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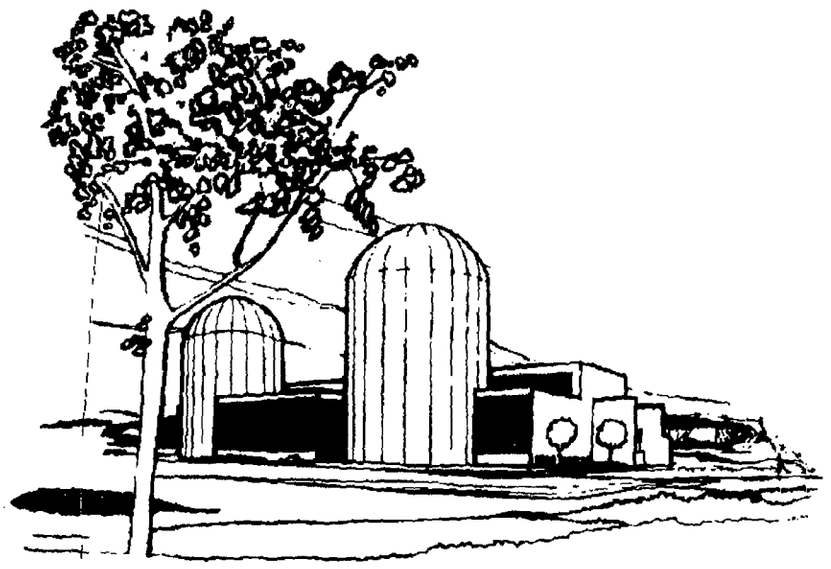
PRAIRIE ISLAND
INDEPENDENT SPENT FUEL
STORAGE INSTALLATION



Technical Specifications
LCO / SR

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Form 17-4435

Docket Number: 72-10
License Number: SNM-2506

NORTHERN STATES POWER COMPANY, A MINNESOTA CORPORATION (NSPM)
DOCKET NO. 72-10
PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION
AMENDMENT TO MATERIALS LICENSE NO. SNM-2506

Amendment 7
License SNM-2506

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The amendment application dated March 28, 2008, as supplemented by letter on June 26 and August 29, 2008; June 26 and September 28, 2009; and January 18, May 4, and July 27, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

   B. The Prairie Island Independent Spent Fuel Storage Installation will continue to operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance that (i) the activities authorized by this amendment can be conducted without endangering public health and safety, and (ii) such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to public health and safety; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by the enclosed changes to Materials License No. SNM-2506, indicated by margin notations.

3. This license amendment is effective as of the date of its issuance.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Eric J. Benner, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Enclosure: Amended License

Date of Issuance: 8/20/10

LICENSE FOR INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter 1, Part 72, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, and possess the power reactor spent fuel and other radioactive materials associated with spent fuel storage designated below; to use such material for the purpose(s) and at the place(s) designated below; and to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified herein.

Licensee		
1. Northern States Power Company, a Minnesota corporation (NSPM) [1]	3. License No.	SNM-2506
	Amendment No.	7
2. 414 Nicollet Mall Minneapolis, Minnesota, 55401-1927	4. Expiration Date	October 31, 2013
	5. Docket or Reference No.	72-10

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical or Physical Form	8. Maximum Amount That Licensee May Possess at Any One Time Under This License
A. Spent fuel assemblies from Prairie Island Nuclear Station Units 1 and 2 reactors, using natural water for cooling and enriched not greater than 3.85 (TN-40) and not greater than 5.00 (TN-40HT) percent U-235, and associated radioactive materials related to receipt, storage and transfer of the fuel assemblies	A. As UO_2 clad with zirconium or zirconium alloys	A. 715.29 TeU of spent fuel assemblies
B. Irradiated fuel assembly inserts from the Prairie Island Nuclear Station Units 1 and 2 reactor. An insert may be a burnable poison rod assembly (BPRA) or a thimble plug device (TPD).	B SS 304 structure, Inconel 718 spring, and borated pyrex glass.	B. One BPRA or TPD per spent fuel assembly.

[1] Northern States Power Company was incorporated in Minnesota as a wholly owned subsidiary of Xcel Energy Inc., effective August 18, 2000. This license, as amended, was amended to reflect the Commission's consent per 10 CFR Part 72, Section 72.50, to the license transfer approved by order dated May 12, 2000.

9. Authorized Use: For use in accordance with statements, representations, and the conditions of the Technical Specifications and Safety Analysis Report dated August 31, 1990, and supplements dated October 29, 1990; April 2, June 5, October 9 and 31, November 15, December 11, 20, and 23, 1991; January 17, February 6, 10, and 12, March 2 and 5, April 3, 22, and 23, July 10, August 12, 13, and 14, 1992; October 2, 1995; August 31, October 29 and November 24, 1999; and February 2, March 14, October 16, 2000; and February 12, 2001; March 28, June 26, and August 29, 2008; June 26, and September 28, 2009; January 18, May 4, and July 27, 2010.

   The material identified in 6 and 7 above is authorized for receipt, possession, storage, and transfer.

10. Authorized Place of Use: The licensed material is to be received, possessed, transferred, and stored at the Prairie Island ISFSI located on the Prairie Island Nuclear Generating Plant site in Goodhue County, Minnesota.

11. This site is described in Chapter 2 of the Technical Specifications and Safety Analysis Report (TS/SAR) for the Prairie Island ISFSI.

12. The Technical Specifications contained in Appendix A attached hereto are incorporated into the license. NSPM shall operate the installation in accordance with the Technical Specifications in Appendix A.

13. NSPM shall fully implement and maintain in effect all provisions of the ISFSI physical security, guard training and qualification, and safeguards contingency plans previously approved by the Commission and all amendments made pursuant to the authority of 10 CFR 72.56, 72.44(e), and 72.186. The plans, which contain safeguards information protected under 10 CFR 73.21, are entitled: "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Physical Security Plan," Revision 0, submitted by letter dated March 10, 1992; "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Security Force Training and Qualification Plan," Revision 0, submitted by letter dated March 10, 1992; and "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Safeguards Contingency Plan," Revision 0, submitted by letter dated March 10, 1992.

14. The Technical Specifications for Environmental Protection contained in Appendix A attached hereto are incorporated into the license.

   Specifications required pursuant to 10 CFR 72.44(d), stating limits on the release of radioactive materials for compliance with limits of 10 CFR Part 20 and "as low as is reasonably achievable objective" for effluents are not applicable. Spent fuel storage cask external surface contamination within the limits of Technical Specification 3.2.1 ensures that the offsite dose will be inconsequential. In addition, there are no normal or off-normal releases or effluents expected from the double-sealed storage casks of the ISFSI.

   Specifications required pursuant to 10 CFR 72.44(d)(1), for operating procedures, for control of effluents, and for the maintenance and use of equipment in radioactive waste treatment systems, to meet the requirements of 10 CFR 72.104 are not applicable. There are, by the design of the sealed storage casks at the ISFSI, no effluent releases. Also, cask loading and unloading operations and waste treatment will occur at the Prairie Island Nuclear Generating Plant, under the specifications of its operating licenses.

15. No spent nuclear fuel shall be allowed to be loaded until such time as the following preoperational license conditions are satisfied:

   A A training exercise (Dry Run) of all spent fuel storage cask loading and handling activities shall be held, which shall include, but not be limited to, those listed, and which need not be

performed in the order listed:

a. Moving cask in and out of spent fuel pool area

b. Loading fuel assembly (using dummy assembly)

c. Cask drying, sealing, and cover gas backfilling operations

d. Moving cask to, and placing it on, the storage pad

e. Returning the cask to the auxiliary building

f. Unloading the cask

g. Decontaminating the cask

h. All dry-run activities shall be done using written procedures

i. The activities listed above shall be performed or modified and performed to show that each activity can be successfully executed before actual fuel loading.

B The Prairie Island Nuclear Generating Plant Emergency Plan shall be reviewed and modified, as required, to include the ISFSI.

C A training module shall be developed for the Prairie Island Nuclear Generating Plant Training Program, establishing an ISFSI Training and Certification Program that will include the following:

a. Cask Design (overview)

b. ISFSI Facility Design (overview)

c. ISFSI Safety Analysis (overview)

d. Fuel loading and cask handling procedures and off-normal procedures

e. ISFSI License (overview).

D The Prairie Island Nuclear Generating Plant Radiation Protection Procedures shall be reviewed and modified, as required, to include the ISFSI.

E The Prairie Island Nuclear Generating Plant Administrative Procedures shall be reviewed and modified, as required, to include the ISFSI.

F A procedure shall be developed and implemented for the documentation of the characterizations performed to select spent fuel to be stored in the casks. Such procedure shall include independent verification of fuel assembly selection by an individual other than the original individual making the selection.

G A procedure shall be developed and implemented for two independent determinations (two samples analyzed by different individuals) of the boron concentration in the water used to fill the cask cavity for fuel loading and unloading activities.

H Written procedures shall be implemented to describe actions to be taken during operation, off-normal, and emergency conditions.

16. The design, construction, and operation of the ISFSI shall be accomplished in accordance with the U.S. Nuclear Regulatory Commission Regulations specified in Title 10 of the U.S. Code of Federal Regulations. All commitments to the applicable NRC regulatory guides and to engineering and construction codes shall be carried out.

17. Fuel and cask movement and handling activities that are to be performed in the Prairie Island Nuclear Generating Plant Auxiliary Building will be governed by the requirements of the Prairie Island Nuclear Generating Plant Facility Operating Licenses (DRP-42 and -60) and associated Technical Specifications.

18. The TN-40HT confinement boundary base material and associated welds shall be helium leak tested at the fabricator in accordance with ANSI N 14.5 to "leaktight" criteria. The TN-40 confinement boundary base material and associated welds shall be helium leak tested at the fabricator in accordance with ANSI N14.5 to "leaktight" criteria, if fabricated after the date of Amendment 7 approval.

19. This license is effective as of the date of issuance shown below.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Eric J. Benner, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards
Washington, DC 20555

Date of Issuance: October 19, 1993

As amended by
Amendment 7 dated 8/20/10

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
RECORD OF REVISIONS
TECHNICAL SPECIFICATION CHANGES AND LICENSE AMENDMENTS

NSP Revision (REV) No.	Date of Issue	License Amendment No.	Remarks
ORIGINAL	10/19/93	-	License Issued
1	3/17/94	1	Correction to Page 1 of License
2	2/1/96	2	Change to p. 6-1
3	8/7/00	3	Change to p. 6-1
4	8/18/00	4	License reissue only
5	2/12/01	5	Change to Sec. 3/4
5*	5/1/08	Correction to Amendment 5	Correction to page 1 of License, per NRC letter dated February 7, 2008
6	9/22/08	6	Transfer of operating authority
7	8/20/10	7	Reformatted and Inclusion of TN-40HT design

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
TECHNICAL SPECIFICATIONS CURRENT PAGE LIST

LICENSE SNM-2506

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NRC Findings & issuance (2nd page)	7
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4	7

Appendix A – Record of Revision

PAGE	Date
RoR-1	8/20/10

Page List

PAGE	Date
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B	8/20/10

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1.0 USE AND APPLICATION

1.1 Definitions

----------NOTE----------
The defined terms of this section appear in capitalized type and are applicable throughout these Technical Specifications and Bases.

Term	Definition
ACTIONS	ACTIONS shall be that part of a Specification that prescribes Required Actions to be taken under designated Conditions within specified Completion Times.
CHANNEL OPERATIONAL TEST (COT)	A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor output as practicable to verify the operability of required alarm functions. The COT shall include adjustments, as necessary, of the required alarm setpoint so that the setpoint is within the required range and accuracy.
DAMAGED FUEL ASSEMBLY	In TN-40 casks, a DAMAGED FUEL ASSEMBLY is a spent nuclear fuel assembly that: a. is a partial fuel assembly, that is, a fuel assembly from which fuel pins are missing unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins; or b. has known or suspected to have structural defects or gross cladding failures (other than pinhole leaks) sufficiently severe to adversely affect fuel handling and transfer capability. In TN-40HT casks, a DAMAGED FUEL ASSEMBLY is a spent nuclear fuel assembly that: a. has visible deformation of the rods in the spent nuclear fuel assembly. Note: This is not referring to the uniform bowing that occurs in the reactor. This refers to bowing that significantly opens up the lattice spacing;

1.1 Definitions (continued)

DAMAGED FUEL ASSEMBLY (continued)	b. has individual fuel rods missing from the assembly. Note: The assembly is not a DAMAGED FUEL ASSEMBLY if a dummy rod that displaces a volume equal to, or greater than, the original fuel rod, is placed in the empty rod location; c. has missing, displaced, or damaged structural components such that radiological and/or criticality safety is adversely affected (e.g., significantly changed rod pitch); d. has missing, displaced, or damaged structural components such that the assembly cannot be handled by normal means (i.e., crane and grapple); e. has reactor operating records (or other records) indicating that the spent nuclear fuel assembly contains cladding breaches; or f. is no longer in the form of an intact fuel bundle (e.g., consists of, or contains, debris such as loose fuel pellets or rod segments).
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on a cask while it is being loaded with fuel assemblies. LOADING OPERATIONS begin when the first fuel assembly is placed in the cask and end when the cask is supported by the transporter.
STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the Independent Spent Fuel Storage Installation (ISFSI) while a cask containing one or more spent fuel assemblies is sitting on a storage pad within the ISFSI.
TRANSPORT OPERATIONS	TRANSPORT OPERATIONS include all licensed activities performed on a cask loaded with one or more spent fuel assemblies when it is being moved to or from the ISFSI. TRANSPORT OPERATIONS begin when the cask is first suspended from the transporter and end when the cask is at its destination and no longer supported by the transporter.

1.1 Definitions (continued)

UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on a cask while fuel assemblies are being unloaded. UNLOADING OPERATIONS begin when the cask is no longer supported by the transporter and end when the last fuel assembly is removed from the cask.

