure that effluents are safely directed through the appropriate ventilation ducts and not spread beyond the physical boundary of the ventilation system until treated.	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1550-99.0.2	70p. The number of required exhaust filtration stages to limit the quantity and concentration of airborne radioactive or other hazardous materials released to the environment from any area of the facility shall be determined by the safety analysis. The design shall include all necessary cleaning and detection equipment for detection and removal of noxious chemicals from the exhaust ventilation system.	NA	The MCO is not a major facility.	
1550-99.0.2	70q. HEPA filters shall be installed at the interface between the enclosures that confine the process and the exhaust ventilation system to minimize the contamination of exhaust ductwork. Prefilters shall be installed ahead of HEPA filters to reduce HEPA filter loading. The filtration system shall be designed to allow reliable in-place testing of the HEPA filter and simplify filter replacement.	NA	The MCO is not a major facility.	
1550-99.0.2	70r. Separate exhaust ventilation system ductwork and the initial two stages of filtration shall be designed for exhaust air from enclosures that confine the process (e.g., gloveboxes).	NA	The MCO is not a major facility.	
1550-99.0.2	70s. These systems shall maintain a negative pressure inside the enclosure with respect to the operating area.	NA	The MCO is not a major facility.	
1550-99.0.2	70t. Enclosures that confine the process and are supplied with gases at positive pressure shall have positive-acting pressure-relief valves that relieve to the exhaust system to prevent over-pressurization of the process confinement system.	NA	The MCO is not a major facility.	
1550-99.0.2	70u. The design of air cleaning systems for normal operations, anticipated operational occurrences, and DBA conditions shall include the use of the following equipment as directed by the cognizant DOE authority and these criteria:	NA	The MCO is not a major facility.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	<ul style="list-style-type: none"> - Prefilters - Scrubbers - Process vessel vent systems - HEPA filters - Sand filters - Glass filters - Radiiodine absorbers - Denisters - Condensers - Distribution baffles - Pressure and flow measurement devices. 			
1550-99.0.2	70v. Airborne contaminant cleaning systems shall be designed for convenient maintenance and the ability to decontaminate components and replace components in the supply, exhaust, and cleanup systems without exposure of maintenance or service personnel to hazardous materials.	NA	The MCO is not a major facility.	
1550-99.0.2	70w. Filtration systems shall be designed so that a bank of filters can be completely isolated from the ventilation systems during filter element replacement.	NA	The MCO is not a major facility.	
1550-99.0.3	Off-Gas systems	NA		
1550-99.0.3	71. The sources and characteristics of radioactive material in off-gas systems shall be identified.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	72. 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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	73. 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.	NA	The MCO will not have an off-gas system.	
	74. Portions of off-gas systems and components that are			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1550-99.0.3	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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	75. 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 MCO will not have an off-gas system.	
1550-99.0.3	76. Adequate instrumentation shall be provided to monitor and assess system performance and to provide necessary alarms.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	77. 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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	78. The off-gas system shall be designed to allow periodic maintenance, inspection, and testing of components.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	79. 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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	80. Process system tanks and other sealed components shall be vented to an off-gas system.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	81. 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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	82. Vents from liquid components shall be provided with traps and drains to prevent inadvertent flooding of off-gas systems.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	83. Adequate shielding shall be provided for filters, absorbers, scrubbers, and other off-gas treatment system	NA	The MCO will not have an off-gas system.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	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.			
1550-99.0.3	84. Corrosive gases and particles from vats, scrubbers, and similar equipment in gloveboxes shall be neutralized prior to reaching the HEPA off-gas filters.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	85. Air ventilated gloveboxes shall have the ability to safely contain in-box contaminants when an access port is opened or a glove ruptures.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	86. 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	The MCO will not have an off-gas system.	
1550-99.0.3	87. 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.	NA	The MCO will not have an off-gas system.	
1550-99.0.3	88. The cleanup systems shall be designed to remove particulates and noxious chemicals and control the release of gaseous radionuclides.	NA	The MCO will not have an off-gas system.	
1589	Air Pollution Control	NA	Air pollution requirements are addressed at the facility.	
1589-1	General	NA		
1589-1	41. These criteria shall be applied to the control, treatment, and subsequent disposal of all airborne and gaseous wastes to assure compliance with the following:	NA	Air pollution requirements are addressed at the facility level and are not appropriate for MCO to discuss.	
1589-1	DOE 5400.1			
1589-1	DOE 5440.1C			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1589-1	DOE 5480.4			
1589-1	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.			
1589-2	Improved Risk Concept	NA		Air pollution requirements are addressed at the facility level.
1589-2	79. 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.	NA		
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	49. 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.	NA		The MCO will not contribute any air pollution.
1589-99.0.1	50. 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.).	NA		The MCO will not contribute any air pollution.
	51. Continuous stack sampling and continuous radiation			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1589-99.0.1	detection shall be considered.	NA	The MCO will not contribute any air pollution.	
1589-99.0.1	52. Sampling systems shall be designed in accordance with ANSI N13.1 and associated appendices to ensure representative sampling of the effluent stream.	NA	The MCO will not contribute any air pollution.	
1589-99.0.1	53. Isokinetic sampling shall be provided for effluent streams that are expected to contain particulate radionuclides.	NA	The MCO will not contribute any air pollution.	
1589-99.0.1	54. The range capability of continuous monitors shall cover from routine to potential DBA releases of radionuclides.	NA	The MCO will not contribute any air pollution.	
1589-99.0.1	55. Nuclear criticality safety shall be considered in the design of equipment used to treat and discharge radioactive airborne effluents.	NA	The MCO will not contribute any air pollution.	
1589-99.0.2	Nonradioactive Airborne Effluents	NA		
1589-99.0.2	89. 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.	NA	The MCO will not contribute any nonradioactive airborne effluents.	
1595	Controls	NA		
1595-1	General			
1595-1	90. 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.	NA	The MCO will not have any control systems.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1595-1	91. 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.	NA	The MCO will not have any control systems.	
1595-1	92. 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.	NA	The MCO will not have any control systems.	
1595-1	93. 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.	NA	The MCO will not have any control systems.	
1595-6	Control of Air Handling Systems	NA		
1595-6.1	Mechanical Ventilation Control			
1595-6.1	94. 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.	NA	The MCO will not have any mechanical ventilation systems.	
1595-6.1	95. 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.	NA	The MCO will not have any mechanical ventilation systems.	
1595-6.1	96. 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	NA	The MCO will not have any mechanical ventilation systems.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	system.			
1595-6.1	97. Automatic dampers should fail open for return air and fail closed for outside air.	NA		The MCO will not have any mechanical ventilation systems.
1595-6.3	Automatic Control Dampers	NA		
1595-6.3	98. 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.	NA		The MCO will not have any mechanical ventilation systems.
1595-6.5	Fire and Smoke Detection and Protection Controls			
1595-6.5	97. Engineered smoke pressurization and evacuation systems shall comply with the following: NFPA 90A NFPA 72E ASHRAE Manual, Design of Smoke Control Systems for Buildings ASHRAE Systems handbook	NA		The MCO will not have any fire systems.
1595-6.5	98. All air handling systems shall be provided with the smoke and fire protection controls required by NFPA 101.	NA		The MCO will not have any fire systems.
1595-6.5	99. 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.	NA		The MCO will not have any fire systems.
	100. Special exhaust systems shall be designed to include			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1595-6.5	fire and smoke safety controls as required by NFPA 91.	NA	The MCO will not have any fire systems.	
1605	Electrical Materials and Methods	NA	This Division 16 is not applicable to MCO.	
1605-1	General			
1605-1	1. All systems shall comply with NFPA 70 and ANSI C2.	NA	Division 16 applies to Electrical Systems. The MCO is a purely mechanical component. Therefore the Division 16 requirements do not apply to the MCO.	
1605-1	2. Electrical systems shall be designed so that all components operate within their capacities for initial and projected loads.	NA	The MCO has no electrical subcomponents.	
1605-1	3. Preferred standard voltages in conformance with ANSI C84.1.	NA	The MCO has no electrical subcomponents.	
1605-1	4. 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.	NA	The MCO has no electrical subcomponents.	
1605-1	5. 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.	NA	The MCO has no electrical subcomponents.	
1605-2	Wiring System			
1605-2.1	Raceways			
1605-2.1.1	General			
1605-2.1.1	6. Raceways that penetrate fire-rated assemblies shall be	NA	The MCO has no electrical subcomponents.	

