TN-68 GENERIC TECHNICAL SPECIFICATIONS
AMENDMENT NO. 1

TABLE OF CONTENTS

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 CHANNEL OPERATIONAL TEST (COT) shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify the operability of required alarm functions. The COT shall include adjustments, as necessary, of the alarm setpoint so that the setpoint is within the required range and accuracy.
HANDLED BY NORMAL MEANS	HANDLED BY NORMAL MEANS refers to fuel assemblies/bundles that can be transferred within the spent fuel pool, cask pit and cask by the use of the normal station fuel handling equipment and procedures.
INTACT FUEL ASSEMBLY	An INTACT FUEL ASSEMBLY is a spent nuclear fuel assembly without known or suspected cladding defects greater than pinhole leaks or hairline cracks and which can be HANDLED BY NORMAL MEANS. Partial fuel assemblies, that is spent fuel assemblies from which fuel rods are missing, shall not be classified as INTACT FUEL ASSEMBLIES unless dummy fuel rods are used to displace an amount of water equal to or greater than that displaced by the original fuel rod(s). Fuel with damage to spacer grids that renders the fuel outside its design and licensing basis for use in the reactor shall not be classified as an INTACT FUEL ASSEMBLY.
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 from 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 spent fuel is sitting on a storage pad within the ISFSI.

(continued)

1.1 Definitions (continued)

TRANSPORT OPERATIONS	TRANSPORT OPERATIONS include all licensed activities performed on a cask loaded with one or more fuel assemblies when it is being moved to and 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 from the transporter.
UNLOADING OPERATIONS	UNLOADING OPERATIONS include al 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 indentions 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.
EXAMPLES	The following examples illustrate the use of logical connectors.

(continued)

1.2 Logical Connectors

EXAMPLES (continued)

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.

(continued)

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 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 Times(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., 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 Condition 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.

(continued)

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

(continued)

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 AND	Perform Action B.1.	12 hours
	B.2	Perform Action B.2.	36 hours

When a system is determined to not meet the LCO, Condition A is entered. If the system is not restored 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.

(continued)

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-3

ACTIONS

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

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. LCO not met.	A.1	Restore compliance with LCO.	4 hours
B. Required Action and associated Completion Time not met.	B.1 AND	Perform Action B.1.	12 hours
	B.2	Perform Action B.2.	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 component, and Completion Times tracked on a per component basis. When a component is determined to not meet the LCO, Condition A is entered and its Completion Time starts. If subsequent components are determined to not meet the LCO, Condition A is entered for each component and separate Completion Times start and are tracked for each component.

(continued)

1.3 Completion Times (continued)

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 modify performance requirements.

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, 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. SR 3.0.4 restrictions would not apply if both the following conditions are satisfied:

a. The Surveillance is not required to be performed; and

b. The Surveillance is not required to be met or, even if required to be met, is not known to be failed.

(continued)

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 interval specified in the 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 inoperable, a variable is outside specified limits, or the cask is outside the Applicability of the LCO). If the interval specified by SR 3.0.2 is exceeded while the cask is in a condition specified in the Applicability of the LCO, the LCO is not met in accordance with SR 3.0.1.

If the interval as specified by SR 3.0.2 is exceeded while the cask 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.

(continued)

1.4 Frequency

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 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.

2.0 FUNCTIONAL AND OPERATIONAL LIMITS

2.1 Functional and Operational Limits

2.1.1 Fuel to be Stored in the TN-68 Cask

The spent nuclear fuel to be stored in the TN-68 cask shall meet the following requirements:

A. Fuel shall be unconsolidated INTACT FUEL ASSEMBLIES except that up to 8 fuel assemblies with damage consisting of known or suspected cladding defects greater than pinholes or hairline cracks may be stored subject to the following limitations:
   i. they must be HANDLED BY NORMAL MEANS
   ii. they must be stored in a basket configured for damaged fuel, in the designated compartments shown in Figure 2.1.1-1, with end caps installed top and bottom,
   iii. there must be no missing fuel pins or fuel pin segments, and
   iv. assembly average burnup is limited to $\leq$45 GWd/MTU.