1.0 USE AND APPLICATION

1.2 Logical Connectors

PURPOSE

The purpose of this section is to explain the meaning of logical connectors.

Logical connectors are used in Technical Specifications (TS) to discriminate between, and yet connect, discrete Conditions, Required Actions, Completion Times, Surveillances, and Frequencies. The only logical connectors that appear in TS are AND and OR. The physical arrangement of these connectors constitutes logical conventions with specific meanings.

BACKGROUND

Several levels of logic may be used to state Required Actions. These levels are identified by the placement (or nesting) of the logical connectors and by the number assigned to each Required Action. The first level of logic is identified by the first digit of the number assigned to a Required Action and the placement of the logical connector in the first level of nesting (i.e., left justified with the number of the Required Action). The successive levels of logic are identified by additional digits of the Required Action number and by successive indentations of the logical connectors.

When logical connectors are used to state a Condition, Completion Time, Surveillance, or Frequency, only the first level of logic is used, and the logical connector is left justified with the statement of the Condition, Completion Time, Surveillance, or Frequency.

1.2 Logical Connectors (continued)

EXAMPLES The following examples illustrate the use of logical connectors.

EXAMPLE 1.2-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Verify . . . AND A.2 Restore . . .	... —

In this example the logical connector AND is used to indicate that when in Condition A, both Required Actions A.1 and A.2 must be completed.

1.2 Logical Connectors

EXAMPLES (continued)

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Stop . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR A.3 Remove . . .	

This example represents a more complicated use of logical connectors. Required Actions A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Actions may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Action A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

1.0 USE AND APPLICATION

1.3 Completion Times

PURPOSE

The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.

BACKGROUND

Limiting Conditions for Operation (LCOs) specify minimum requirements for ensuring safe operation of the cask. The ACTIONS associated with an LCO state Conditions that typically describe the ways in which the requirements of the LCO can fail to be met. Specified with each stated Condition are Required Action(s) and Completion Time(s).

DESCRIPTION

The Completion Time is the amount of time allowed for completing a Required Action. It is referenced to the time of discovery of a situation (e.g., inoperable equipment or variable not within limits) that requires entering an ACTIONS Condition unless otherwise specified, providing the cask is in a specified condition stated in the Applicability of the LCO. Required Actions must be completed prior to the expiration of the specified Completion Time. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the cask is not within the LCO Applicability.

Once a Condition has been entered, subsequent subsystems, components, or variables expressed in the Condition, discovered to be not within limits, will not result in separate entry into the Conditions unless specifically stated. The Required Actions of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

1.3 Completion Times (continued)

EXAMPLES The following examples illustrate the use of Completion Times with different types of Conditions and changing Conditions.

EXAMPLE 1.3-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Perform Required Action B.1. AND B.2 Perform Required Action B.2.	12 hours 36 hours

Condition B has two Required Actions. Each Required Action has its own separate Completion Time. Each Completion Time is referenced to the time that Condition B is entered.

The Required Actions of Condition B are to complete Required Action B.1 within 12 hours AND to complete Required Action B.2 within 36 hours. A total of 12 hours is allowed for completing Required Action B.1 and a total of 36 hours (not 48 hours) is allowed for completing Required Action B.2 from the time that Condition B was entered. If Required Action B.1 is completed within 6 hours, the time allowed for completing Required Action B.2 is the next 30 hours because the total time allowed for completing Required Action B.2 is 36 hours.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One system not within limit.	A.1 Restore system to within limit.	7 days
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	12 hours 36 hours

When a system is determined to not meet the LCO, Condition A is entered. If the system is not restored to within the LCO limit within 7 days, Condition B is also entered and the Completion Time clocks for Required Actions B.1 and B.2 start. If the system is restored after Condition B is entered, Condition A and B are exited, and therefore, the Required Actions of Condition B may be terminated.

EXAMPLE 1.3-3

Example 1.3-3 is not applicable to the ISFSI.

EXAMPLE 1.3-4

Example 1.3-4 is not applicable to the ISFSI.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-5

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Perform Action A.1.	4 hours
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	12 hours 36 hours

The Note above the ACTIONS Table is a method of modifying how the Completion Time is tracked. If this method of modifying how the Completion Time is tracked was applicable only to a specific Condition, the Note would appear in that Condition rather than at the top of the ACTIONS Table.

The Note allows Condition A to be entered separately for each cask, and Completion Times tracked on a per cask basis. When a cask does not meet the LCO, Condition A is entered and its Completion Time starts. If subsequent casks are determined not to meet the LCO, Condition A is entered for each cask and separate Completion Times start and are tracked for each cask.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-6

Example 1.3-6 is not applicable to the ISFSI.

EXAMPLE 1.3-7

Example 1.3-7 is not applicable to the ISFSI

IMMEDIATE COMPLETION TIME

When "Immediately" is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner.

1.0 USE AND APPLICATION

1.4 Frequency

PURPOSE

The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Surveillance Requirement (SR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the SR.

The "specified Frequency" is referred to throughout this section and each of the Specifications of Section 3.0, Surveillance Requirement (SR) Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each SR as well as certain Notes in the Surveillance column that modifies performance requirements.

Sometimes special situations dictate when the requirements of a Surveillance are to be met. They are "otherwise stated" conditions allowed by SR 3.0.1. They may be stated as clarifying Notes in the Surveillance, as part of the Surveillance, or both.

Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential SR 3.0.4 conflicts. To avoid these conflicts, the SR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With an SR satisfied, SR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance,

1.4 Frequency

DESCRIPTION (continued)

even without a Surveillance specifically being "performed," constitutes a Surveillance not "met." "Performance" refers only to the requirement to specifically determine the ability to meet the acceptance criteria

Some Surveillances contain notes that modify the frequency of performance or the conditions during which the acceptance criteria must be satisfied. For these Surveillances, the Applicability-entry restrictions of SR 3.0.4 may not apply. Such a Surveillance is not required to be performed prior to entering the specified condition in the Applicability of the associated LCO if any of the following three conditions are satisfied.

a. The Surveillance is not required to be met in the specified condition to be entered; or

b. The Surveillance is required to be met in the specified condition to be entered, but has been performed within the specified Frequency (i.e., it is current) and is known not to be failed; or

c. The Surveillance is required to be met, but not performed, in the specified condition to be entered, and is known not to be failed.

Examples 1.4-3 and 1.4-6 discuss these special situations.

1.4 Frequency (continued)

EXAMPLES The following examples illustrate the various ways that Frequencies are specified.

EXAMPLE 1.4-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify pressure within limit.	12 hours

Example 1.4-1 contains the type of SR most often encountered in the Technical Specifications (TS). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the stated Frequency is allowed by SR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the SR is not required to be met per SR 3.0.1 (such as when the equipment is determined to not meet the LCO, a variable is outside specified limits, or the facility is outside the Applicability of the LCO). If the interval specified by SR 3.0.2 is exceeded while the facility is in a condition specified in the Applicability of the LCO, and the performance of the Surveillance is not otherwise modified (refer to Example 1.4-3), then SR 3.0.3 becomes applicable.

If the interval as specified by SR 3.0.2 is exceeded while the facility is not in a condition specified in the Applicability of the LCO for which performance of the SR is required, the Surveillance must be performed within the Frequency requirements of SR 3.0.2 prior to entry into the specified condition. Failure to do so would result in a violation of SR 3.0.4.

EXAMPLES (continued)

EXAMPLE 1.4-2

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify flow is within limits.	Once within 12 hours prior to starting activity AND 24 hours thereafter

Example 1.4-2 has two Frequencies. The first is a one time performance Frequency, and the second is of the type shown in Example 1.4-1. The logical connector "AND" indicates that both Frequency requirements must be met. Each time the example activity is to be performed, the Surveillance must be performed within 12 hours prior to starting the activity.

The use of "once" indicates a single performance will satisfy the specified Frequency (assuming no other Frequencies are connected by "AND"). This type of Frequency does not qualify for the 25% extension allowed by SR 3.0.2.

"Thereafter" indicates future performances must be established per SR 3.0.2, but only after a specified condition is first met (i.e., the "once" performance in this example). If the specified activity is canceled or not performed, the measurement of both intervals stops. New intervals start upon preparing to restart the specified activity.

EXAMPLES (continued)

EXAMPLE 1.4-3

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
----------NOTE---------- Not required to be performed until 24 hours after first completion of SR 3.1.5.2. ---------- Verify cask interseal helium pressure $\geq$ 30 psig.	24 hours

The interval continues, whether or not SR 3.1.5.2 has been performed.

As the Note modifies the required performance of the Surveillance, it is construed to be part of the "specified Frequency." Should the 24 hour interval be exceeded prior to the completion of SR 3.1.5.2, this Note allows 24 hours after SR 3.1.5.2 to perform the Surveillance. The Surveillance is still considered to be performed within the "specified Frequency." Therefore, if the Surveillance were not performed within the 24 hour (plus the extension allowed by SR 3.0.2) interval, but SR 3.1.5.2 has not been completed, it would not constitute a failure of the SR or failure to meet the LCO. Also, no violation of SR 3.0.4 occurs when entering STORAGE OPERATIONS (the assumed Applicability of the associated LCO), even with the 24 hour Frequency not met.

Once SR 3.1.5.2 has been completed, 24 hours would be allowed for completing the Surveillance. If the Surveillance were not performed within this 24 hour interval, there would then be a failure to perform a Surveillance within the specified Frequency, and the provisions of SR 3.0.3 would apply.

1.4 Frequency

EXAMPLES (continued)

EXAMPLE 1.4-4

Example 1.4-4 is not applicable to the ISFSI.

EXAMPLE 1.4-5

Example 1.4-5 is not applicable to the ISFSI.

EXAMPLE 1.4-6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
----------NOTE---------- Not required to be met prior to the specified Frequency. ----------	Once prior to TRANSPORT OPERATIONS
Verify the cask helium leak rate is $\leq$ 1.0 E-5 atm-cc/sec.	

Example 1.4-6 specifies that the requirements of this Surveillance do not have to be met until required by the specified Frequency i.e., TRANSPORT OPERATIONS (the assumed Applicability of the associated LCO is LOADING OPERATIONS). The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, until required by the specified Frequency, there is neither failure of the SR nor failure to meet the LCO per SR 3.0.1. Therefore, no violation of SR 3.0.4 occurs when entering the Applicability of the associated LCO, e.g., entering LOADING OPERATIONS.

2.0 FUNCTIONAL AND OPERATING LIMITS

2.1 Fuel Characteristics for Fuel Stored in a TN-40 or TN-40HT Cask

a. Fuel shall be unconsolidated assemblies;

b. Fuel shall be irradiated at the Prairie Island Nuclear Generating Plant Units 1 or 2;

c. Fuel shall be limited to fuel types:

i. Westinghouse 14X14 Standard,
ii. Exxon 14X14 Standard (includes high burnup standard),
iii. Exxon 14X14 TOPROD, and
iv. Westinghouse 14X14 OFA (including VANTAGE+);

d. Fuel may include burnable poison rod assemblies (BPRAs) provided:

i. the BPRA has cooled for $\geq$ 18 years,
ii. the cask average cumulative burnup of the fuel assembly(s) where the BPRA(s) resided during reactor operation shall be $\leq$ 30,000 MWd/MTU;

e. Fuel may include thimble plug devices (TPDs) provided:

i. the TPD has cooled for a minimum of 16 years,
ii. the cask average cumulative burnup of the fuel assembly(s) where the TPD(s) resided during reactor operation shall be $\leq$ 125,000 MWd/MTU;

f. The combined weight of a fuel assembly and any BPRA or TPD shall be < 1330 lbs;

g. The combined weight of all fuel assemblies, BPRAs, and TPDs stored in a single cask shall be < 52,000 lbs;

h. The number of assemblies stored shall be $\leq$ 40; and

i. The fuel shall not be a DAMAGED FUEL ASSEMBLY.

2.0 FUNCTIONAL AND OPERATING LIMITS (continued)

2.2 Additional Fuel Characteristics for Fuel Stored in a TN-40 Cask

a. The initial enrichment shall be ≤ 3.85 weight percent U-235;

b. The assembly average burnup shall be ≤ 45,000 MWd/MTU;

c. The cooling time prior to loading shall be ≥10 years; and

d. The maximum combined heat load of an assembly and any associated BPRA or TPD shall be < 675 Watts.

2.3 Additional Fuel Characteristics for Fuel Stored in a TN-40HT Cask

a. The initial enrichment shall be ≤ 5.0 weight percent U-235;

b. The assembly average burnup shall be:

Initial percent U-235 (%)	Assembly Average Burnup (MWd/MTU)
Average Enrichment < 3.4	≤ 44,000
3.4 ≤ Average Enrichment ≤ 5.0	≤ 60,000

c. The cooling time prior to loading shall be ≥ 12 years;

d. The combined heat load of an assembly and any associated BPRA or TPD shall be ≤ 800 Watts. The following formula shall be used to determine the heat load of an assembly:

2.0 FUNCTIONAL AND OPERATING LIMITS

2.3 Additional Fuel Characteristics for Fuel Stored in a TN-40HT Cask (continued)

$$\text{Heat load} = F * e^{\left(-0.309*\left(1-\frac{12}{C}\right)*\left(\frac{C}{B}\right)^{0.431}*\left(\frac{E}{B}\right)^{-0.374}\right)}$$

Where :

$$F = 18.76+(11.27*B)+(6.506*E)+(0.163*B^2)+(-1.826*B*E)+(6.617*E^2)$$

B is the assembly average burnup in GWd/MTU

E is initial average enrichment in wt. % U-235

C is cooling time in years

2.4 Functional and Operating Limits Violations

If any Functional and Operating Limit of 2.1, 2.2, or 2.3 is violated, the following actions shall be completed.

2.4.1 The affected fuel assemblies shall be removed from the cask;

2.4.2 Within 24 hours, notify the NRC Operations Center; and

2.4.3 Within 30 days, submit a special report which describes the cause of the violation and the actions taken to restore compliance and prevent recurrence.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1 LCOs shall be met during specified conditions in the Applicability, except as provided in LCO 3.0.2.