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	noncombustible.			
1605-2.1.1	7. The complete installation shall be suitably sealed to maintain the established fire ratings as defined in UL Building Materials Directory and UL 1479.	NA	The MCO has no electrical subcomponents.	
1605-2.1.1	8. Raceways shall be -inch minimum in diameter. Raceways embedded in concrete or masonry shall be 3/4-inch minimum and shall be adequate in number and capacity for the initial and projected facility requirements.	NA	The MCO has no electrical subcomponents.	
1605-2.1.2	Electrical Metallic Tubing			
1605-2.1.2	9. Electrical Metallic Tubing (EMT) shall be used to enclose circuit power conductors, alarm and signal circuits in nonhazardous and noncorrosive locations.	NA	The MCO has no electrical subcomponents.	
1605-2.1.2	10. 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.	NA	The MCO has no electrical subcomponents.	
1605-2.1.2	11. When EMT is used outdoors or in damp locations, compression type (rain tight) fittings must be used.	NA	The MCO has no electrical subcomponents.	
1605-2.1.3	Flexible Steel Conduit			
1605-2.1.3	12. Flexible steel conduit shall be used for connection to equipment subject to vibration and connection from junction boxes to recessed lighting fixtures.	NA	The MCO has no electrical subcomponents.	
1605-2.1.4	Rigid Steel Conduit and Intermediate Metal Conduit			
1605-2.1.4	13. Rigid steel conduit or intermediate metal conduit shall be used in locations classified as hazardous by NFPA 70.	NA	The MCO has no electrical subcomponents.	
1605-2.1.5	Aluminum			
1605-2.1.5	14. Aluminum conduit shall be used for high-frequency circuits where steel will cause magnetic problems or in	NA	The MCO has no electrical subcomponents.	

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	atmospheres where steel conduit is unsuitable.			
1605-2.1.5	15. Aluminum conduit shall not be installed underground, encased in concrete, or where the atmosphere is corrosive to aluminum.	NA	The MCO has no electrical subcomponents.	
1605-2.1.6	Nonmetallic Conduit			
1605-2.1.6	16. Nonmetallic conduit shall be used only where allowed by NFPA 70.	NA	The MCO has no electrical subcomponents.	
1605-2.1.7	Surface-Metal or Nonmetallic Systems			
1605-2.1.7	17. 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	The MCO has no electrical subcomponents.	
1605-2.1.7	18. Surface-metal raceways passing from one floor to another shall have mechanical protection to a height of 4 feet above the floor level.	NA	The MCO has no electrical subcomponents.	
1605-2.2	Conductors			
1605-2.2.1	General			
1605-2.2.1	19. Conductors for interior electrical systems shall be copper, except that aluminum conductors size No. 4 AWG and larger may be used.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	20. Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	21. No. 10 and No. 12 AWG conductors for power and lighting branch circuits shall be solid.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	22. No. 8 AWG conductors and larger shall be stranded.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	23. Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA	NA	The MCO has no electrical subcomponents.	