B. Fuel shall be limited to fuel with Zircaloy cladding. Fuel having stainless steel replacement rods may be stored provided that a shielding analysis demonstrates that the dose rate contribution from such rods is bounded by the design basis fuel rods.

C. Fuel shall be limited to the following fuel types or equivalents by other manufacturers with the following unirradiated specifications:

Assembly Type		Designation	#of Fuel Rods	Max Rod Pitch	Min Rod OD	Max Uranium Content (MTU/assy)
GE	7x7	2,2A,2B	49	0.738	0.563	0.1977
GE	7x7	3,3A,3B	49	0.738	0.563	0.1923
GE	8x8	4,4A,4B	63	0.640	0.493	0.1880
GE	8x8	5,6,6B,7,7B	62	0.640	0.483	0.1876
GE	8x8	8,8B	62	0.640	0.483	0.1885
GE	8x8	8,8B,9,9B,10	60	0.640	0.463	0.1824
GE	9x9	11,13	74	0.566	0.440	0.1757
GE	10x10	12	92	0.510	0.404	0.1857

Fuel designs 6, 6B, 7 and 7B may also be designated as P, B or BP. Fuel designs may be C, D or S lattice only.

D. Fuel assemblies may be channeled or unchanneled. Channel thickness up to 0.120 inches thick are acceptable.

E. 7x7 fuel assemblies shall have the bounding characteristics specified in Table 2.1.1-1.

(continued)

2.1 Functional and Operational Limits (continued)

F. 8x8, 9x9, and 10x10 fuel assemblies shall be selected using the flow chart in Figure 2.1.1-2.

G. All fuel assemblies shall have the following bounding characteristics:
   i. maximum initial enrichment per Table 2.1.1-2
   ii. The maximum weight per individual assembly shall be 705 pounds.

2.2 Functional and Operational Limits Violations

If any Functional and Operational Limit of 2.1.1 is violated, the following actions shall be completed:

2.2.1 The affected fuel assemblies shall be removed from the cask and placed in a safe condition.

2.2.2 Within 24 hours, notify the NRC Operations Center.

2.2.3 Within 30 days, a special report shall be submitted to the NRC which describes the cause of the violation and the actions taken to restore compliance and prevent recurrence.

Table 2.1.1-1

Minimum Acceptable Cooling Time as a
Function of Max. Burnup and Min. Initial Enrichment for 7x7 Fuel

REQUIRED BWR COOLING TIMES (YEARS)													
Min.Init. Enrich. (1)	Maximum Burnup (GWd/MTU) (2)												
(bundle ave %w)(3)	15	20	30	32	33	34	35	36	37	38	39	40	
1.0	10	10											
1.1	10	10											
1.2	10	10											
1.3	10	10											
1.4	10	10											
1.5	10	10	10	10	11	11	11						
1.6	10	10	10	10	10	11	11	11					
1.7	10	10	10	10	10	11	11	11	12				
1.8	10	10	10	10	10	11	11	11	11	12			
1.9	10	10	10	10	10	11	11	11	11	12			
2.0	10	10	10	10	10	10	11	11	11	12	12		
2.1	10	10	10	10	10	10	11	11	11	12	12	12	
2.2	10	10	10	10	10	10	11	11	11	12	12	12	
2.3	10	10	10	10	10	10	11	11	11	11	12	12	
2.4	10	10	10	10	10	10	10	11	11	11	12	12	
2.5	10	10	10	10	10	10	10	11	11	11	12	12	
2.6	10	10	10	10	10	10	10	11	11	11	12	12	
2.7	10	10	10	10	10	10	10	10	11	11	11	12	
2.8	10	10	10	10	10	10	10	10	10	11	11	12	
2.9	10	10	10	10	10	10	10	10	10	11	11	12	
3.0	10	10	10	10	10	10	10	10	10	10	11	12	
3.1	10	10	10	10	10	10	10	10	10	10	11	12	
3.2	10	10	10	10	10	10	10	10	10	10	10	11	
3.3	10	10	10	10	10	10	10	10	10	10	10	10	
3.4	10	10	10	10	10	10	10	10	10	10	10	10	
3.5	10	10	10	10	10	10	10	10	10	10	10	10	
3.6	10	10	10	10	10	10	10	10	10	10	10	10	
3.7	10	10	10	10	10	10	10	10	10	10	10	10	
	- not evaluated												

1. Round actual value down to next lower tenth.
2. Round actual value up to next higher GWd/MTU.
3. Average over entire bundle including uranium blankets.
4. A decay heat limit of 312 W/assembly is included in the table basis.