LCO 3.0.2 Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5.

If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated.

LCO 3.0.3 When an LCO is not met and the associated ACTIONS are not met, or an associated ACTION is not provided, within 4 hours actions shall be initiated to:

a. implement appropriate compensatory actions as needed;

b. verify that the cask is not in an unanalyzed condition or that a required safety function is not compromised; and

c. within 24 hours, obtain Shift Manager approval of the compensatory actions and plan for exiting LCO 3.0.3.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.

3.0 LCO APPLICABILITY (continued)

LCO 3.0.4 When an LCO is not met, entry into a specified condition in the Applicability shall only be made:

a. when the associated ACTIONS to be entered permit continued operation in the specified condition in the Applicability for an unlimited period of time;

b. after performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or

c. when an allowance is stated in the individual value, parameter, or other Specification.

This Specification shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS or that are related to the unloading of a cask.

LCO 3.0.5 Equipment removed from service or not in service in compliance with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate it meets the LCO or that other equipment meets the LCO. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate that the LCO is met.

3.0 LCO APPLICABILITY (continued)

LCO 3.0.6	Not applicable to the ISFSI.
LCO 3.0.7	Not applicable to the ISFSI.
LCO 3.0.8	Not applicable to the ISFSI.
LCO 3.0.9	Not applicable to the ISFSI.

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

SR 3.0.1 SRs shall be met during the specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO. Failure to perform a Surveillance within the specified Frequency shall be failure to meet the LCO except as provided in SR 3.0.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.

SR 3.0.2 The specified Frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met.

For Frequencies specified as "once," the above interval extension does not apply.

If a Completion Time requires periodic performance on a "once per . . ." basis, the above Frequency extension applies to each performance after the initial performance.

Exceptions to this Specification are stated in the individual Specifications.

3.0 SR APPLICABILITY (continued)

SR 3.0.3

If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is greater. This delay period is permitted to allow performance of the Surveillance. A risk evaluation shall be performed for any Surveillance delayed greater than 24 hours and the risk impact shall be managed.

If the Surveillance is not performed within the delay period, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.

When the Surveillance is performed within the delay period and the Surveillance is not met, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.

SR 3.0.4

Entry into a specified condition in the Applicability of an LCO shall only be made when the LCO's Surveillances have been met within their specified Frequency, except as provided by SR 3.0.3. When an LCO is not met due to Surveillances not having been met, entry into a specified condition in the Applicability shall only be made in accordance with LCO 3.0.4.

This provision shall not prevent entry into specified conditions in the Applicability that are required to comply with ACTIONS or that are related to the unloading of a cask.

3.1 CASK INTEGRITY

3.1.1 Cask Cavity Vacuum Drying

LCO 3.1.1 The cask cavity vacuum drying pressure shall be below the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask cavity vacuum drying pressure limit not met.	A.1 Return cask to pool and reflood.	7 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	----------NOTE---------- Not required to be met prior to the specified Frequency. ----------	
	Verify that the equilibrium cask cavity vacuum drying pressure is brought to $\leq$ 10 mbar absolute for $\geq$ 30 minutes after isolation from the vacuum drying system.	Once prior to helium backfill (SR 3.1.2.2)

3.1 CASK INTEGRITY

3.1.2 Cask Helium Backfill Pressure

LCO 3.1.2 The cask cavity shall be backfilled with helium to within the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask initial helium backfill pressure limit not met.	----------NOTE---------- Action A.1 applies until a gas other than helium is introduced into the cask for subsequent operations or the helium is removed for the performance of SR 3.1.1.1. ----------	
	A.1 Initiate action to establish a helium environment in the cask.	Immediately
	AND	
	A.2 Establish cask cavity backfill pressure within limits.	Prior to leak testing (SR 3.1.3.1)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to pool and reflood.	7 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.2.1 ----------NOTE---------- Not required to be met prior to the specified Frequency. ---------- Verify that a helium environment has been established in the cask cavity.	Once within 34 hours after commencing cask draining
SR 3.1.2.2 ----------NOTE---------- Not required to be met prior to the specified Frequency. ---------- Verify that the cask cavity helium pressure is $\geq$ 1345 mbar absolute and $\leq$ 1445 mbar absolute.	Once prior leak testing (SR 3.1.3.1)

3.1 CASK INTEGRITY

3.1.3 Cask Helium Leak Rate

LCO 3.1.3 The combined helium leak rate for all seals shall be less than the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask helium leak rate not met.	A.1 Establish cask helium leak rate within limit.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to spent fuel pool and reflood.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	----------NOTE---------- Not required to be met prior to the specified Frequency. ----------	
	Verify the cask helium leak rate is $\leq$ 1.0 E-5 atm-cc/sec.	Once prior to TRANSPORT OPERATIONS

3.1 CASK INTEGRITY

3.1.4 Cask Safety Status

LCO 3.1.4 The cask exterior surfaces shall be free of damage, deterioration, and debris.

APPLICABILITY: STORAGE OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Significant damage, deterioration, or debris accumulation to cask surface.	A.1 Take appropriate action to return cask to proper operation.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Visually verify that there is no significant damage or deterioration of cask exterior surfaces.	92 days
SR 3.1.4.2	Visually verify that there is no significant accumulation of debris on cask exterior surfaces.	92 days

3.1 CASK INTEGRITY

3.1.5 Cask Interseal Pressure

LCO 3.1.5 Cask interseal pressure shall be maintained at a pressure greater than the limit.

APPLICABILITY: STORAGE OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask interseal pressure below limit.	A.1 Reestablish cask interseal pressure above limit.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to spent fuel pool and reflood.	30 days

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.1.5.1	----------NOTE---------- Not required to be performed until 24 hours after first completion of SR 3.1.5.2. ---------- Verify cask interseal helium pressure $\geq$ 30 psig.	24 hours
SR 3.1.5.2	----------NOTE---------- Not required to be met prior to the specified Frequency. ---------- Perform a CHANNEL OPERATIONAL TEST (COT) to verify proper functioning of pressure switch / transducer on cask overpressure system.	Once within 7 days of commencing STORAGE OPERATIONS AND Every 12 months thereafter

3.1 CASK INTEGRITY

3.1.6 Cask Maximum Surface Temperature

LCO 3.1.6 The cask surface temperature shall be less than the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask surface temperature above limit.	A.1 Return cask to spent fuel pool and remove all fuel assemblies from the cask. AND	7 days
	A.2 Submit report to NRC Region III office with a copy to Director, Office of Nuclear Material Safety and Safeguards.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	----------NOTE---------- Not required to be performed prior to the specified Frequency. ----------	
	Verify outer surface temperature is $\leq$ 250°F.	Once at least 24 hours after commencing cask draining AND Prior to TRANSPORT OPERATIONS

3.2 CASK RADIATION PROTECTION

3.2.1 Cask Surface Contamination

LCO 3.2.1 Removable contamination on the cask exterior surface shall be less than the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Removable contamination on the cask exterior surface exceed a limit.	A.1 Decontaminate cask surfaces to below required levels.	Prior to TRANSPORT OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.1.1	----------NOTE---------- Not required to be met prior to the specified Frequency. ----------	
	Verify that the removable contamination on the exterior surface of the cask are: a. < 1000 dpm / 100 cm^2 (0.2 Bq / cm^2) from beta and gamma sources; and b. < 20 dpm / 100 cm^2 (0.003 Bq / cm^2) from alpha sources.	Once prior to TRANSPORT OPERATIONS

3.2 CASK RADIATION PROTECTION

3.2.2 Cask Dose Rates

LCO 3.2.2 Dose rates on the cask exterior surfaces shall be less than the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dose rates on the cask exterior surface exceed a limit.	A.1 Perform specific analysis demonstrating compliance with 10 CFR Part 20, and 10 CFR Part 72 radiation protection requirements.	Prior to TRANSPORT OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.2.1	----------NOTE---------- Not required to be performed prior to the specified Frequency. ----------	
	Verify that dose rates on the exterior surface of the cask are[1]: a. $\leq$ 45 mrem/hr gamma and $\leq$ 10 mrem/hr neutron at center of top protective cover; b. $\leq$ 80 mrem/hr gamma and $\leq$ 190 mrem/hr neutron between cask flange and side neutron shield; c. $\leq$ 40 mrem/hr gamma and $\leq$ 35 mrem/hr neutron at mid-height of side neutron shield; and d. $\leq$ 85 mrem/hr gamma and $\leq$ 930 mrem/hr neutron between cask bottom and side neutron shield.	Once prior to TRANSPORT OPERATIONS

[1] Dose rates on the external surface of the cask may not bound localized dose rates due to streaming. Therefore, appropriate measures should be implemented to ensure exposures are consistent with good ALARA practices.

3.3 CASK CRITICALITY CONTROL

3.3.1 Dissolved Boron Concentration

LCO 3.3.1 The dissolved boron concentration of the water in the spent fuel pool and the water added to the cavity of a cask shall be greater than the limit.

APPLICABILITY: LOADING OPERATIONS and UNLOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dissolved boron concentration limit not met.	A.1 Initiate actions to suspend loading of fuel assemblies into cask. AND A.2 Remove all fuel assemblies from cask.	Immediately 24 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1	Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the cask cavity is $\geq$ 2450 ppm.	Once within 4 hours prior to LOADING OPERATIONS
SR 3.3.1.2	----------NOTE---------- Not required to be met prior to the specified Frequency. ----------	
	Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the cask cavity is $\geq$ 2450 ppm.	Once within 4 hours prior to flooding cask for UNLOADING OPERATIONS

3.4 CASK FUEL LOADING CONTROL

3.4.1 Fuel Stored in a cask

LCO 3.4.1 Fuel stored in a cask shall meet the functional and operating limits specified in Specification 2.1 through 2.3.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of LCO not met.	A.1 Initiate action to remove the affected fuel assembly(s) from the cask.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- Not required to be performed prior to the specified Frequency. ----------	
	Verify by administrative means that each fuel assembly and fuel assembly insert (BPRA or TPD) satisfies the requirements in Specification 2.1 through 2.3.	Once prior to inserting into cask
SR 3.4.1.2	----------NOTE---------- Not required to be performed prior to the specified Frequency. ----------	
	Verify the identity of each fuel assembly and fuel assembly insert (BPRA or TPD).	Once prior to inserting into cask AND Once prior to closure of cask

4.0 DESIGN FEATURES

4.1 Design Drawings

The Prairie Island ISFSI design approval was based on use of the TN-40 and TN-40HT storage casks and review of specific design drawings, some of which have been deemed appropriate for inclusion in the Prairie Island ISFSI Safety Evaluation Report (SER). Drawings listed in Section 1.2 of the Prairie Island ISFSI SER have been reviewed and approved by NRC. These drawings may be revised under the provisions of 10 CFR 72.48, as appropriate.

4.2 Maximum Cask Lifting Height

The casks have been evaluated for drops up to 18 inches. All lifts of a loaded cask greater than 18 inches must be performed with a single-failure-proof system.

4.3 Neutron Poison Loading in the TN-40HT Casks

The minimum areal boron-10 density of the neutron poison plates shall meet that specified in Table 4.3-1. This will ensure that the poison loading is consistent with that assumed in the criticality analysis.

4.3.1 TN-40HT Neutron Absorber Requirements

The neutron absorber used for criticality control in the TN-40HT basket may consist any of the following types of material: (a) Boron-aluminum alloy (borated aluminum), (b) Boron carbide / aluminum metal matrix composite (MMC), or (c) Boral®. The TN-40HT safety analyses do not rely upon the tensile strength of these materials. The radiation and temperature environment in the cask is not sufficiently severe to damage these metallic/ceramic materials. To assure performance of the neutron absorber's design function only visual inspections, thermal conductivity testing, and the presence / uniformity of boron-10 (B10) need to be verified with testing requirements specific to each material. References to metal matrix composites throughout Section 4.3 are not intended to refer to borated aluminum or Boral®.

4.0 DESIGN FEATURES

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

a. Boron Aluminum Alloy (Borated Aluminum)

Description - The material is produced by direct chill (DC) or permanent mold casting with boron precipitating primarily as a uniform fine dispersion of discrete aluminum diboride (AlB_2) or Titanium diboride (TiB_2) particles in the matrix of aluminum or aluminum alloy (other boron compounds, such as AlB12, can also occur). For extruded products, the TiB_2 form of the alloy shall be used. For rolled products, the AlB_2, the TiB_2, or a hybrid may be used. Boron is added to the aluminum in the quantity necessary to provide the specified minimum B10 areal density in the final product. The boron may have the natural isotopic distribution or may be enriched in B10. The criticality calculations take credit for 90% of the minimum specified B10 areal density of borated aluminum. The basis for this credit is the B10 areal density acceptance testing, which shall be as specified in Section 4.3.2.c.

Requirements - The boron content in the aluminum or aluminum alloy shall not exceed 5% by weight. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via neutron transmission testing as described in Section 4.3.2.c.

b. Boron Carbide / Aluminum Metal Matrix Composites (MMC)

Description – The material is a composite of fine boron carbide particles in an aluminum or aluminum alloy matrix. The material shall be produced by either direct chill casting, permanent mold casting, powder metallurgy, or thermal spray techniques. It is a low-porosity product, with a metallurgically bonded matrix. The criticality calculations take credit for 90% of the minimum specified B10 areal density of MMCs. The basis for this credit is the B10 areal density acceptance testing, which is specified in Section 4.3.2.c.