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	70.			
1605-2.2.1	24. Conductors for Class 2 low-energy remote-control and signal circuits shall be not smaller than No. 18 AWG.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	25. Power and lighting conductors shall be 600-volt, Type THW, XHHW, or THWN.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	26. Conductors required to be rated 90 degrees C in accordance with NFPA 70 shall be Type RHH, THW, or THHN.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	27. Conductors in high-temperature areas shall be NEC Type FEP or TFE as required.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	28. Direct-burial conductors shall be Type UF, UL 493.	NA	The MCO has no electrical subcomponents.	
1605-2.2.1	29. 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.	NA	The MCO has no electrical subcomponents.	
1605-2.2.3	Conductor Identification			
1605-2.2.3	31. Voltage levels, grounded conductors, equipment grounding conductors and ungrounded phase conductors shall be identified.	NA	The MCO has no electrical subcomponents.	
1605-2.2.2	32. 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:	NA	The MCO has no electrical subcomponents.	
1605-2.2.2	Color coding for 240/120-volt, single-phase systems <ul style="list-style-type: none"> - Grounded neutral white - Grounding conductor green or bare - Ungrounded conductor black - Ungrounded conductor red 	NA	The MCO has no electrical subcomponents.	
1605-2.2.2	Color coding for 208Y/120-volt, three-phase systems	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	<ul style="list-style-type: none"> - Grounded neutral white - Grounding conductor green or bare - Phase "A" (ungrounded) conductor black - Phase "B" (ungrounded) conductor red - Phase "C" (ungrounded) conductor blue 			
1605-2.2.2	Color coding for 480Y/277-volt, three-phase systems <ul style="list-style-type: none"> - Grounded neutral gray - Grounding conductor green or bare - Phase "A" (ungrounded) conductor brown - Phase "B" (ungrounded) conductor orange - Phase "C" (ungrounded) conductor yellow 	NA	The MCO has no electrical subcomponents.	
1605-2.3	Receptacles			
1630-2.3	33. Receptacle circuits shall be provided with ground-fault circuit-interrupters as directed by NFPA 70.	NA	The MCO has no electrical subcomponents.	
1630	Exterior Electrical Utility Service			
1630-1	General			
1630-1.3	Redundancy			
1630-1.3	34. Facilities designated by the cognizant DOE authority as critical shall be served by dedicated, redundant circuits.	NA	The MCO has no electrical subcomponents.	
1630-1.3	35. The two services shall be separated by a 4-hour fire-rated barrier and shall be served from separate sources.	NA	The MCO has no electrical subcomponents.	
1630-1.3	36. 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	The MCO has no electrical subcomponents.	
1630-2	Supply Equipment and Facilities			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1630-2.2	Power Supply Lines			
1630-2.2.1	General			
1630-2.2.1	37. 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.	NA	The MCO has no electrical subcomponents.	
1630-2.2.1	38. 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.	NA	The MCO has no electrical subcomponents.	
1630-2.2.1	39. Minimum rights-of-way shall extend 5 feet beyond outside conductors.	NA	The MCO has no electrical subcomponents.	
1630-2.3	Substations and Switching Stations			
1630-2.3.3	Grounding			
1630-2.3.3	40. Station grounding shall comply with Section 1639-2, Substations and Switching Station Grounding.	NA	The MCO has no electrical subcomponents.	
1630-2.3.5	Oil-Filled Equipment			
1630-2.3.5	41. Dikes and drainage provisions shall be built as required by the local SPCC in conformance with 40 CFR 112.	NA	The MCO has no electrical subcomponents.	
1630-2.3.5	42. 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.	NA	The MCO has no electrical subcomponents.	
1630-2.3.5	43. Electrical equipment cooling material shall be handled in accordance with 29 CFR 1910.1200.	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1630-3	Power Supply for Exterior Lighting			
1630-3.2	Emergency Power			
1630-3.2	44. Sites or facilities requiring continuous lighting for safety or security reasons shall have an emergency power source for such lighting.	NA	The MCO has no electrical subcomponents.	
1630-5	Lightning Protection			
1630-5	45. Lightning protection systems shall comply with NFPA 78.	NA	The MCO has no electrical subcomponents.	
1630-5	46. 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.	NA	The MCO has no electrical subcomponents.	
	47. 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.	NA	The MCO has no electrical subcomponents.	
1639	Grounding			
1639-1	General			
1639-1	48. 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.	NA	The MCO has no electrical subcomponents.	
1639-2	Substation and Switching Station Grounding			
1639-2	49. Substation and switching station grounding systems shall comply with IEEE 80. Grounding connections shall comply with IEEE 837.	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1639-4	Isolated Ground Systems			
1639-4	50. 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	The MCO has no electrical subcomponents.	
1640	Interior Electrical Systems			
1640-1	General			
1640-1.4	Power System Reliability			
1640-1.4	51. 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	The MCO has no electrical subcomponents.	
1640-1.5	Power Quality Requirements			
1640-1.5	52. 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.	NA	The MCO has no electrical subcomponents.	
1640-1.6	System Protection			
1640-1.6	53. System protection shall comply with IEEE 242. For specialized research and development facilities, protection of equipment and systems shall comply with DOE/EV 0051/1.	NA	The MCO has no electrical subcomponents.	
1640-1.7	Ground Fault Protection			
1640-1.7	54. Ground-fault protection shall comply with NFPA 70. See also Section 1605-2.3, Receptacles.	NA	The MCO has no electrical subcomponents.	
1640-1.8	Neutral Conductors			