Table 2.1.1-2

Enrichment Limit as a Function of Basket Type

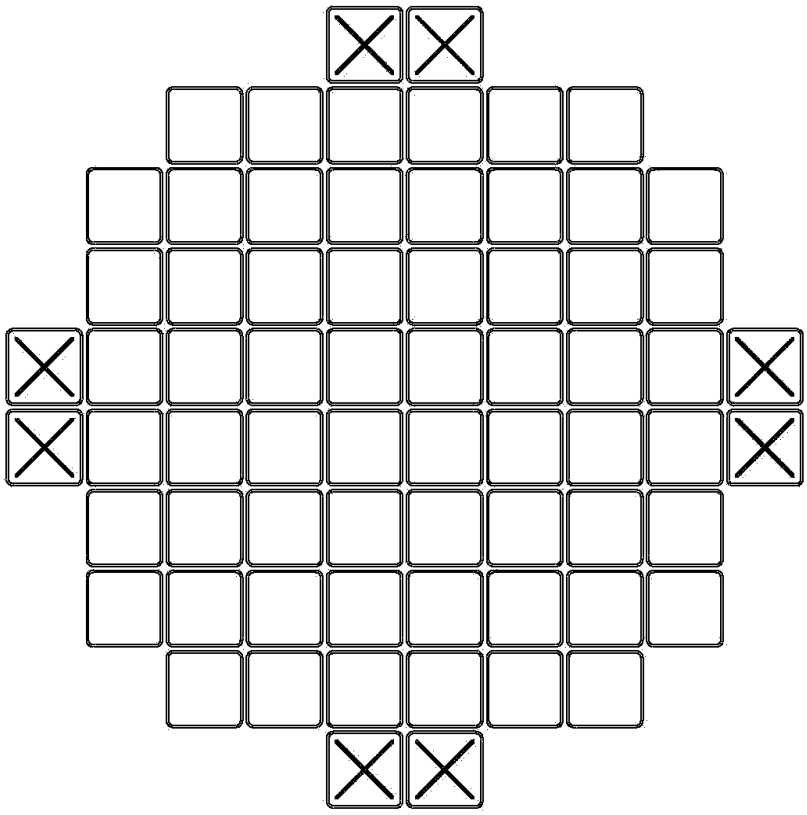
Specified Minimum B10 Areal Density (mg B10/cm^2) in Basket		Intact Fuel Maximum Lattice Average Enrichment (wt % U235)	Damaged Fuel Maximum Pellet Enrichment (wt % U235)	Basket Designator
Boral® 75% B10 credit	Borated Aluminum and Metal Matrix Composites 90% B10 credit			
36	30	3.7	3.7	(none)
42	35	3.95	3.95	A
48	40	4.05	4.05	B
54	45	4.15	4.15	C
60	50	4.3	4.3	D
66	55	4.4	4.4	E
72	60	4.5	4.5	F
84	70	4.7	4.7	G

Notes:

1. The basket designator is included in the unit serial number
2. The maximum pellet enrichment is the enrichment of the most highly enriched rod in the most highly enriched lattice