Requirements – For non-clad MMC products, the boron carbide content shall not exceed 40% by volume. The boron carbide content for MMCs with an integral aluminum cladding shall not exceed 50% by volume. Non-clad

4.0 DESIGN FEATURES

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

MMC products shall have a density greater than 98% of theoretical density, with no more than 0.5 volume % interconnected porosity. For MMC with an integral cladding, the final density of the core shall be greater than 97% of theoretical density, with no more than 0.5 volume % interconnected porosity of the core and cladding as a unit of the final product. Boron carbide particles for the products considered here shall have an average size of 40 microns or less, although the actual specification may be by mesh size, rather than by average particle size. No more than 10% of the particles shall be over 60 microns. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via neutron transmission testing as described in Section 4.3.2.c. The MMCs material shall be qualified in accordance with the requirements specified in Section 4.3.3, and shall subsequently be subject to the process controls specified in SAR Section A9.7.6.

c. Boral®

Description - This material consists of a core of aluminum and boron carbide powders between two outer layers of aluminum, mechanically bonded by hot-rolling an "ingot" consisting of an aluminum box filled with blended boron carbide and aluminum powders. The core, which is exposed at the edges of the sheet, is slightly porous. Before rolling, at least 80% by weight of the B_4C particles in Boral® shall be smaller than 200 microns. The criticality calculations take credit for 75% of the minimum specified B10 areal density of Boral®.

Requirements - The nominal boron carbide content shall be limited to 65% (+ 2% tolerance limit) of the core by weight. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via chemical analysis and by certification of the B10 isotopic fraction for the

4.0 DESIGN FEATURES

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

boron carbide powder, or by neutron transmission testing described in Section 4.3.2.c. Areal density testing shall be performed on a coupon taken from the sheet produced from each ingot. If the measured areal density is below that specified, all the material produced from that ingot will be either rejected, or accepted only on the basis of alternate verification of B10 areal density for each of the final pieces produced from that ingot.

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing

a. Visual Inspections Of Neutron Absorbers

For borated aluminum and MMCs, visual inspections shall follow the recommendations in Aluminum Standards and Data, Chapter 4 "Quality Control, Visual Inspection of Aluminum Mill Products and Castings". Local or cosmetic conditions such as scratches, nicks, die lines, inclusions, abrasion, isolated pores, or discoloration are acceptable. Widespread blisters, rough surface, or cracking shall be treated as non-conforming. Inspection of MMCs with an integral aluminum cladding shall also include verification that the matrix is not exposed through the faces of the aluminum cladding and that solid aluminum is not present at the edges. For Boral®, visual inspection shall verify that there are no cracks through the cladding, exposed core on the face of the sheet, or solid aluminum at the edge of the sheet.

b. Thermal Conductivity Testing Of Neutron Absorbers

Testing shall conform to ASTM E1225, ASTM E1461, or equivalent method, performed at room temperature on coupons taken from the rolled or extruded production material. Previous testing of borated aluminum and metal matrix composite, Table 4.3-2, shows that thermal conductivity increases slightly with temperature. Initial sampling shall be one test per lot, defined by the heat or ingot, and may be reduced if the first five tests meet the specified minimum thermal conductivity. If a thermal conductivity test result is below the specified minimum, at least four additional tests shall be performed on the material from that lot. If the mean value of those tests, including the original test, falls below the specified minimum the associated lot shall be rejected. After twenty five tests of a single type of material, with the same aluminum alloy matrix, the same boron content, and the same primary boron

4.0 DESIGN FEATURES

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

phase, e.g., B_4C, TiB_2, or AlB_2, if the mean value of all the test results less two standard deviations meets the specified thermal conductivity, no further testing of that material is required. This exemption may also be applied to the same type of material if the matrix of the material changes to a more thermally conductive alloy (e.g., from 6000 to 1000 series aluminum), or if the boron content is reduced without changing the boron phase. The thermal analysis in SAR Chapter A3.3.2.2 considers a dual plate basket construction base model with 0.125" thick neutron absorber with a 0.312" thick aluminum 1100 plate. This model gives the bounding values for the maximum component temperatures. Either a dual plate basket construction or an alternate single plate (borated aluminum or MMC) construction basket may be utilized. For the dual plate construction, the specified thickness of the neutron absorber may vary, and the thermal conductivity acceptance criterion for the neutron absorber will be based on the nominal thickness specified. In either construction type, to maintain the thermal performance of the basket, the minimum thermal conductivity shall be such that the total thermal conductance (sum of conductivity * thickness) of the neutron absorber and the aluminum 1100 plate shall at least equal the conductance assumed in the analysis for the base model, 3.98 BTU/hr-deg F. Samples of the acceptance criteria for various neutron absorber thicknesses are highlighted in Table 4.3-3. The aluminum 1100 plate does not need to be tested for thermal conductivity; the material may be credited with the values published in the ASME Code Section II part D. The neutron absorber material need not be tested for thermal conductivity if the nominal thickness of the aluminum 1100 plate is 0.359 inch or greater.

c. Neutron Transmission Testing of Neutron Absorbers

Neutron Transmission acceptance testing procedures shall be subject to approval by Transnuclear. Test coupons shall be removed from the rolled or extruded production material at locations that are systematically or probabilistically distributed throughout the lot. Test coupons shall not exhibit physical defects that would not be acceptable in the finished product, or that would preclude an accurate measurement of the coupon's physical thickness. A lot is defined as all the pieces produced from a single ingot or heat or from a group of billets from the same heat. If this definition results in a lot size too small to provide a meaningful statistical analysis of results, an

4.0 DESIGN FEATURES

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

alternate larger lot definition may be used, so long as it results in accumulating material that is uniform for sampling purposes. The sampling rate for neutron transmission measurements shall be such that there is at least one neutron transmission measurement for each 2000 square inches of final product in each lot. The B10 areal density is measured using a collimated thermal neutron beam of up to 1.1 inch diameter. The neutron transmission through the test coupons is converted to B10 areal density by comparison with transmission through calibrated standards. These standards are composed of a homogeneous boron compound without other significant neutron absorbers. For example, boron carbide, zirconium diboride or titanium diboride sheets are acceptable standards. These standards are paired with aluminum shims sized to match the effect of neutron scattering by aluminum in the test coupons. Uniform but non-homogeneous materials such as metal matrix composites may be used for standards, provided that testing shows them to provide neutron attenuation equivalent to a homogeneous standard. Standards will be calibrated, traceable to nationally recognized standards, or by attenuation of a monoenergetic neutron beam correlated to the known cross section of boron 10 at that energy. Alternatively, digital image analysis may be used to compare neutron radioscopic images of the test coupon to images of the standards. The area of image analysis shall be up to 0.75 sq. inch. The minimum areal density specified shall be verified for each lot at the 95% probability, 95% confidence level or better. If a goodness-of-fit test demonstrates that the sample comes from a normal population, the one-sided tolerance limit for a normal distribution may be used for this purpose. Otherwise, a non-parametric (distribution-free) method of determining the one-sided tolerance limit may be used. Demonstration of the one-sided tolerance limit shall be evaluated for acceptance in accordance with Transnuclear's Quality Assurance (QA) procedures. The following illustrates one acceptable method and is intended to be utilized as an example. The acceptance criterion for individual plates is determined from a statistical analysis of the test results for their lot. The B10 areal densities determined by neutron transmission are converted to volume density, i.e., the B10 areal density is divided by the thickness at the location of the neutron transmission measurement or the maximum thickness of the coupon. The lower tolerance limit of B10 volume density is then determined as the mean value of B10 volume density for the sample less K times the

4.0 DESIGN FEATURES

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

standard deviation, where K is the one-sided tolerance limit factor with 95% probability and 95% confidence. Finally, the minimum specified value of B10 areal density is divided by the lower tolerance limit of B10 volume density to arrive at the minimum plate thickness which provides the specified B10 areal density. Any plate which is thinner than the statistically derived minimum thickness or the minimum design thickness, whichever is greater, shall be treated as non-conforming, with the following exception. Local depressions are acceptable, so long as they total no more than 0.5% of the area on any given plate, and the thickness at their location is not less than 90% of the minimum design thickness. Non-conforming material shall be evaluated for acceptance in accordance with Transnuclear's QA procedures.

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites

a. Applicability And Scope

Prior to initial use in a spent fuel dry storage system, new MMCs shall be subjected to qualification testing that will verify that the product satisfies the design function. Key process controls shall be identified per SAR Section A9.7.6 so that the production material is equivalent to or better than the qualification test material. Changes to key processes shall be subject to qualification before use of such material in a spent fuel dry storage system. ASTM methods and practices are referenced below for guidance. Alternative methods may be used with the approval of Transnuclear.

b. Durability

There is no need to include accelerated radiation damage testing in the qualification. Metals and ceramics do not experience measurable changes in mechanical properties due to fast neutron fluences typical over the lifetime of spent fuel storage. Thermal damage and corrosion (hydrogen generation) testing shall be performed unless such tests on materials of the same chemical composition have already been performed and found acceptable. The following paragraphs illustrate two cases where such testing is not required. Thermal damage testing is not required for unclad MMCs consisting only of boron carbide in an aluminum 1100 matrix, because there is no reaction between aluminum and boron carbide below 842 °F, well

4.0 DESIGN FEATURES

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites (continued)

above the basket temperature under normal conditions of storage or transport. Corrosion testing is not required for MMCs (clad or unclad) consisting only of boron carbide in an aluminum 1100 matrix, because testing on one such material has already been performed by Transnuclear.

c. Delamination Testing Of Clad MMC

Clad MMCs shall be subjected to thermal damage testing following water immersion to ensure that delamination does not occur under normal conditions of storage. An example of such a test would be: (1) immerse a specimen at least 6 x 6 inches in water under pressure $\geq$30 psig for at least 24 hours, (2) Place the specimen in a vacuum furnace preheated to at least 300°F, and evacuate the furnace. Acceptance criterion: no blistering or delamination of the cladding.

d. Required Tests And Examinations To Demonstrate Mechanical Integrity

At least three samples, one each from approximately the two ends and middle of the test material production run shall be subjected to:

(1) room temperature tensile testing (ASTM- B557) demonstrating that the material has a 0.2% offset yield strength no less than 1.5 ksi; has an ultimate strength no less than 5.0 ksi; and has minimum elongation in two inches no less than 0.5%. As an alternative to the elongation requirement, ductility may be demonstrated by bend testing per ASTM E290. The radius of the pin or mandrel shall be no greater than three times the material thickness, and the material shall be bent at least 90 degrees without complete fracture.

(2) testing by ASTM-B311 to verify more than 98% theoretical density for non-clad MMCs and 97% for the matrix of clad MMCs. Testing or examination for interconnected porosity on the faces and edges of unclad MMC, and on the edges of clad MMC shall be performed by a method to be approved by Transnuclear. The maximum interconnect porosity is 0.5 volume %.

4.0 DESIGN FEATURES

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites (continued)

(3) and for at least one sample, for MMCs with an integral aluminum cladding, thermal durability testing demonstrating that after a minimum 24 hour soak in either pure or borated water, then insertion into a preheated oven at approximately 825°F for a minimum of 24 hours, the specimens are free of blisters and delamination and pass the mechanical testing requirements described in test (1) of this section.

e. Required Tests And Examinations To Demonstrate B10 Uniformity

Uniformity of the boron distribution shall be verified either by: (a) Neutron radioscopy or radiography (ASTM E94, E142, and E545) of material from the ends and middle of the test material production run, verifying no more than 10% difference between the minimum and maximum B10 areal density, or (b) Quantitative testing for the B10 areal density, B10 density, or the boron carbide weight fraction, on locations distributed over the test material production run, verifying that one standard deviation in the sample is less than 10% of the sample mean. Testing may be performed by a neutron transmission method similar to that specified in Section 4.3.2.c, or by chemical analysis for boron carbide content in the composite.

f. Approval of Procedures

Qualification procedures shall be subject to approval by Transnuclear.

4.4 Codes and Standards for the TN-40HT Casks

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, 2004 Edition including the 2006 Addenda (the Code), is the governing code for the TN-40HT cask, except that the material properties from later editions of Section II Part D may be used for design. The TN-40HT cask containment boundary is designed, fabricated and inspected in accordance with Subsection NB of the ASME Code to the maximum practical extent. Exceptions to the Code are listed in Table 4.4-1.

4.0 DESIGN FEATURES

4.4 Codes and Standards for the TN-40HT Casks (continued)

The TN-40HT basket is designed, fabricated and inspected in accordance with Subsection NG of the ASME Code to the maximum practical extent. Exceptions to the Code are listed in Table 4.4-1.

The ASME Code requirements apply only to important to safety items.

Proposed alternatives to the Code, including exceptions allowed by Table 4.4-1 may be used when authorized by the Director of the Office of Nuclear Material Safety and Safeguards or Designee. Requests for exceptions shall demonstrate that:

1. The proposed alternatives would provide an acceptable level of quality and safety; or

2. Compliance with the specified requirements of the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Requests for exceptions in accordance with this section shall be submitted in accordance with 10 CFR 72.4

TABLE 4.3-1
MINIMUM B10 AREAL CONTENT FOR TN-40HT FIXED POISON PLATES

Minimum Areal B10 Content for Boral® (mg/cm^2)	Minimum Areal B10 Content for B-Al[(a)] (mg/cm^2)
45.0	37.5

(a) B-Al = Metal Matrix Composites and Borated Aluminum Alloys.