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1640-1.8	55. 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.	NA	The MCO has no electrical subcomponents.	
1640-2	Service Equipment and Facilities			
1640-2.1	General			
1640-2.1	56. Interior electrical systems shall comply with NFPA 70. Switchgear criteria shall comply with IEEE C37 series.	NA	The MCO has no electrical subcomponents.	
1640-2.3	Transformers			
1640-2.3	57. Interior service transformer installations shall comply with NFPA 70.	NA	The MCO has no electrical subcomponents.	
1640-2.3	58. Transformer protection and appurtenances shall comply with IEEE C37.91.	NA	The MCO has no electrical subcomponents.	
1640-2.3	59. Transformer installation shall comply with FM 5-4/14-8.	NA	The MCO has no electrical subcomponents.	
1640-2.4	Motors			
1640-2.4	60. Motors shall comply with NEMA MG-1, except that hermetic refrigerant motor compressors shall comply with UL 984.	NA	The MCO has no electrical subcomponents.	
1640-2.5	Motor Control			
1640-2.5	61. Control equipment shall comply with the NEMA ICS standards and UL 508.	NA	The MCO has no electrical subcomponents.	
1640-2.5	62. 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	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria recommended.	Status	Requirements Document	Implementation
1640-2.5	63. 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.	NA	The MCO has no electrical subcomponents.	
1640-2.5	64. 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.	NA	The MCO has no electrical subcomponents.	
1640-3	Power Service for Security, Communications, and Alarm Systems			
1640-3.1	General			
1640-3.1	65. 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.	NA	The MCO has no electrical subcomponents.	
1640-3.2	Primary Power Supply			
1640-3.2	66. 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.	NA	The MCO has no electrical subcomponents.	
1640-3.3	Standby or Emergency Power Supplies			
1640-3.3	67. Standby or emergency power supplies for security, communications, and alarm systems shall be provided in	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1660	accordance with Section 1660, Special Systems.			
1660-1	Special Systems			
1660-1	General			
1660-1	68. 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	The MCO has no electrical subcomponents.	
1660-1	69. 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	The MCO has no electrical subcomponents.	
1660-1	70. 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.	NA	The MCO has no electrical subcomponents.	
1660-1	71. 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.	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1660-1	72. 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	The MCO has no electrical subcomponents.	
1660-1	73. Emergency or standby power shall service fire alarm, security alarm, and supervisory sensing devices designated essential by the cognizant DOE authority.	NA	The MCO has no electrical subcomponents.	
1660-1	74. Emergency power systems are further detailed in Section 1660-99, Special Facilities.	NA	The MCO has no electrical subcomponents.	
1660-2	Emergency Power Systems			
1660-2	75. Emergency power systems shall comply with NFPA 37, NFPA 70, NFPA 101, NFPA 110, and IEEE 446.	NA	The MCO has no electrical subcomponents.	
1660-2	76. 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).	NA	The MCO has no electrical subcomponents.	
1660-2	77. Such power sources shall have the necessary built-in features to facilitate operational testing on a periodic basis to verify their readiness.	NA	The MCO has no electrical subcomponents.	
1660-2	78. Application of diesel engines shall comply with FCC Technical Report No. 69.	NA	The MCO has no electrical subcomponents.	
1660-2	79. Batteries, when required, shall be rechargeable and shall be kept fully charged at all times when primary power is available.	NA	The MCO has no electrical subcomponents.	
1660-2	80. The charger shall automatically switch from float to fast charge rate at a preset drop in DC bus voltage.	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1660-2	81. The charger shall be furnished with a capacity to charge the battery from a fully discharged state to not less than 83 percent of the rated ampere-hour capacity within 24 to 72 hours. See also IEEE 308.	NA	The MCO has no electrical subcomponents.	
1660-2	82. 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.	NA	The MCO has no electrical subcomponents.	
1660-3	Uninterruptible Power Systems			
1660-3	83. Uninterruptible power supplies shall be provided for those loads requiring guaranteed continuous power.	NA	The MCO has no electrical subcomponents.	
1660-3	84. Applications of UPSs shall comply with IEEE 446, as modified by the cognizant DOE authority.	NA	The MCO has no electrical subcomponents.	
1660-99	Special Facilities			
1660-99.0	Nonreactor Nuclear Facilities - General			
1660-99.0.1	Safety Class (Emergency) Electrical Systems			
1660-99.0.1	85. 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).	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	86. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	87. Safety class electric systems shall be provided with suitable redundancy and separation to ensure that adequate capacity and capability are available with the	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	addition of a single failure.			
1660-99.0.1	88. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	89. The connection of loads that do not require safety class power to safety class buses shall be minimized.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	90. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	91. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	92. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.1	93. The capability to periodically test safety class electric systems to verify system performance shall be provided.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	Protection System and Instrumentation and Controls			
1660-99.0.2	94. The protection system shall provide automatic initiation of protective actions that require rapid response and automatic control of interlocks that prevent unsafe	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	operator actions.			
1660-99.0.2	56. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	57. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	58. Automatically initiated protective actions shall be provided with a manually initiated backup.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	59. 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).	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	60. Safety class instrumentation shall sense abnormal conditions affecting safety and subsequently provide an alarm, e.g., low differential pressure between HVAC zones, criticality monitoring.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	61. 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.	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1660-99.0.2	62. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	63. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.2	64. 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).	NA	The MCO has no electrical subcomponents.	
1660-99.0.3	Qualifications			
1660-99.0.3	65. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.4	Separation and Physical Protection			
1660-99.0.4	66. 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.	NA	The MCO has no electrical subcomponents.	
1660-99.0.4	67. 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	NA	The MCO has no electrical subcomponents.	