Figure 2.1.1-1

Location of Damaged Fuel Compartments

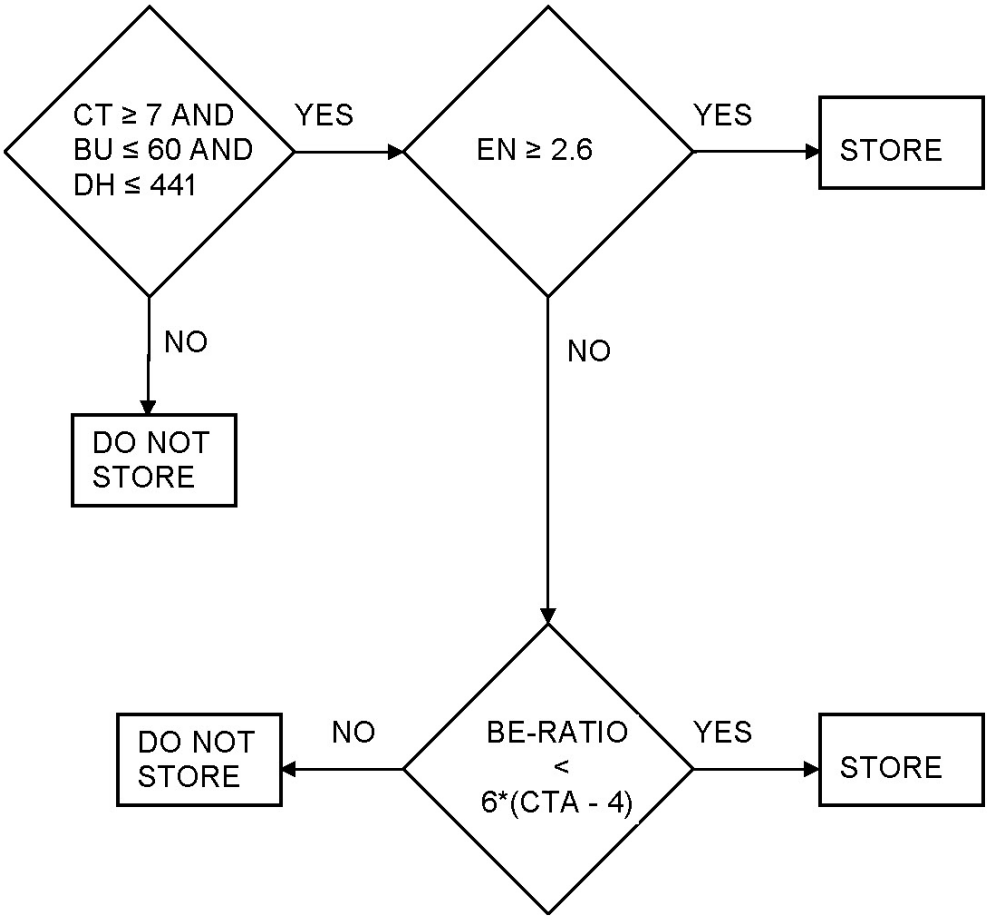


Note:

Damaged fuel is to be stored only in a basket configured with damaged fuel compartment extensions at the locations marked with an X.

Figure 2.1.1-2

Flowchart for Selection of 8x8, 9x9, and 10x10 Fuel



CT = Cooling Time in years
CTA = CT rounded down to the nearest Integer
BU = Burnup in GWd/MTU
EN = Enrichment in wt % U235
DH = Decay Heat in Watts
BE-RATIO = Burnup to Enrichment ratio

Notes:

1. Decay heat per formula on following page, or any method that yields equivalent or more conservative (higher) results
2. Burnup and enrichment are bundle average, including axial blankets

(continued)

Figure 2.1.1-2, continued

The Decay Heat (DH) in watts is expressed as:

DH = F1*Exp({[1-(6.0/X3)]*G}*[(X3-6.0)H]*[(X2/X1)I])

where

$F1 = A + B*X1 + C*X2 + D*X1^2 + E*X1*X2 + F*X2^2$

and

X1 = Bundle Average Burnup in GWd/MTU
X2 = Initial Enrichment in wt % U235
X3 = Cooling Time in Years

A = 11.489825
B = 6.573922
C = 5.364592
D = 0.112665
E = -1.248752
F = 4.262201
G = -0.354672
H = 0.114847
I = -0.188754

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 Not applicable to a cask.

LCO 3.0.4 When an LCO is not met, entry into a specified condition in the Applicability shall not be made except when the associated ACTIONS to be entered permit continued operation in the specified condition in the Applicability for an unlimited period of time. 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 the cask.

Exceptions to this are stated in the individual Specifications. These exceptions allow entry into specified conditions in the Applicability when the associated ACTIONS to be entered allow operation in the specified condition in the Applicability only for a limited period of time.

LCO 3.0.5 Equipment removed from service or declared to not meet the LCO to comply 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.