TABLE 4.3-2
THERMAL CONDUCTIVITY FOR SAMPLE NEUTRON ABSORBERS

Temperature °C	Material			
	1	2	3	4
20	193	170	194	194
100	203	183	207	201
200	208	-	-	
250	-	201	218	206
300	211	204	220	203
314	-	-	-	202
342	-	-	-	202

Units: W/mK

Materials:

1) Boralyn® MMC, aluminum 1100 with 15% B_4C
2) Borated aluminum 1100, 2.5% boron as TiB_2
3) Borated aluminum 1100, 2.0% boron as TiB_2
4) Borated aluminum 1100, 4.3% boron as AlB_2

TABLE 4.3-3
SAMPLE DETERMINATION OF THERMAL CONDUCTIVITY ACCEPTANCE CRITERION

Single Plate Model	Al 1100	n absorber	total
thickness (inch)	0	0.437	0.437
conductivity at 70°F (Btu/hr-in-°F)	n/a	**9.11**	n/a
conductance (Btu/hr-°F)	0	3.98	3.98*

Dual Plate Construction	Al 1100	n absorber	total	
thickness (inch)	0.312	0.125	0.437	as modeled
conductivity at 70°F (Btu/h-.in-°F)	11.09	**4.17**	n/a	
conductance (Btu/hr-°F)	3.46	0.52	3.98	
thickness (inch)	0.187	0.250	0.437	thicker neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	**7.62**	n/a	
conductance (Btu/hr-°F)	2.07	1.91	3.98	
thickness (inch)	0.359	0.078	0.437	thinner neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	**0**	n/a	
conductance (Btu/hr-°F)	3.98	0	3.98	

The acceptance criterion is identified by boldface type for each thickness.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 1 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
TN-40HT Cask, Basket	NB/NF/ NG-1100 NB/NF/ NG-2130 NB/NF/ NG-4121	Stamping and preparation of reports by the Certificate Holder, Use of ASME Certificate Holders	The TN-40HT cask is not stamped, nor is there a code design specification or stress report generated. A design criteria document is generated in accordance with Transnuclear's (TN) Quality Assurance (QA) Program and the design and analysis is performed under TN's QA Program. The cask may also be fabricated by other than N-stamp holders and materials may be supplied by other than ASME Certificate holders.
TN-40HT Cask, Basket	NCA	All	Not compliant with NCA. TN Quality Assurance requirements, which are based on 10 CFR72 Subpart G, are used in lieu of NCA-4000. Fabrication oversight is performed by TN personnel in lieu of an Authorized Nuclear Inspector.
Pressure Test of the Containment Boundary	NB-6000	Hydrostatic testing	The containment vessel is hydrostatically tested in accordance with the requirements of the ASME B&PV Code, Section III, Articles NB-6200 with the exception that some of the containment vessel may be installed in the shield shell during testing. The containment vessel is supported by the shield shell during all design and accident events.
Weld of Bottom Inner Plate to the Containment Shell	NB-5231	Full penetration corner welded joints require the fusion zone and the parent metal beneath the attachment surface to be UT'd after welding	The joint may be welded after the containment shell is shrink-fit into the shield shell. The geometry of the joint does not allow for UT inspection. In this case, the joint will be examined by RT and either PT or MT methods in accordance with ASME subsection NB requirements. If the containment shell is welded complete before shrink fitting, UT examination per NB-5231 will be performed.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 2 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Containment Shell Rolling Qualification	NB-4213	The rolling process used to form the inner vessel should be qualified to determine that the required impact properties of NB-2300 are met after straining by taking test specimens from three different heats	If the plates are made from less than three heats, each heat will be tested to verify the impact properties.
Welds of the Bottom Shield to Shield Shell and Shield Shell to Shell Flange	NB-4243 and NB-5230	Category C weld joints in vessels and similar weld joints in other components shall be full penetration joints. These welds shall be examined by UT or RT and either PT or MT	Certain welds are partial penetration welds. As an alternative to the NDE requirements of NB-5230, for Category C welds, all of these closure welds are multi-layer welds that are progressive PT examined.
Containment Vessel	NB-7000	Vessels are required to have overpressure protection	No overpressure protection is provided. Function of containment vessel is to contain radioactive contents under normal and accident conditions. The containment vessel is designed to withstand maximum internal pressure considering 100% fuel rod failure and maximum accident temperatures.
Containment Vessel, Basket	NB-8000 NG-8000	Requirements for nameplates, stamping and reports per NCA-8000	The TN-40HT cask is to be marked and identified in accordance with 10 CFR 72 requirements. Code stamping is not required. QA data package to be in accordance with TN approved QA program.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 3 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Weld of Shield Plate to Lid Outer Plate	NB-4335 NB-4620	Impact testing of weld and heat affected zone of lid to shield plate Post weld heat treatment	The lid shield plate is not in the component support path, and has no pressure-retaining function; it is a non-structural attachment, and NB jurisdiction does not apply to the plate or weld. The weld must conform to NB-4430.
Gamma Shielding and Trunnion	NB-1132 NF-1132	Attachments in the component support load path and not performing a pressure retaining function shall conform to Subsection NF	The gamma shield shell and trunnions are not fabricated completely in accordance with Subsection NF. The shield shell's primary function is not structural. The weld of the bottom shield plate to the shield shell is subject to multilevel PT or MT to prevent complete loss of the bottom shielding in an accident. Other shield shell weld (shield shell to the shell flange) failures would not lead to loss of shielding. The trunnions and trunnion welds are designed to load factors much higher than those of subsection NF, the trunnion weld is subject to root and final PT or MT, and the trunnions are tested to 1.5 times design load.
Basket Neutron Poison Material	NG-2000	Use of ASME Materials	The basket neutron poison material is not considered in the structural analysis of the basket. The material provides criticality control and adds a heat transfer path. The poison material is not a Code material.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 4 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Basket	NG-3352	Table NG 3352-1 lists the permissible welded joints	The fusion welds between the stainless steel insert plates and the stainless fuel compartment tube are not included in Table NG-3352-1. The required minimum tested capacity of the welded connection (at each side of the tube) shall be 35 kips (at room temperature). The capacity shall be demonstrated by qualification and production testing. ASME Code Section IX does not provide tests for qualification of these types of welds. Therefore, these welds are qualified using Section IX to the degree applicable together with the testing described here. The welds will be visually inspected to confirm that they are located over the insert plates, in lieu of the visual acceptance criteria of NG-5260 which are not appropriate for this type of weld. A joint efficiency (quality) factor of 1.0 is utilized for the fuel compartment longitudinal seam welds. Table NG-3352-1 permits a joint efficiency (quality) factor of 0.5 to be used for full penetration weld examined by ASME Section V visual examination (VT). For the TN-40HT basket, the compartment seam weld is thin (0.188" thick) and the weld will be made in one pass. Both surfaces of weld (inside and outside) will be fully examined by VT and therefore a factor of 2 x 0.5=1.0 will be used in the analysis. This is justified as both surfaces of the single weld pass/layer will be fully examined, and the stainless steel material that comprises the fuel compartment tubes is very ductile.

5.0 ADMINISTRATIVE CONTROLS

5.1 General

The Prairie Island ISFSI is located on the Prairie Island Nuclear Generating Plant site and will be managed and operated by Northern States Power Company, a Minnesota corporation (NSPM), staff. The administrative controls shall be in accordance with the requirements of the Prairie Island Nuclear Generating Plant Facility Operating Licenses (DPR-42 and –60) and associated Technical Specifications, as appropriate.

5.2 Environmental Monitoring Program

The licensee shall include the Prairie Island ISFSI in the environmental monitoring program for the Prairie Island Nuclear Generating Plant. An environmental monitoring program is required pursuant to 10 CFR 72.44(d)(2). This program shall include the quarterly determination of ISFSI radiation levels from two (2) thermoluminescent dosimeters on the fence at each side of the ISFSI (8 total).

The licensee shall include the ISFSI in the environmental monitoring report for the Prairie Island Nuclear Generating Plant, and a copy shall be sent to the Director, Office of Nuclear Material Safety and Safeguards

5.3 Annual Environmental Report

An annual report, as required by 10 CFR 72.44(d)(3), shall be submitted to the NRC Region III, Office, with a copy to the Director, Office of Nuclear Material Safety and Safeguards, within 60 days after January 1 of each year. This report should specify the quantity of each of the principal radionuclides released to the environment in liquid and in gaseous effluents during the previous year of operation and such other information as may be required by the Commission to estimate maximum potential radiation dose commitment to the public resulting from effluent release.

5.0 ADMINISTRATIVE CONTROLS (continued)

5.4 Technical Specification Bases Control Program

This program provides a means for processing changes to the Bases of these Technical Specifications.

a. Changes to the Bases of these Technical Specifications shall be made under appropriate administrative controls and reviews;

b. Licensees may make changes to Bases without prior NRC approval provided the changes do not require either of the following;

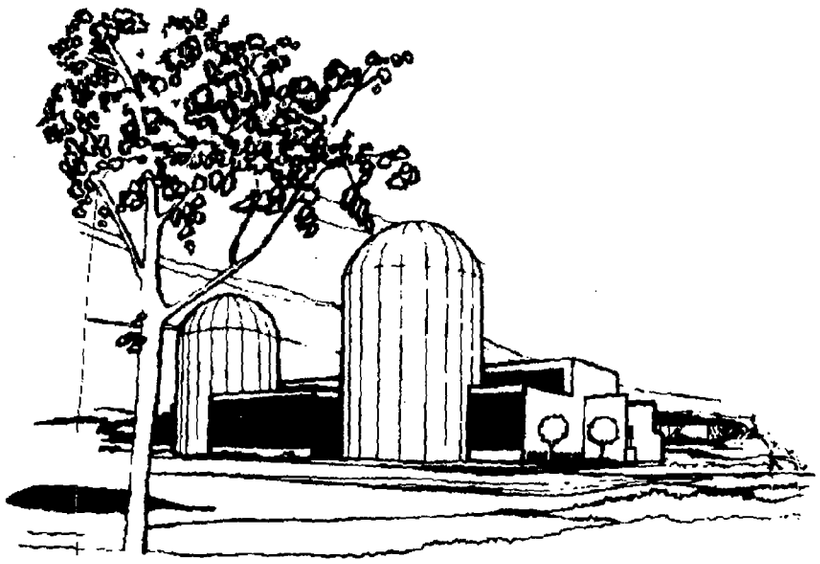
   1. a change in the Technical Specifications incorporated in the license, or

   2. a change to the ISFSI SAR or Bases that requires NRC approval pursuant to 10 CFR 72.48;

c. The Bases Control Program shall contain provisions to ensure that the Bases are maintained consistent with the ISFSI SAR; and

d. Changes to the Bases implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with the ISFSI SAR updates.

PRAIRIE ISLAND
INDEPENDENT SPENT FUEL
STORAGE INSTALLATION



Technical Specifications
BASES

CONTROLLED DOCUMENT

**THIS DOCUMENT IS SUBJECT TO AUDIT.
DO NOT ADD MATERIAL TO, NOR
REMOVE MATERIAL FROM, THIS BOOK.**

Form 17-4435

Docket Number: 72-10
License Number: SNM-2506

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
RECORD OF REVISION BASES CHANGES AND LICENSE AMENDMENTS

NSP Revision (REV) No.	Date of Issue	License Amendment No.	Remarks
-	-	1 through 6	Original Bases were part of Technical Specifications
7	8/20/2010	7	Initial Issue of revised format and Inclusion of TN-40HT design.

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B 2.0 FUNCTIONAL AND OPERATING LIMITS

BASES

BACKGROUND

To protect the integrity of the fuel cladding and ultimately the public from radioactive materials in effluents and direct radiation levels associated with cask operation, the TN-40 and TN-40HT storage cask design requires certain criteria and limits to be placed on the spent fuel parameters for the fuel to be stored in a cask. These criteria and parameter limits include fuel type, initial enrichment, maximum burnup, minimum cooling time, and fuel assembly physical condition (i.e., unconsolidated and not DAMAGED FUEL ASSEMBLY). To limit the associated radiological dose terms from other devices to be stored in casks, i.e., burnable poison rod assemblies (BPRA's) and thimble plug devices (TPD's), similar limitations are placed on BPRA's and TPD's. These criteria and the associated limits are placed on the respective input assumptions used in the thermal, structural, criticality, shielding, and confinement analyses performed for the TN-40 and TN-40HT casks.

APPLICABLE SAFETY ANALYSIS

The applicable safety analyses, as described in the SAR, are the thermal, structural, criticality, shielding, and confinement. The associated Technical Specification criteria and limits are applied to the input assumptions for the specific fuel parameters within these analyses. Within these SAR analyses fuel is considered "Design Bases Fuel" which bounds all specific fuel types to be considered for the TN-40 or TN-40HT. Therefore, the respective SAR analyses do not describe the maximum uranium content for each fuel type. The fuel geometry is determined by the fuel type designation (i.e. 14x14 std, 14x14 TOPROD, 14x14 OFA, etc.). Reactor coolant radiochemistry data from the fuel assembly's final cycle of operation, fuel sipping, eddy current exams, or ultrasonic testing may be used to determine that a particular fuel assembly has no cladding breaches.

BASES (continued)

FUNCTIONAL AND OPERATING LIMITS VIOLATIONS

The Functional and Operational Limits are established to protect the integrity of the fuel clad barrier and the public from radioactive materials in effluents and direct radiation levels associated with cask operation. Therefore, all limit violations result in the following ACTIONS.

If Functional and Operating Limit 2.1, 2.2, or 2.3 is violated, the limitations on the fuel assemblies in the cask have not been met. ACTIONS must be taken to place the affected fuel assemblies in a safe condition. This safe condition may be established by returning the affected fuel assemblies to the spent fuel pool.

Any violation of a Functional and Operating Limit is to be reported to the NRC Operations Center within 24 hours and a written report of the violation must be accomplished within 30 days.

B 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

BASES

LCOs

LCO 3.0.1, 3.0.2, 3.0.3, 3.0.4, and 3.0.5 establish the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

LCO 3.0.1

LCO 3.0.1 establishes the Applicability statement within each individual Specification as the requirement for when the LCO is required to be met (i.e., when the cask is in the specified conditions of the Applicability statement of each Specification).

LCO 3.0.2

LCO 3.0.2 establishes that upon discovery of a failure to meet an LCO, the associated ACTIONS are required to be met. The Completion Time of each Required Action for an ACTIONS Condition is applicable from the point in time that an ACTIONS Condition is entered. The Required Actions establish those remedial measures that must be taken within specified Completion Times when the requirements of an LCO are not met. This Specification establishes that:

a. completion of the Required Actions within the specified Completion Times constitutes compliance with a Specification; and

b. completion of the Required Actions is not required when an LCO is met within the specified Completion Time, unless otherwise specified.