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
	perform their necessary safety functions.			
1660-99.0.5	Test and Calibration			
1660-99.0.5	68. 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.	NA		The MCO has no electrical subcomponents.
1660-99.0.5	69. The design shall allow periodic testing of protective functions to determine whether failure or loss of redundancy may have occurred.	NA		The MCO has no electrical subcomponents.
1660-99.0.6	Power Sources			
1660-99.0.6	95. An analysis shall be made to determine power requirements for safe shutdown of the process.	NA		The MCO has no electrical subcomponents.
1660-99.0.6	96. 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.	NA		The MCO has no electrical subcomponents.
1660-99.0.7	Control Areas			
1660-99.0.7	157. 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.	NA		The MCO has no electrical subcomponents.
1660-99.0.7	158. 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.	NA		The MCO has no electrical subcomponents.

Applicable Section	Item Number/Criteria	Status	Requirements Document	Implementation
1670	Exterior Communications and Alarm Systems			
1670-2	Fire Alarm and Supervisory Systems			
1670-2	101. 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.	NA	The MCO has no electrical subcomponents.	
1670-2	102. 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	The MCO has no electrical subcomponents.	
1670-2	103. Exterior fire alarm pull boxes and emergency-reporting telephones shall be installed in weatherproof housings manufactured specifically for the mechanism.	NA	The MCO has no electrical subcomponents.	

HNF-3570, Rev. 0
Table 2. Assessment of MCO Compliance with SNF Project NRC Equivalency Criteria

Item No.	HNF-SD-SNF-DB-005, Rev. 3 - Additional NRC Requirements	Related DOE/PHMC References	Assessment of Compliance for MCO
1	<p>Ensure the containment/confinement integrity of the Multi-Canister Overpack (MCO) and its subcriticality geometry are preserved when the design basis earthquakes for the Canister Storage Building (CSB) and CVD facility-as outlined in WHC-SD-SNF-DB-004, are imposed on these facilities.</p> <p>Note: refer to WHC document WHC-SD-SNF-DB-004, titled <i>Spent Nuclear Fuel Project Seismic Design Criteria, Nuclear Regulatory Commission Equivalency Evaluation Report</i>, for details on seismic.</p> <p>(References: Title 10, <i>Code of Federal Regulations</i>, Sections 72.24, "Contents of application: Technical information," 72.90, "General considerations," 72.92, "Design basis external natural events," 72.102, "Geological and seismological characteristics," 72.122, "Overall requirements," and 72.212, "Conditions of general license issued;" Regulatory Guides 1.60, <i>Design Response Spectra for Seismic Design of Nuclear Power Plants</i>, Revision 1, 1.61, <i>Damping Values for Seismic Design of Nuclear Power Plants</i>, Revision 0, and 3.48, <i>Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation (Dry Storage)</i>, Revision 1; and SECY-93-087, <i>Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Designs</i>)</p>	<p>DOE 5480.28 and Companion stds. DOE 6430.1A HNF-PRO-097</p>	<p>This requirement is satisfied by the CSB and CVDF facility designs. Details regarding the natural phenomena loads and applicable DOE, NRC, and national consensus standards applied to the facility designs are documented in the facility SARs.</p> <p>CVDF design for natural phenomena, consistent with the NRC equivalency criteria, is documented in the CVDF Phase 2 SAR (HNF-SD-SNF-SAR-002, Rev. 4) Chapters 1 and 2 and supporting references (e.g. WHC-SD-SNF-DB-010, Rev. 1, <i>Cold Vacuum Drying System Natural Phenomena Hazards</i>, 1996). The CVDF Phase 2 SAR, Table 1-17, summarizes natural phenomena loads and applicable DOE, NRC, and national consensus standards applied to CVDF for seismic, straight wind, tornado, volcanic ash, flooding, lightning, and snow. The CVDF requirements for natural phenomena are implemented in the design by the design requirements document (HNF-SD-SNF-DRD-002, Rev. 3) and the controlling lower tier design and procurement documentation.</p> <p>CSB design for natural phenomena, consistent with the NRC equivalency criteria, is documented in the CSB Phase 3 SAR (HNF-SD-SNF-RPT-004, Rev. 5) Chapters 1 and 2 and supporting references (e.g. WHC-SD-SNF-DB-009, Rev. 4, <i>Canister Storage Building Natural Phenomena Hazards</i>, 1996). The CSB Phase 3 SAR, Table 1-23, summarizes natural phenomena loads and applicable DOE, NRC, and national consensus standards applied to CSB for seismic, straight wind, tornado, volcanic ash, flooding, lightning, and snow. The CSB requirements for natural phenomena are implemented in the design by the CSB Performance Specification (WHC-S-0425, Rev. 2, 1996) and the controlling lower tier design and procurement documentation.</p>
2	<p>Ensure the containment/confinement integrity of the MCO and its subcriticality geometry are preserved when a design basis tornado (including translational velocity, rotational velocity and pressure differential) and tornado missile are imposed on the designs of the CSB and CVD facility taking into consideration Regulatory Guide 1.76, <i>Design Basis Tornado for Nuclear Power Plants</i>, SECY-93-087,</p>	<p>DOE 5480.28 and companion stds. DOE 6430.1A HNF-PRO-097</p>	<p>This requirement is satisfied by the CSB and CVDF facility designs. Details regarding the natural phenomena loads and applicable DOE, NRC, and national consensus standards applied to the facility designs are documented in the facility SARs. See section above for SAR references. Also see item #10 this column.</p>