LCO 3.0.6 Not applicable to a cask.

LCO 3.0.7 Not applicable to a cask.

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 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.
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 less. This delay period is permitted to allow performance of the Surveillance. 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 not be made unless the LCO's Surveillances have been met within their specified Frequency. 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 sustained at or below 4 mbar absolute for a period of at least 30 minutes after isolation from the vacuum drying system.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
-------NOTE------- Not applicable until SR 3.1.1.1 is performed. ---------- A. Cask cavity vacuum drying pressure limit not met.	-------NOTE---------- Action A.1 applies until *a gas other than helium is introduced into the cask* for subsequent operations. ---------- A.1 Achieve or maintain a nominal helium environment in the cask. <u>AND</u> A.2 Establish cask cavity drying pressure within limits.	*6* hours *Prior to helium backfill (SR 3.1.2.1)*
B. Required Action A.1 and associated Completion Time not met.	B.1 *Return cask to pool and reflood.*	7 days
C. Required Action A.2 and associated Completion Time not met.	C.1 *Return cask to pool and reflood.*	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	Verify that the equilibrium cask cavity vacuum drying pressure is brought to ≤ 4 mbar absolute for ≥ 30 minutes	*< 22 kW:* *Once, prior to helium backfill (SR 3.1.2.1)* *≥ 22 kW:* *Once, within 24 hours of completion of cask draining.* *or* *Once, prior to helium backfill (SR 3.1.2.1), if cask is evacuated to < 50 mbar and backfilled with helium anytime prior to 24 hours from draining.*

3.1 CASK INTEGRITY

3.1.2 Cask Helium Backfill Pressure

LCO 3.1.2 The cask cavity shall be filled with helium to a pressure of 2.0 atm absolute (+0/-10%).

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
-------NOTE------- Not applicable until SR 3.1.2.1 is performed. ---------- 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 ---------- A.1 Achieve or maintain a nominal helium environment in the cask AND A.2 Establish cask cavity backfill pressure within limits.	*Immediately* *Prior to leak testing (SR 3.1.3.1)*
B. Required Action A.1 and Associated Completion Time not met.	B.1 *Return cask to pool and reflood.*	7 days
C. Required Action A.2 and associated Completion Time not met.	C.1 *Return cask to pool and reflood.*	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2.1	Verify that the cask cavity helium pressure is 2.0 atm absolute (+0/-10%).	*< 22 kW:* Once, *prior to leak testing (SR 3.1.3.1)* *≥ 22 kW:* *Once, within 30 hours of completion of cask draining.* *or* *Once, prior to leak testing (SR 3.1.3.1) if the cask is backfilled with helium after vacuum drying (SR 3.1.1.1).*

3.1 CASK INTEGRITY

3.1.3 Cask Helium Leak Rate

LCO 3.1.3 The combined helium leak rate for all closure seals shall not exceed 1.0 E-5 ref-cc/sec.

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
------NOTE------- Not applicable until SR 3.1.3.1 is performed. ---------- 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 pool and reflood.*	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.3.1 Verify cask helium leak rate is within limit.	Once, prior to TRANSPORT OPERATIONS.

3.1 CASK INTEGRITY

3.1.4 Combined Helium Leak Rate

LCO 3.1.4 The combined helium leak rate for all closure seals and the overpressure system shall not exceed 1.0 E-5 ref-cc/sec.

APPLICABILITY: During STORAGE OPERATIONS.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
-------NOTE------- Not applicable until SR 3.1.4.1 is performed. ---------- A. Combined helium leak rate not met.	A.1 Establish combined helium leak rate within limit.	48 hours
B. Required Action A.1 and Associated Completion Time not met.	B.1 *Return cask to spent fuel unloading facility*	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
----------NOTE---------- This surveillance may be combined with SR 3.1.3.1. ----------	Once, prior to TRANSPORT OPERATIONS
SR 3.1.4.1 Verify the combined helium leak *r*ate is within the limit.	OR Once within 48 hours of commencing STORAGE OPERATIONS.

3.1 CASK INTEGRITY

3.1.5 Cask Interseal Pressure

LCO 3.1.5 Cask interseal pressure shall be maintained at a pressure of at least 3.0 atm absolute.