There are two basic types of Required Actions. The first type of Required Action specifies a time limit in which the LCO must be met. This time limit is the Completion Time to restore a system or component or to restore variables to within specified limits. If this

BASES

LCO 3.0.2 (continued)

type of Required Action is not completed within the specified Completion Time, the cask may have to be placed in the spent fuel pool and unloaded. (Whether stated as a Required Action or not, correction of the entered Condition is an action that may always be considered upon entering ACTIONS.) The second type of Required Action specifies the remedial measures that permit continued operation that is not further restricted by the Completion Time. In this case, compliance with the Required Actions provides an acceptable level of safety for continued operation.

Completing the Required Actions is not required when an LCO is met or is no longer applicable, unless otherwise stated in the individual Specification.

The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the ACTIONS include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS is not to be made for operational convenience.

Individual Specifications may specify a time limit for performing a Surveillance Requirement (SR) when equipment is removed from service or bypassed for testing. In this case, the Completion Times of the Required Actions are applicable when this time limit expires, if the equipment remains removed from service or bypassed.

When a change in specified condition is required to comply with Required Actions, the cask may enter a specified condition in which another Specification becomes applicable. In this case, the Completion Times of the associated Required Actions would apply from the point in time that the new Specification becomes applicable and the ACTIONS Condition(s) are entered.

BASES (continued)

LCO 3.0.3

LCO 3.0.3 establishes that upon discovery of a failure to meet an LCO and that associated ACTIONS required cannot be met or an associated ACTION to resolve the condition is not provided, the Required Actions of this LCO establish those additional remedial measures that must be taken. These remedial measures provide for the implementation of appropriate compensatory actions to resolve the condition, verification that the cask is not in an unanalyzed condition, verification that required safety functions have not been compromised, and involvement of Plant Operations Management Staff has been included.

LCO 3.0.4

LCO 3.0.4 establishes limitations on changes in specified conditions in the Applicability when an LCO is not met. It allows placing the cask in a specified condition stated in that Applicability (e.g., Applicability desired to be entered) when:

a. conditions are such that the requirements of the LCO would not be met in the Applicability desired to be entered; and

b. continued noncompliance with the LCO requirements, if the Applicability were entered, would result in the cask being required to exit the Applicability desired to be entered to comply with the Required Actions.

Compliance with Required Actions that permit continued operation of the cask for an unlimited period of time in a specified condition provides an acceptable level of safety for continued operation. Therefore, in such cases, entry into a specified condition in the Applicability may be made in accordance with the provisions of the Required Actions. The provisions of this Specification are not to be interpreted as endorsing the failure to exercise the good practice of restoring equipment or variables to within specified limits before entering an associated specified condition in the Applicability.

BASES

LCO 3.0.4 (continued)

The provisions of LCO 3.0.4 are not to prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS. In addition, the provisions of LCO 3.0.4 are not to prevent changes in specified conditions in the Applicability that are related to the unloading of a cask.

Exceptions to LCO 3.0.4 are stated in the individual Specifications. Exceptions may apply to all the ACTIONS or to a specific Required Action of a Specification.

Surveillances do not have to be performed on the associated equipment out of service (or on variables outside the specified limits), as permitted by SR 3.0.1. Therefore, changing specified conditions while in an ACTIONS Condition, either in compliance with LCO 3.0.4 or where an exception to LCO 3.0.4 is stated, is not a violation of SR 3.0.1 or SR 3.0.4 for those Surveillances that do not have to be performed due to the associated out of service equipment.

LCO 3.0.5

LCO 3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or not in service in compliance with ACTIONS. The sole purpose of this Specification is to provide an exception to LCO 3.0.2 (e.g., to not comply with the applicable Required Action(s)) to allow the performance of required testing to demonstrate:

a. the equipment being returned to service meets the LCO; or

b. other equipment meets the applicable LCOs.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed required testing. This Specification does not provide time to perform any other preventive or corrective maintenance.

BASES (continued)

LCO 3.0.6	This specification is not applicable to the ISFSI. The placeholder is retained for consistency with the Prairie Island Nuclear Generating Plant Technical Specifications.
LCO 3.0.7	This specification is not applicable to the ISFSI. The placeholder is retained for consistency with the Prairie Island Nuclear Generating Plant Technical Specifications.
LCO 3.0.8	This specification is not applicable to the ISFSI. The placeholder is retained for consistency with the Prairie Island Nuclear Generating Plant Technical Specifications.
LCO 3.0.9	This specification is not applicable to the ISFSI. The placeholder is retained for consistency with the Prairie Island Nuclear Generating Plant Technical Specifications.

B 3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

BASES

SRs

SR 3.0.1 through SR 3.0.4 establishes the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

SR 3.0.1

SR 3.0.1 establishes the requirement that SRs must be met during the specified conditions in the Applicability for which the requirements of the LCO apply, unless otherwise specified in the individual SRs. This Specification is to ensure that Surveillances are performed to verify systems and components, and that variables are within specified limits. Failure to meet a Surveillance within the specified Frequency, in accordance with SR 3.0.2, constitutes a failure to meet an LCO. Surveillances may be performed by means of any series of sequential, overlapping, or total steps provided the entire Surveillance is performed within the specified Frequency. Additionally, the definitions related to instrument testing (e.g., CHANNEL OPERATION TEST) specify that these tests are performed by means of any series of sequential, overlapping, or total steps.

Systems and components are assumed to meet the LCO when the associated SRs have been met. Nothing in this Specification, however, is to be construed as implying that systems or components meet the associated LCO when:

a. the systems or components are known to not meet the LCO, although still meeting the SRs; or

b. the requirements of the Surveillance(s) are known to be not met between required Surveillance performances.

BASES

SR 3.0.1 (continued)

Surveillances do not have to be performed when the cask is in a specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified. Surveillances, including Surveillances invoked by Required Actions, do not have to be performed on equipment that has been determined to not meet the LCO because the ACTIONS define the remedial measures that apply. Surveillances have to be met and performed in accordance with SR 3.0.2 prior to returning equipment to service.

Upon completion of maintenance, appropriate post maintenance testing is required to declare equipment within its LCO. This includes ensuring applicable Surveillances are not failed and their most recent performance is in accordance with SR 3.0.2. Post maintenance testing may not be possible in the current specified conditions in the Applicability due to the necessary cask parameters not having been established. In these situations, the equipment may be considered to meet the LCO provided testing has been satisfactorily completed to the extent possible and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a specified condition where other necessary post maintenance tests can be completed.

SR 3.0.2

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a "once per..." interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers plant operating conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities).

BASES

SR 3.0.2 (continued)

The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency. This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications. The requirements of regulations take precedence over the TS. Therefore, when a test interval is specified in the regulations, the test interval cannot be extended by the TS, and the SR includes a Note in the Frequency stating, "SR 3.0.2 is not applicable".

As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Surveillance intervals or periodic Completion Time intervals beyond those specified.

BASES (continued)

SR 3.0.3

SR 3.0.3 establishes the flexibility to defer declaring affected equipment as not meeting the LCO or an affected variable outside the specified limits when a surveillance has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency, whichever is greater, applies from the point in time that it is discovered that the Surveillance has not been performed in accordance with SR 3.0.2, and not at the time that the specified Frequency was not met. This delay period provides adequate time to complete Surveillances that have been missed. This delay period permits the completion of a surveillance before complying with Required Actions or other remedial measures that might preclude completion of the Surveillance.

The basis for this delay period includes consideration of facility conditions, adequate planning, availability of personnel, the time required to perform the Surveillance, the safety significance of the delay in completing the required Surveillance, and the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the requirements.

When a surveillance with a Frequency based not on time intervals, but upon specified facility conditions or operational situations, is discovered not to have been performed when specified, SR 3.0.3 allows the full delay period of 24 hours to perform the Surveillance.

SR 3.0.3 also provides a time limit for completion of Surveillances that become applicable as a consequence of changes in the specified conditions in the Applicability imposed by Required Actions.

Failure to comply with specified Frequencies for SRs is expected to be an infrequent occurrence. Use of the delay period established by SR 3.0.3 is a flexibility which is not intended to be used as an operational convenience to extend Surveillance intervals.

BASES

SR 3.0.3 (continued)

If a surveillance is not completed within the allowed delay period, then the equipment is considered not in service or the variable is considered outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon expiration of the delay period. If a surveillance is failed within the delay period, then the equipment is not in service, or the variable is outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon the failure of the Surveillance.

Completion of the Surveillance within the delay period allowed by this Specification, or within the Completion Time of the ACTIONS, restores compliance with SR 3.0.1.

SR 3.0.4

SR 3.0.4 establishes the requirement that all applicable SRs must be met before entry into a specified condition in the Applicability.

This Specification ensures that system and component requirements and variable limits are met before entry in the Applicability for which these systems and components ensure safe operation of the facility.

The provisions of this Specification are not to be interpreted as endorsing the failure to exercise the good practice of restoring systems or components to an appropriate status before entering an associated specified condition in the Applicability. However, in certain circumstances, failing to meet an SR will not result in SR 3.0.4 restricting a change in specified condition. When a system, subsystem, division, component, device, or variable is outside its specified limits, the associated SR(s) are not required to be performed, per SR 3.0.1, which states that Surveillances do not have to be performed on such equipment. When equipment does not

BASES

SR 3.0.4 (continued)

meet the LCO, SR 3.0.4 does not apply to the associated SR(s) since the requirement for the SR(s) to be performed is removed. Therefore, failing to perform the Surveillance(s) within the specified Frequency does not result in an SR 3.0.4 restriction to changing specified conditions of the Applicability. However, since the LCO is not met in this instance, LCO 3.0.4 will govern any restrictions that may (or may not) apply to specified condition changes.

The provisions of SR 3.0.4 are not to prevent changes in specified conditions in the Applicability that is required to comply with ACTIONS. In addition, the provisions of SR 3.0.4 are not to prevent changes in specified conditions in the Applicability that are related to the unloading of a cask. The precise requirements for performance of SRs are specified such that exceptions to SR 3.0.4 are not necessary. The specific time frames and conditions necessary for meeting the SRs are specified in the Frequency, in the Surveillance, or both. This allows performance of Surveillances when the prerequisite condition(s) specified in a Surveillance procedure require entry into the specified condition in the Applicability of the associated LCO prior to the performance or completion of a surveillance. A Surveillance that could not be performed until after entering the LCO Applicability would have its Frequency specified such that it is not "due" until the specific conditions needed are met. Alternatively, the Surveillance may be stated in the form of a Note as not required (to be met or performed) until a particular event, condition, or time has been reached. Further discussion of the specific formats of SR annotation is found in Section 1.4, Frequency.

B 3.1 CASK INTEGRITY

B 3.1.1 Cask Cavity Vacuum Drying

BASES

BACKGROUND

A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operating Limits. A lid is then placed on the cask. Subsequent operations involve lifting the cask above the fuel pool level, removing water from the cask fuel cavity, and then moving the cask to the decontamination area. After the cask lid is secured, vacuum drying of the cask cavity is performed and the cask cavity is backfilled with helium. During normal storage conditions, the cask is backfilled with helium, which is a better heat conductor than air, which results in lower temperatures for stored fuel and the basket.

Cavity vacuum drying is utilized to remove residual water/moisture from the fuel cavity after the cask has been drained of water. Any water which was not drained from the cask cavity evaporates from fuel or basket surfaces due to the vacuum. This is aided by the temperature increase due to the heat generation of the fuel.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactive material during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are the uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This protective environment is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas.

BASES (continued)

LCO

A vacuum drying pressure of less than the limit indicates that all liquid water has evaporated and has been removed from the cask cavity. Removing water from the cask cavity helps to ensure the long term minimization of fuel clad corrosion.

APPLICABILITY

Cavity vacuum drying is performed during LOADING OPERATIONS before the cask is transported to the ISFSI storage pad. Therefore, the vacuum requirements do not apply after the cask is backfilled with helium prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the internal environment of one cask is independent of the internal environment of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the cask cavity drying pressure limit cannot be achieved the cask is to be placed back into the spent fuel pool within 7 days. Seven days is sufficient time to reflood the cask. Once placed in the spent fuel pool, the fuel is provided with adequate decay heat removal to maintain the loaded fuel within limits.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

Cask cavity dryness is demonstrated by evacuating the cask cavity to a high vacuum and verifying that the vacuum is held over a specified time period. A maintained high vacuum for the specified time period is an indication that no further evaporation is occurring and the cask cavity is dry. During the dryness demonstration period, the vacuum evacuation pump is to be isolated from the cask cavity. This is accomplished by closing the isolation valve and shutting down of vacuum pump or other system line-ups established to ensure a leaking evacuation pump isolation valve could not be inappropriately maintaining the vacuum in the cask.

The dryness demonstration must be performed successfully on each cask prior to placing the cask in storage. The dryness demonstration must be performed prior to completing the final helium backfill required by SR 3.1.2.2.

REFERENCES None.

B 3.1 CASK INTEGRITY

B 3.1.2 Cask Helium Backfill Pressure

BASES

BACKGROUND

A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operating Limits. A lid is then placed on the cask. Subsequent operations involve lifting the cask above the fuel pool level, removing water from the cask fuel cavity, and then moving the cask to the decontamination area. After the cask lid is secured, vacuum drying of the cask cavity is performed and the cask cavity is backfilled with helium. For normal storage conditions, the cask is backfilled with helium, which is a better heat conductor than air, which results in lower temperatures for stored fuel and the basket.

Backfilling the cask cavity with helium promotes heat transfer from the fuel and the inert atmosphere protects the fuel cladding. Providing a helium pressure greater than atmospheric pressure ensures that there will be no in-leakage of air over the life of the cask.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactive material during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are the uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis (References 1 and 2).

BASES

APPLICABLE SAFETY ANALYSIS (continued)

The thermal analyses of the cask are performed assuming that helium is in the cask. But during the period from draining of the cask until evacuation of the air and its replacement by helium, heat conduction out of the fuel occurs through air, which has a lower conductivity than helium. A thermal analysis for TN-40HT casks has shown that under these conditions, the maximum fuel cladding temperature will remain below the limit of 752°F for at least 34 hours (Reference 3).