2	Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs, and NUREG/CR-4461, <i>Tornado Climatology of the Contiguous United States</i> (potential revisions to SRP 3.5.1.4, Revision 2, <i>Missiles Generated by Natural Phenomena</i>). (Refer to WHC document WHC-SD-SNF-DB-002, <i>Spent Nuclear Fuel Project Path Forward Nuclear Safety Equivalency to Comparable NRC-Licensed Facilities</i> , Table 5.c, 72.24 and 72.122, for related information.) (Reference: 10 CFR 72.122, "Overall requirements")			
3	Ensure the design of the MCO supports the ability for ready retrieval. (Reference: 10 CFR 72.122, "Overall requirements")	DOE 6430.1A	Section 4.11 and 4.13 of the MCO Performance Specification (HNF-S-0426, Rev. 4) address requirements for lifting and handling the MCO to permit safe retrieval of the MCO from the CSB storage tubes. The MCO closure design accommodates ready access to the SNF by removal of the cover cap and disassembly of the mechanical closure. It is also the goal of the project to assure the MCO is recoverable from the CSB storage tubes and other areas after design basis accident (DBA) drops involving MCOs. Many drop analyses have been performed to assure the retrievability of the MCO will be possible.	
4	Use Regulatory Guide 1.26 to assist in assigning the appropriate ASME Section III code classes to the MCO shell, parts and subassemblies, as applicable. (Note: NUREG/CR-3854, <i>Fabrication Criteria for Shipping Containers</i> , has direct application to the MCO and may be used in lieu of Regulatory Guide 1.26.) (Regulatory Guide 1.26, <i>Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants</i> , Revision 3)	DOE 6430.1A	After review of both Regulatory Guide 1.26 and NUREG/CR-3854, the MCO design authority choose to apply NUREG/CR-3854 for assigning an ASME code class as it more directly applied to the MCO. The MCO Performance Specification (HNF-S-0426, Rev. 4) Section 4.9.1 invokes application of Section III, Subsection NB of the ASME Code as guided by NUREG/CR-3854.	
5	Review the NRC positions in Regulatory Guides 1.84 and 1.85 on ASME Section III code cases before using such code cases for safety class applications for the MCO. The NRC positions on applicable code cases should be used in the design. Where no NRC position is stated in regards to the acceptance of a code case, that code case may be used as approved by the code Committee. (References: Regulatory Guides 1.84 and 1.85 [both Revision 30], <i>Design and Fabrication Code Case Acceptability ASME Section III, Division I and Materials Code Case Acceptability ASME Section III</i> ,	DOE 6430.1A	ASME Code Case N-284 is applied to the MCO shell as outlined in Section 13.2 of Appendix 5 of the MCO Design Report (HNF-SD-SNF-DR-003, Rev. 1). This Code Case is acceptable for use per Regulatory Guide 1.84. Code Case N-595, currently pending approval by ASME, will be referenced in the next revision to the MCO Design Report. Additional Code Cases may be obtained from ASME as required.	

5	<i>Division 1, respectively)</i>		
6	<p>Incorporate a requirement into safety class procurement specifications for the MCO that requires suppliers to report defects and noncompliances in items or services. The requirement should be similar to the following:</p> <p>Safety-class equipment and/or services furnished under this order are subject to reporting of defects. If equipment and/or services contain defects that could cause a substantial safety hazard, then immediate reporting to the Buyer is required unless the Seller has actual knowledge that the Buyer has been adequately informed of such defect.</p> <p>The Seller shall evaluate identified or suspected defects. If the Seller's evaluation determines a defect does exist that could cause a substantial safety hazard, then the Seller shall notify the Buyer as soon as practicable and, in all cases, within 5 working days following completion of the evaluation.</p> <p>If the Seller determines that it does not have the capability to perform the evaluation, the Seller may request the Buyer to cause an evaluation to be performed. Seller's request shall be effected within 5 working days of this determination. If the Seller elects to have the Buyer perform the evaluation, then all necessary and pertinent information and correspondence shall be sent to the Buyer. Results of evaluations by the Buyer will be transmitted to the Seller.</p> <p>The requirements for reporting of defects as described above are in effect beginning with contract award and remain in force throughout the projected forty (40) year life of the safety class equipment furnished under this contract.</p>	HNF-PRO-298	<p>The Production MCO fabrication contract will contain the following words (currently used for the contract on the first 3 MCOs, Reference contract #MGW-SLX-A31483, clause B22X):</p> <p>"Safety class equipment and/or services furnished under this order and subject to reporting of defects. If equipment and/or services contain defects which could cause a substantial safety hazard, then immediate reporting to the Buyer is required, unless the Seller has actual knowledge that the Buyer has been adequately informed of such defect. The Seller shall evaluate identified or suspected defects. If the Seller's evaluation determines a defect does exist which could cause a substantial safety hazard, then the Seller shall notify the Buyer as soon as practicable, and in all cases, within five (5) working days following completion of the evaluation.</p> <p>If the Seller determines that it does not have the capability to perform the evaluation, the Seller may request the Buyer to cause an evaluation to be performed. Seller's request shall be effected within five (5) working days of this determination. If the Seller elects to have the Buyer perform the evaluation, then all necessary and pertinent information and correspondence shall be sent to the Buyer. Results of evaluations by the Buyer will be transmitted to the Seller.</p> <p>The requirements for reporting of defects as described above are in effect beginning with contract award and remain in force throughout the projected forty (40) year life of the safety class equipment furnished under this contract.</p>
7	<p>Before implementation, the DOE-Richland Operations Office will review and approve any changes to WHC-SP-1131, <i>Quality Assurance (QA) Program and Implementation Plan</i>, for the SNF Project that could be interpreted as decreasing the Quality Assurance Program's existing commitments for the SNF Project. (Note: HNF-SP-1228, <i>Quality Assurance Program Implementation Plan for Nuclear Facilities</i>, is in the process of being revised for subsequent approval by</p>	10 CFR 830.12	<p>The MCO Topical Report (HNF-SD-SNF-DR-005, Rev. 1, Chapter 13) documents the QA requirements for the MCO subproject, including reference to the SNF Quality Assurance Program Plan (SNFP-1, Rev. 1) and Quality Assurance Program Implementation Plan for Nuclear Facilities (HNF-SP-1228, Rev. 1) which implement the requirements of 10CFR830.120 for the SNF Project. These plans require DOE approval prior to any changes, similar to the NRC Rule 10CFR50.54(a).</p>

7	DOE-RL Nuclear facility lists and descriptions from WHC-SP-1131 are being relocated to ES&H nuclear safety documents. WHC-SP-1311 remains in effect until DOE-RL approval is secured for HN-SP-1228 and facility lists and descriptions are relocated to ES&H nuclear safety documents.) (References: 10 CFR 50.54(a), "Conditions of licenses [Quality Assurance Provisions]")			
8	Ensure for MCO fabrication that the areas of vendor and subcontractor quality assurance records and control of safety class-I purchased material, equipment, and services receive emphasis during SNF Project audits, surveillances, and assessments. (Reference: IEN 95-29)	PHMC Procurement Clauses as appropriate		Control of vendor and subcontractor quality assurance records and control of safety class purchased SSC are verified via scheduled and unscheduled surveillances performed to verify vendor/subcontractor compliance with established contractual quality assurance requirements as well as their SNFP-approved Quality Assurance program. Additional SNFP QA surveillances are scheduled to verify the fabricator's compliance with contract quality assurance program requirements and their SNFP-approved Quality Assurance program as fabrication of MCOs proceeds toward completion and delivery. Surveillances performed to date during fabrication of the first 30 baskets and three training and testing MCOs are available for review.
9	Implement the WHC Occurrence Reporting System for the design and fabrication of the MCO. (Reference: 10 CFR 50.55(e), "Conditions of construction permits")	DOE 5000.3B HN-PRO-060		Section 9.2.6 of the MCO Fabrication Specification (HN-SP-0453, Rev. 2) requires reporting of all nonconformances in materials, approved procedures, design drawings, and purchase documents. Application of the PHMC Occurrence Reporting System is an in-house action that SNFP would take should design or fabrication flaws be reported or discovered. Reporting of SNF Project "occurrences" during the design and construction phase is implemented by Administrative Procedure AP 2-15.
10	Use a criticality safety value of 0.95 for k_{eff} for the MCO design, functions and related activities. (References: SRP 9.1.2, <i>Spent Fuel Storage</i> , Revision 3, and NUREG-0612, <i>Control of Heavy Loads at Nuclear Power Plants</i> , <i>Resolution of Generic Technical Activity A-36</i>)	DOE 5480.24 HN-PRO-334 HN-PRO-537 HN-PRO-540 HN-PRO-544 HN-PRO-545		Criticality Safety Evaluation Report for Spent Fuel Processing and Storage Facilities, HN-SD-SNF-CSER-005, documents analyses of the MCO criticality safety which demonstrate the k_{eff} will not exceed 0.95. This information is also documented in Chapter 6 of the MCO Topical Report (HN-SD-SNF-SARR-005). The criticality control measures necessary to ensure a k_{eff} of less than 0.95 relative to the MCO design are documented in Section 4.19.3 of the MCO Performance Specification, HN-SP-0426, Rev. 4.
11	Identify SSCs "important to safety" in accordance with 10 CFR 72.3 identifies as "important to safety" those SSCs whose function is: To maintain the conditions required to store spent fuel or high level	DOE 6430.1A HN-PRO-516		The MCO Topical Report, Chapter 3, Table 3-9 contains the NRC equivalency "important-to-safety" classifications for major MCO SSCs per the definitions proposed in the HN-SD-SNF-DB-005, Rev. 3, submitted for