Establishment of even a low pressure helium environment satisfies the helium properties described in design basis thermal analyses because thermal conductivity of gases is not pressure dependent until a very high vacuum is attained.

The heat-up analysis for the TN-40 casks does not contain a time limit on when helium must be introduced into the cask to maintain acceptable fuel cladding temperature. However, the time derived for the TN-40HT casks, .i.e. the Frequency established for SR 3.1.2.1, is conservatively applied to TN-40 casks.

LCO

Backfilling the cask cavity with helium ensures that the heat transfer, is in accordance with cask design functions.

Backfilling the cask cavity with helium at a pressure exceeding atmospheric pressure will ensure that there will be no air in-leakage into the cavity which could damage the fuel cladding over the licensed storage period. An initial helium pressure limit is specified to ensure that the pressure within the cask remains within the design pressure limits over the life of the cask (Reference 3). The helium pressure is the as left value immediately after helium fill is completed in preparation for long term storage.

BASES (continued)

APPLICABILITY Helium backfill is performed during LOADING OPERATIONS prior to transporting the cask to the ISFSI storage pad.

ACTIONS The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the internal environment of one cask is independent of the internal environment of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

Required Action A.1 is modified by a Note which allows exiting this Required Action to vent the helium cask environment to perform subsequent actions that may be necessary to ready the cask for storage.

The thermal analyses of the cask are performed assuming that helium is in the cask. If the helium back fill pressure is not met, then actions must be initiated immediately to establish a helium environment.

A.2

If the helium backfill pressure cannot be obtained, actions must be taken to meet the LCO. Once the helium atmosphere is established by Required Action A.1, there is enough conduction to maintain the loaded fuel within its temperature limits and to prevent thermal expansion from damaging the basket. Therefore, no time limit is required for this action, other than completion prior to helium leak testing.

BASES

ACTIONS (continued)

B.1

If a helium cask environment cannot be achieved and maintained, fuel clad temperatures may increase beyond the analyzed condition. Therefore, the cask will be required to be placed back into the spent fuel pool within 7 days and re-flooded. This time is sufficient time to return the cask to the spent fuel pool and re-flood the cask cavity. Once placed in the spent fuel pool, the fuel is provided adequate decay heat removal to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.2.1

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

Establishment of even a low pressure (i.e. a fraction of a mbar) helium environment satisfies the helium properties described in design basis thermal analyses because thermal conductivity of gases is not pressure dependent until a high vacuum is attained. Thereby, design basis heat removal requirements will be satisfied provided some helium has been introduced to, and maintained in, the cask cavity within the 34 hour vacuum drying time frame analyzed in Reference 3.

SR 3.1.2.2

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.2.2 (continued)

The long-term integrity of the stored fuel is dependent on storage in a dry, inert environment and maintenance of adequate heat transfer mechanisms. Filling the cask cavity with helium at the initial pressure specified will ensure that there will be no air in-leakage, which could potentially damage the fuel cladding, and that the cask cavity internal pressure will remain within limits for the life of the cask.

Backfilling with helium at a specified pressure must be performed successfully on each cask prior to performance of leak testing activities and TRANSPORT and STORAGE OPERATIONS.

REFERENCES

1. SAR Section 8.2.

2. SAR Section A8.2.

3. SAR Section A3.3.

B 3.1 CASK INTEGRITY

B 3.1.3 Cask Helium Leak Rate

BASES

BACKGROUND

A cask is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Functional and Operational Limits. A lid is then placed on the cask. Subsequent operations involve removing water from the cask fuel cavity and moving the cask to the decontamination area. After the cask lid is secured, vacuum drying of the cask cavity is performed, and the cavity is backfilled with helium.

During normal storage conditions, the cask is backfilled with helium, which is a better heat conductor than air, and the inert atmosphere protects the fuel cladding. Prior to moving the cask to the storage pad, the helium leak rate is determined to ensure that the fuel is confined.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactive material during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are the uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.

BASES (continued)

LCO

Verifying that the cask cavity is sealed by measuring the helium leak rate will ensure that the assumptions in the normal, off-normal, and accident radiological evaluations are maintained. The safety analyses are based on an air leakage rate of 1.0 E-5 atm-cc/sec (Reference 1). Thus specifying a helium leak rate limit at the same value is conservative.

APPLICABILITY

The cask seal integrity verification, by measuring helium leak rate, is performed during LOADING OPERATIONS prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the internal environment of one cask is independent of the internal environment of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the helium leak rate limit is not met ACTIONS must be taken to meet the LCO. The 7 day Completion Time of Required Action A.1 provides ample time to investigate the source of the leak and reestablish the cask helium leak rate within limit.

BASES

ACTIONS (continued)

B.1

The 30 day Completion Time of Required Action B.1 is based on engineering judgment that any credible seal leak within the 30 day period would not result in a significant loss of helium inventory that would affect the heat removal capability of the cask. In the event of a significant leak, the cask environment would not be reduced to less than one atmosphere of helium because there is no mechanism to exchange the helium in the cask with external air. Based on engineering judgment, this 30 day Completion Time is sufficient to disconnect the test equipment, vent the cask, and return it to the spent fuel pool. Once placed in the spent fuel pool, the fuel is provided adequate decay heat removal to maintain the loaded fuel within limits.

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

A primary design consideration of the cask is that it adequately contain radioactive material and retain an inert environment. The specified helium leak rate for this Surveillance demonstrates that an adequate confinement barrier has been established and that the cask is within design assumptions. The determination of the leak rate shall be done in accordance with ANSI N14.5 (Reference 2). The minimum sensitivity of the leak rate test is 5×10^{-6} atm-cc/sec and the test includes the overpressure system up to the isolation valve.

Measuring the helium leak rate must be performed successfully on each cask prior to placing it in storage. Once the helium atmosphere is established by SR 3.1.2.1, there is enough conduction to maintain

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.3.1 (continued)

the loaded fuel within its temperature limits, and to prevent thermal expansion from damaging the basket. Therefore, no time limit is required for this Surveillance, other than completion prior to Transport Operations.

REFERENCES

1. SAR Section A8.2.

2. American National Standards Institute, "National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials", ANSI N14.5-1997, New York, Oct. 1987.

B 3.1 CASK INTEGRITY

B 3.1.4 Cask Safety Status

BASES

BACKGROUND	The design intent of a dry storage cask is for the temporary confinement and shielding of irradiated nuclear fuel assemblies during cask placement on a concrete storage pad outside of the plant power block. The cask is designed and constructed within specific design requirements and parameters, as well as provided with associated design features that result in acceptable heat transfer rates away from the irradiated fuel assemblies through the exterior surfaces of the cask and into the environment. During STORAGE OPERATIONS the cask needs to be maintained free from damage and accumulation of debris so as not to compromise the confinement, shielding, and heat transfer design function of the cask.
APPLICABLE SAFETY ANALYSIS	The cask packaging is designed to passively reject decay heat under normal conditions of storage and hypothetical accidents while maintaining appropriate packaging temperatures and pressures within specified design limits. The applicable safety analysis is the heat transfer analysis and thermal model as well as the shielding and confinement analyses presented in the SAR (References 1 and 2).
LCO	Verifying that the cask is free from damage and accumulation of debris will ensure heat transfer, shielding, and confinement are in accordance with the cask design functions.
APPLICABILITY	This LCO is applicable during STORAGE OPERATIONS to ensure each cask is free from damage and accumulation of debris.

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the exterior surface of one cask is independent of the exterior surface of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

Required Action A.1 is in place to ensure that casks are maintained and that design heat transfer characteristics are not compromised by damage or accumulation of debris during cask storage.

SURVEILLANCE REQUIREMENTS

SR 3.1.4.1

A primary design consideration of the cask is that it can adequately contain radioactive material and sufficiently transfer heat from the cask surfaces to the environment. This Surveillance is to visually ensure that a cask does not exhibit damage or deterioration during storage that could compromise the design function of the cask. A Surveillance Frequency of 92 days is sufficient to observe and ensure the implementation of necessary actions to resolve any unsatisfactory conditions.

SR 3.1.4.2

A primary design consideration of the cask is that it can adequately contain radioactive material and sufficiently transfer heat from the

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.4.2 (continued)

cask surfaces to the environment. This Surveillance is to visually ensure that a cask does not exhibit accumulation of debris during storage that could compromise the design function of the cask. A Surveillance Frequency of 92 days is sufficient to observe and ensure the implementation of necessary actions to resolve any unsatisfactory conditions.

REFERENCES

1. SAR Section 3.3.
2. SAR Section A3.3.

B 3.1 CASK INTEGRITY

B 3.1.5 Cask Interseal Pressure

BASES

BACKGROUND

A cask is loaded, dried, and sealed prior to being transported to the ISFSI and placed on a storage pad. The cask is designed with redundant seals to contain the radioactive material. In addition, 10 CFR 72.122(h)(4) states that the casks must have the capability to be continuously monitored such that the licensee will be able to determine when corrective action needs to be taken to maintain safe storage conditions. The monitoring systems provide:

a. the capability to monitor interseal pressure that will indicate if cask seal integrity is compromised; and

b. local alarms to indicate that potential seal degradation has occurred.

It is necessary to verify cask seal integrity at regular intervals to ensure the cask's interseal containment boundary is being maintained and to verify there is no seal leakage to the environment.

APPLICABLE SAFETY ANALYSIS

The confinement of radioactive material during the storage of spent fuel in a cask is ensured by the use of multiple confinement barriers and systems. The barriers relied upon are the uranium dioxide fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the cask in which the fuel assemblies are stored. Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in

BASES

APPLICABLE SAFETY ANALYSIS (continued)

the accident analysis (References 1 and 2). In addition, the thermal analyses of the cask STORAGE OPERATIONS assume that the cask cavity is filled with helium.

LCO

Verifying cask interseal pressure ensures that the assumptions relating to radioactive releases in the accident analyses and radiological evaluations are maintained. Seal integrity is verified by monitoring interseal pressure indication and associated alarms.

APPLICABILITY

Cask interseal pressure verification is performed regularly during STORAGE OPERATIONS to confirm that the cask confinement barriers have not been compromised. During LOADING OPERATIONS, the seal integrity is verified prior to moving the cask to the ISFSI storage pads. Verification during TRANSPORT OPERATIONS is not possible as the cask is being moved. However, TRANSPORT OPERATIONS are brief, follow the verification performed during LOADING OPERATIONS, and, therefore, do not represent a significant lapse in seal integrity monitoring.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the sealing function of one cask is independent of the sealing function of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

BASES

ACTIONS (continued)

A.1

If the cask interseal pressure is below the limit, an appropriate assessment and evaluation is to be performed to determine the cause of the low pressure condition. The 7 day period is sufficient time to perform an assessment of the condition and make necessary repairs to the overpressure system and reestablish a pressure above the limit. Reestablishing the pressure above the limit prevents leakage of radioactive material from the cask cavity.

B.1

If it is determined that there is a leakage path in the cask seals or overpressure system, a repair is to be performed in a timely manner. If the interseal pressure has been reestablished to 30 psig or above, no leakage of radioactive material from the cask cavity can occur. The 30 day Completion Time of Required Action B.1 provides ample time to implement necessary repairs or for the return of the cask to the spent fuel pool and to be re-flooded. Once placed in the spent fuel pool, the fuel is provided adequate decay heat removal to maintain the loaded fuel within limits. The allowed completion times are bounded by the 45 day exposure duration for off-normal conditions in Reference 3.

SURVEILLANCE REQUIREMENTS

SR 3.1.5.1

This Surveillance is modified by a Note. This Note clarifies that performing the Surveillance is not required, and thus SR 3.0.4 does not apply, until 24 hours after first completion of SR 3.1.5.2. This Note is necessary to allow entry into STORAGE OPERATIONS and subsequent installation of the necessary monitoring equipment on the ISFSI pad to allow for performing the Surveillance during the STORAGE OPERATIONS.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.5.1 (continued)

During STORAGE OPERATIONS the cask overpressure tank pressure is routinely monitored by associated system instrumentation. Every 24 hours the pressure is to be verified to be above the 30 psig pressure minimum limit. The 24 hours is an appropriate time-frame during STORAGE OPERATIONS to alert operations personnel of a potential cask seal leak, system leak, or system malfunction. The method for verifying seal integrity is to monitor the interseal pressure. Normally, the cask seal integrity is verified using installed instrumentation that alarms or indicates. If this system is not operating on one or more casks, monitoring of seal integrity at each affected cask may be performed by alternative means.

SR 3.1.5.2

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

To ensure operability of the interseal pressure monitoring system as a remote indicator during STORAGE OPERATIONS, SR 3.1.5.2 verifies the proper functioning and setpoint of the pressure switch or transducer within 7 days of commencing STORAGE OPERATIONS. This verification is a CHANNEL OPERATIONAL TEST (COT) which exercises the pressure switch by reducing the sensed pressure below the setpoint, and verifies the accuracy of the trip setpoint within the required range. Full channel calibration over the range of the instrument is not required because the instrument provides no analog indication. Subsequent operability is verified by a COT every 12 months. This time frame is a reasonable period to address any instrument drift and reliability of the pressure switch.

BASES (continued)

REFERENCES

1. SAR Section 8.2.
2. SAR Section A8.2.
3. SAR Section A7A.8

B 3.1 CASK INTEGRITY

B 3.1.6 Cask Maximum Surface Temperature

BASES

BACKGROUND	The design intent of a dry storage cask is for the temporary confinement and shielding of irradiated nuclear fuel assemblies during cask placement on a concrete storage pad outside of the plant power block. The cask is designed and constructed within specific design requirements and parameters, as well as provided with associated design features that result in acceptable heat transfer rates away from the irradiated fuel assemblies through the exterior surfaces of the cask and into the environment.
APPLICABLE SAFETY ANALYSIS	The cask packaging is designed to passively reject decay heat under normal conditions of storage and hypothetical accidents while maintaining appropriate packaging temperatures and pressures within specified design limits. The applicable safety analysis is the heat transfer analyses and thermal model as well as the shielding and confinement analyses presented in the SAR (References 1 and 2). These thermal analyses are also an integral input to other analyses such as the structural analyses.
LCO	A surface temperature in excess of the limit indicates that the cask heat transfer may not be functioning as designed and thus the design conclusions of the safety analyses may not be satisfied.
APPLICABILITY	In order to provide some indication that the cask heat transfer is performing as designed prior to removing the cask from the Auxiliary Building, the check of the surface temperature is performed during LOADING OPERATIONS.

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the surface temperature of one cask is independent of the surface temperature of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If cask surface temperature is above the limit, the cask must be returned to the spent fuel pool and the fuel removed. Once the cask has been placed in the spent fuel pool, the fuel is provided adequate decay heat removal facilities to maintain the loaded fuel within limits. Removal of fuel from the cask places the cask in a condition where this LCO is no longer applicable.

A.2

Violations of this LCO are significant to the extent that notification to the NRC is required within 30 days. A report is to be prepared and submitted to the NRC Region III Office with a copy to the Director, Office of Nuclear Material Safety and Safeguards.

SURVEILLANCE REQUIREMENTS

SR 3.1.6.1

This Surveillance is modified by a Note. The Note clarifies that performing the Surveillance is not required, and thus SR 3.0.4 does not apply, prior to the specified Frequency.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.6.1 (continued)

Prior to TRANSPORT OPERATIONS, the cask outer surface temperature is to be measured and verified to be below the specified limit. The Frequency of this Surveillance also requires a minimum time of 24 hours, after commencing cask draining, to allow the fuel assemblies, basket, and cask body to reach equilibrium temperature, prior to the performance of this Surveillance.

REFERENCES

1. SAR, Section 3.3.
2. SAR, Section A3.3.

B 3.2 CASK RADIATION PROTECTION

B 3.2.1 Cask Surface Contamination

BASES

BACKGROUND

A cask is immersed in the spent fuel pool in order to load the spent fuel assemblies. As a result, the surface of the cask will become contaminated with radioactive material from the spent fuel pool water. In order to minimize radioactive contamination to personnel or the environment, this contamination is to be removed prior to moving the cask to the ISFSI pad. By removing cask surface contamination, an uncontaminated ISFSI environment can be maintained that allows ISFSI entry without additional radiological controls to prevent the spread of contamination. An uncontaminated ISFSI environment reduces personnel dose due from loose contamination or airborne contamination. This practice is consistent with ALARA principles (Reference 1).

APPLICABLE SAFETY ANALYSIS

The radiation protection measures implemented at the ISFSI are based on the assumption that the exterior surfaces of the cask have been decontaminated. Failure to decontaminate the surfaces of the casks would lead to higher than projected occupational doses.

LCO

Removable surface contamination limits on the cask exterior surfaces are based on the minimum level of activity that can be routinely detected under a surface contamination control program using direct survey methods. Experience has shown that these limits are low enough to prevent the spread of contamination to clean areas and are significantly less than the levels which would cause significant personnel skin dose.

BASES (continued)

APPLICABILITY

Verification that the cask surface contamination is less than the LCO limit is performed during LOADING OPERATIONS. This verification occurs prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS. Measurement of the cask surface contamination is unnecessary during TRANSPORT OPERATIONS in preparation for UNLOADING OPERATIONS, because surface contamination would have been measured prior to moving the cask to the ISFSI.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the outer surface contamination of one cask is independent of the contamination of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the removable surface contamination of a cask that has been loaded with spent fuel is not within the LCO limits, action must be initiated to decontaminate the cask and bring the removable surface contamination within limits. The Completion Time requires that the decontamination be completed prior to TRANSPORT OPERATIONS, which will prevent the release of contamination to the environment and the ISFSI.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

This SR verifies that the removable surface contamination on the cask is less than the limits. The Frequency requires performing the verification once prior to initiating TRANSPORT OPERATIONS. This Frequency is adequate to confirm that the cask can be moved to the ISFSI without spreading loose contamination, and assumes that the cask will not develop surface contamination during TRANSPORT or STORAGE OPERATIONS. Storage of the fuel in the dry, redundantly-sealed cask eliminates the possibility for leakage of contaminated liquids.

REFERENCES

1. SAR Section 7.1.

B 3.2 CASK RADIATION PROTECTION

B 3.2.2 Cask Dose Rates

BASES

BACKGROUND

The design intent of a dry storage cask is for the temporary confinement of irradiated nuclear fuel assemblies and subsequent cask placement on a concrete storage pad outside of the plant power block. The cask is designed and constructed within specific design requirements and parameters, as well as provided with associated design features that result in acceptable dose rates at the exterior surfaces of the cask. Acceptable dose rates are defined as those that provide compliance with 10 CFR Part 20 and 10 CFR Part 72 radiation protection requirements.

Measurement of the resultant initial dose rates of the cask exterior surfaces and verification that the initial cask dose rates are within established limits prior to TRANSPORT OPERATIONS, ensure a specific cask is performing in accordance with its design requirements. Subsequent monitoring of the ISFSI environment dose rates ensures all casks continue to perform in accordance with design requirements.

APPLICABLE SAFETY ANALYSIS

The applicable safety analysis is the shielding analysis and subsequent dose rates from a cask(s) including contribution from direct radiation and in-direct radiation to arrive at the expected dose rates around the ISFSI (Reference 1). These analyses ensure that the offsite dose rates are within the regulatory limits.

LCO

Initial cask exterior surfaces dose rates, for each cask, at each of four specific cask locations, is to be measured and verified to be below limits prior to TRANSPORT OPERATIONS. Ensuring that the surface dose rates are consistent with the calculated surface dose

BASES

LCO (continued)

rates in Reference 1 provides assurance that the offsite dose rates would be consistent with the calculated offsite dose rates in Reference 1. Thus meeting the LCO requirements demonstrates that the dose rates are in compliance with 10 CFR Part 20 and 10 CFR Part 72 radiation protection requirements.

Note that the dose rates in Reference 1 are based on the TN-40HT cask design and conservatively bound operations with a mixture of TN-40 and TN-40HT casks. Thus the LCO may be applied to either a TN-40 or TN-40HT cask.

APPLICABILITY

Verification that exterior cask surface dose rates, at the specified locations, are less than the limits is performed during LOADING OPERATIONS. This verification occurs prior to TRANSPORT OPERATIONS and STORAGE OPERATIONS.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the dose rates of one cask is independent of the dose rates of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If any of the four specified exterior surface dose rates are in excess of the specified limit, a specific analysis demonstrating compliance with 10 CFR Part 20 and 10 CFR Part 72 radiation protection requirements is to be performed prior to TRANSPORT OPERATIONS.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.2.2.1

This Surveillance is modified by a Note. The Note clarifies that performing the Surveillance is not required, and thus SR 3.0.4 does not apply, prior to the specified Frequency.

This SR verifies that a cask exterior surface dose rate, in each of the four specified locations, is less than the respective specified dose rate limit for that location. The Frequency requires performing the verification once prior to TRANSPORT OPERATIONS. This Frequency is adequate to confirm that a cask is in compliance with 10 CFR Part 20 and 10 CFR Part 72 radiation protection requirements and can be moved to the ISFSI.

REFERENCES

1. SAR Section A7.

B 3.3 CASK CRITICALITY CONTROL

B 3.3.1 Dissolved Boron Concentration

BASES

BACKGROUND

The casks are designed to maintain the fuel sub-critical under all postulated fuel arrangements with the effective neutron multiplication factor (k_{eff}), including statistical uncertainties, of ≤ 0.95 (Reference 1). To counteract neutron moderation by water, water placed in the cask is to be borated water to provide the additional neutron absorption necessary to maintain the k_{eff} within the limit.

APPLICABLE SAFETY ANALYSIS

During LOADING OPERATIONS and UNLOADING OPERATIONS, the methods for criticality control rely on borated water used to fill the cask cavity. The borated water provides the additional neutron absorption to counteract the neutron moderating effect of water. Providing a boron concentration of the water in the spent fuel pool water and therefore the cask cavity water at or above the limit, prior to cask loading prevents violation of the criticality design criterion. Criticality analyses were performed for a TN-40HT cask assuming fresh fuel with an initial enrichment of 5.0 weight percent U-235 with all the cavity voids filled with 2450 ppm borated water and reflected all around by water. Analyses assume the fraction of boron-10 in the solution to be that of naturally-occurring boron.

The boron concentration limit established for SR 3.3.1.2 was derived from the criticality analyses for the TN-40HT and conservatively bounds the boron requirements for a TN-40 cask. Thus it is conservatively applied to TN-40 loading activities.

BASES (continued)

LCO

The water in the cask cavity must have a boron concentration greater than the limit. The minimum boron concentration limit ensures sub-critical conditions under design basis loading conditions in the cask.

APPLICABILITY

The boron concentration of the water in the cask cavity must be within its limit whenever there is water in the cask cavity. This condition occurs during LOADING OPERATIONS and UNLOADING OPERATIONS.

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the dissolved boron concentration of one cask is independent of the dissolved boron concentration of subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the dissolved boron concentration in the spent fuel pool and therefore, the cask cavity, is not within limit, loading of any additional fuel assemblies into the cask must be stopped. Without the required concentration of dissolved boron in the water, maintaining the sub-criticality limit in all conditions can not be guaranteed. The immediate Completion Time reflects the importance of prohibiting the introduction of any potential positive reactivity addition into the cask cavity without the required boron concentration.

BASES

ACTIONS (continued)

A.2

If the dissolved boron concentration in the spent fuel pool and therefore, the cask cavity, is not within the limit, all fuel assemblies must be removed from the cask. Removal of fuel from the cask places the cask in a condition where this LCO is no longer applicable. The 24-hour Completion Time takes into consideration the time necessary to unload a fully loaded cask.

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1

This SR specifically applies to LOADING OPERATIONS. The boron concentration of the spent fuel pool water is determined prior to commencing cask loading using chemical analysis of two samples analyzed by different individuals (per the requirements of License Condition 15G) to reduce the risk that a single error could lead to not meeting the LCO.

The requirement to verify the boron concentration within 4 hours prior to commencing LOADING OPERATIONS ensures that the water added to the cask is within the limit. The Frequency is based on the operating experience that boron concentration changes occur very slowly.

SR 3.3.1.2

This Surveillance is modified by a Note. The Note clarifies that meeting the Surveillance is not required, and thus there is not a failure to meet the LCO per SR 3.0.1 and SR 3.0.4 does not apply, prior to the specified Frequency.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.1.2 (continued)

This SR specifically applies to UNLOADING OPERATIONS. The boron concentration is analyzed as described above in SR 3.3.1.1. The requirement to verify the boron concentration within 4 hours prior to flooding the cask for UNLOADING OPERATIONS ensures that the water added to the cask cavity is within the limit. The Frequency is based on operating experience the boron concentration changes very slowly.

REFERENCES

1. SAR, Section A3.3.

B 3.4 CASK FUEL LOADING CONTROL

B 3.4.1 Fuel Stored in a Cask

BASES

BACKGROUND	The cask design is based upon certain spent fuel assembly parameters, including fuel type, fuel assembly weight, initial enrichment, maximum burnup, and minimum cooling time. These spent fuel parameters are used in the thermal, structural, radiological, and criticality evaluations performed for the cask. To assure that the spent fuel assemblies to be placed in casks do not exceed these design parameters, functional and operational limits are established for the selected fuel assemblies. The functional and operational limits are established to protect the integrity of the fuel clad barrier and the public from radioactive materials in effluents and direct radiation levels associated with cask operation. Prior to fuel assembly storage in a cask, fuel assemblies are to meet the established Functional and Operating Limits specified in Sections 2.1 through 2.3. Compliance with these limits is to be demonstrated by verification and documentation of the characteristics of each fuel assembly to be stored in a cask.
APPLICABLE SAFETY ANALYSIS	The established Functional and Operating Limits specified in Sections 2.1 through 2.3 are based upon the input parameters used for the various analyses for cask design including fuel thermal, criticality, structural, shielding, and confinement analyses.
LCO	Verification that fuel assembly characteristics are in accordance with the established functional and operating limits will ensure that the safety analyses bound the fuel being loaded.
APPLICABILITY	The verification of fuel assembly compliance with the established functional and operating limits is applicable prior to LOADING OPERATIONS.

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each cask. This Note is acceptable because the fuel loading into one cask is independent of the fuel loaded in subsequent casks or adjacent casks. The Required Actions for each Condition provide appropriate compensatory actions for each cask not meeting the LCO. Subsequent casks that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If a fuel assembly, previously placed in a cask, is found to not meet the specified functional and operating limits, the fuel assembly is to be immediately removed from the cask. The immediate Completion Time reflects the importance of maintaining the protection and integrity of the fuel clad barrier as well as the public from radioactive materials in effluents and direct radiation levels associated with cask operation by only storing fuel in accordance with cask design requirements.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This Surveillance is modified by a Note. The Note clarifies that performing the Surveillance is not required, and thus SR 3.0.4 does not apply, prior to the specified Frequency.

This SR applies prior to inserting the fuel into the cask. The spent fuel assembly compliance with the Functional and Operating Limits is to be demonstrated by administrative verification. This verification applies to fuel assemblies as well as BPRA's or TPD's. Per the requirements of License Condition 15F, satisfying the Functional and Operating Limits shall be independently verified by an individual other than the original individual making the selections. The Frequency is selected to ensure only fuel meeting cask design requirements is inserted into a cask.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.1.2

This Surveillance is modified by a Note. The Note clarifies that performing the Surveillance is not required, and thus SR 3.0.4 does not apply, prior to the specified Frequency.

The spent fuel assembly identity is to be verified once prior to inserting in a cask and once again prior to final closure of the cask. The fuel assembly and insert identity shall be independently verified. This verification applies to fuel assemblies as well as BPRA's or TPD's. The Frequency is selected to ensure only fuel meeting cask design requirements are inserted into a cask.

REFERENCES None.