11	<p>waste safety</p> <p>To prevent damage to the spent fuel of the high-level radioactive waste container during handling and storage, or</p> <p>To provide reasonable assurance that spent fuel or high-level radioactive waste can be received, handled, packaged stored, and retrieved without undue risk to the health and safety of the public.</p> <p>Important to safety "is implemented using the category definitions below:</p> <p>Category A – Critical Safe Operation</p> <p>SSCs in this category include those whose failure or malfunction could directly affect result in a condition adverse to public health and safety</p> <p>Category B – Major Impact on Safety</p> <p>SSCs in this category include those whose failure or malfunction could indirectly result in a condition adversely affecting public health and safety. The failure of a Category B item, in conjunction with the failure of an additional item, could result in an unsafe condition. Note: from the definition of Category C, Category B is understood to include events that could significantly damage the MCO without severe impact to public health and safety.</p> <p>Category C – Minor Impact on Safety</p> <p>SSCs whose failure or malfunction would not significantly reduce the MCO effectiveness and would not be likely to create a situation adversely affecting public health and safety. For Category A "important to safety" items, the DOE QA program for Safety Class items is equivalent and will be implemented. For Category B "important to safety" items, the DOE QA program for Safety Significant items is equivalent and will be implemented. For Category C "important to safety" items, the DOE QA program for General Service items is equivalent and will be implemented.</p> <p>(Reference: 10 CFR 72.3, "Definitions," 10 CFR 72.106, "Controlled area of an ISFSI or MRS," 10 CFR 72.122, "Overall requirements," and 10 CFR 72.140(b), "Quality assurance requirements,"</p> <p>NUREG/CR-6407, <i>Classification of Transportation Packaging and</i></p>	<p>DOE approval July 1998.</p> <p>The Quality Assurance Program requirements applicable for MCO fabrication are documented in the MCO Fabrication Specification, HNF-S-0453, Rev. 2, including specific requirements relative to procurement of SC, SS, and GS materials.</p>
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11	Dry Spent Fuel Storage Systems)		
12	<p>Incorporate the requirements of Regulatory Guide 8.8 into the design of the MCO. Example considerations include: the process and configuration associated with welding the MCO cover cap-in place, inservice inspection and maintenance, among other MCO-related activities that could impact ALARA.</p> <p>(Reference: Regulatory Guide 8.8, <i>Information Relative to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Reasonably Achievable</i>, Revision 3)</p>	<p>10 CFR 835 DOE 5480.11 DOE 6430.1A Hanford Site Radiological Control Manual HSRCM-1</p>	<p>Compliance with Regulatory Guide 8.8 is required in Section 4.13 of the MCO Performance Specification, HN-3570. The MCO Design Report (HN-SD-SNP-DR-003, Rev. 1, Section 3.13) discusses the application of ALARA principles in the MCO design.</p> <p>As stated in the far left column, this regulatory guide is for a nuclear power station.</p> <p>Many of the items in the guide are not applicable to the MCO as the MCO is a single hardware component. However some of the sections' philosophy is appropriate for application to the MCO. A review of the guide indicated the following sections are appropriate in varying degrees to the MCO:</p> <p>Section Title</p> <p>C.1.d. Review of new or modified design and equipment sections</p> <p>C.2. Facility and equipment design features</p> <p>C.2.b. Radiation shields and geometry</p> <p>C.2.d. Control of airborne contaminants and gaseous radiation sources</p> <p>The above sections were used, as appropriate, in the design process of the MCO.</p> <p>The remaining areas of the regulatory guide discuss other general ALARA principles and good practice which were also used in the course of the design, but are not directly applicable as the MCO is a single component and not a nuclear power station system. The design of the MCO collar includes a tapered section on the outside near the bottom of the shield plug assembly to prevent and minimize line-of-sight scattered, direct, or fluoresced radiation from coming out of the annulus created outside of the MCO. The cask design uses this step taper to create an labyrinth to minimize the dose rates emitted from the created annulus to achieve ALARA.</p> <p>The interior of the MCO includes a bank of high efficiency particulate air (HEPA) filters for exiting process gases to minimize the radiological contamination risk to personnel around the MCO during the making and breaking of process connections on the top of the shield plug and during process operations in the facilities and using associated systems. This process bank of filters will retain as much of the process gas swept contamination inside the MCO as possible and keep it behind the shield plug main body to reduce operator dose potential. Parts that are not HEPA filtered have screens which retain particles greater than 2 mm in diameter inside the MCOs. These</p>

		<p>filtering and screening features further demonstrate support of ALARA.</p> <p>The design of the MCO shield plug reflects numerous features selected to achieve ALARA. The thickness of the stainless steel plug was maximized as much as possible to minimize the dose at the top of the shield plug. Examples of compliance with Reg. Guide 8.8 include passageways through the shield plug with 90 degree angles to prevent streaming per Section 2.b.4. and per Section 2.b.3., shield plug appurtenances were designed to be actuated via both remote-operated and long handled tooling to reduce dose by means of distance.</p> <p>The selection of the mechanical closure was based, in part, on study results which included detailed dose/manhour estimates for the specific operation steps involved in closing the MCO and cask.</p> <p>The MCO project also has produced other shielding studies, dose maps, and reports to support the systems, facilities, and operations that will use and interface with the MCO and hardware. This information is published in design reports, in engineering studies, and in shielding studies. The pertinent MCO specifications, reports and document numbers are listed below. Much of the initial and preliminary work conducted to determine direction is not included in these references.</p> <p>HNF-S-0426, "MCO performance specification"</p> <p>HNF-SD-SNF-CN-026, "MCO Shield Plug Dose Analysis"</p> <p>HNF-SD-SNF-DR-003, "MCO Design Report"</p> <p>HNF-SD-SNF-ES-021, "Multi-Canister Overpack Closure Study"</p> <p>These preceding paragraphs document the MCO's compliance with the applicable requirements of 10 CFR 835. The facility, administrative procedure, and administrative control areas' compliance with applicable portions of 10 CFR 835 has to be, by its nature, performed by others outside of the MCO sub-project.</p> <p>The MCO shield plug, combined with the cask or other shielding barrier (MHM or CSB MCO work station), provide the necessary shielding which will result in annual dose-equivalent exposures meeting the radiological exposure criteria. Development of estimated annual dose-equivalent exposures is facility dependent and is being performed by the CVDF and CSB subprojects. Results of these dose estimates, demonstrating compliance with exposure criteria, will be documented in the CVDF and CSB facility FSARs. Also, please see the text immediately above of item 12 for further discussion.</p>	
13	<p>Include the following radiological exposure criteria considerations for the design and safety analyses of the MCO and its interfaces with the CSB and CVD facility, since the MCO provides a containment/confinement function for the K Basins spent nuclear fuel.</p> <p>Ensure the Section 20.1301 hourly dose limit of 0.002 rem to the public for any unrestricted area from external sources during normal operations and anticipated occurrences is met.</p>	<p>10 CFR 835</p> <p>DOE 5400.5</p> <p>DOE 5480.11</p> <p>DOE 5480.23</p> <p>DOE 6430.1A</p> <p>DOE-STD-3009-94</p> <p>HSRCM-1</p>	

13	<p>Ensure during normal operations and anticipated occurrences for any real individual of the public that the following Section 72.104 annual dose equivalent criteria are met: 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ.</p> <p>(References: 10 CFR 20, "Standards for Protection Against Radiation," and 10 CFR 72.104, "Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS," and 10 CFR 72.126, "Criteria for radiological protection")</p>	HNF-PRO-516	Completion of this represents an open item at this time and will be documented in the SARs for the SNF removal campaigns.

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