APPLICABILITY: During 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	Restore 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 unloading facility*	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.5.1	Verify cask interseal helium pressure above limit.	7 days
SR 3.1.5.2	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 36 months

3.1 CASK INTEGRITY

3.1.6 Cask Minimum Lifting Temperature

LCO 3.1.6 The loaded cask shall not be lifted if the outer surface of the cask is below -20°F.

APPLICABILITY: During TRANSPORT OPERATIONS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask surface temperature below limit.	A.1 Lower cask to safe position.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
--- NOTE: This surveillance does not need to be performed if temperature is known to be above freezing. --- SR 3.1.6.1 Verify outer surface temperature is above limit.	Once, immediately prior to lifting cask and prior to cask transfer to or from ISFSI

3.2 CASK RADIATION PROTECTION

3.2.1 Cask Surface Contamination

LCO 3.2.1 Removable contamination on the cask exterior surfaces shall not exceed:

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.

APPLICABILITY: During LOADING OPERATIONS.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
------NOTE------- Not applicable until SR 3.2.1.1 is performed. ---------- A. Removable contamination on the cask exterior surface exceeds either limit.	A.1 Decontaminate cask surfaces to below required levels.	Prior to TRANSPORT OPERATIONS.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.1.1	Verify that the removable contamination on the exterior surface of the cask does not exceed the specified limits.	Once, prior to TRANSPORT OPERATIONS

4.0 DESIGN FEATURES

The Specifications in this section include the design characteristics of special importance to each of the physical barriers and to maintenance of safety margins in the cask design. The principle objective of this category is to describe the design envelope that constrains any physical changes to essential equipment. Included in this category are the site environmental parameters which provide the bases for design, but are not inherently suited for description as LCOs.

4.1 Storage Cask

4.1.1 Criticality

The design of the storage cask, including spatial constraints on adjacent assemblies (minimum basket opening of 5.97 inches by 5.97 inches) and boron content of the basket material (minimum areal density per Table 2.1.1-2) shall ensure that fuel assemblies are maintained in a subcritical condition with a k_{eff} of less than 0.95 under all conditions of operation.

Neutron Absorber Tests

Boron Aluminum Alloy (Borated Aluminum), Boron Carbide/Aluminum Metal Matrix Composites (MMCs) or Boral® shall be supplied in accordance with FSAR sections 9.1.7.1, 9.1.7.2, 9.1.7.3, 9.4.2, 9.4.3.5, and 9.4.4.3. These sections of the FSAR are hereby incorporated into the TN-68 CoC.

4.1.2 Structural Performance

The cask has been evaluated for a cask tipover (equivalent to a side drop of 65 g's) and a bottom end drop resulting in an axial gravitational (g) loading of 60 g's.

4.1.3 Codes and Standards

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, 1995 Edition with Addenda through 1996, is the governing Code for the TN-68 Cask, except that the material properties from later editions of Section II Part D may be used for design. The TN-68 cask confinement 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 4.1-1.

The TN-68 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 4.1-1.

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

Proposed alternatives to ASME Code Section III, 1995 Edition with Addenda through 1996 including exceptions allowed by Table 4.1-1 may be used when authorized by the Director of the Office of Nuclear Material Safety and Safeguards or Designee. The applicant should demonstrate that:

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

2. Compliance with the specified requirements of ASME Code Section III, 1995 Edition with Addenda through 1996, 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 should be submitted in accordance with 10 CFR 72.4.

4.1.4 Helium Purity

The cask shall be filled with helium with a purity of at least 99.99%. This level of purity will ensure that the residual impurities in the cask cavity will be less than 1 mole.

4.2 Storage Pad

4.2.1 Storage Locations for Casks

Casks shall be spaced a minimum of 14 feet apart, center to center. This minimum spacing will ensure the proper dissipation of radiant heat energy from an array of casks as assumed in the TN-68 Safety Analysis Report.

The casks may be spaced more closely if the Certificate Holder or Licensee performs a thermal analysis, in accordance with the methodology described in Section 4.10.1.2 of the SAR, to demonstrate that the cask surface temperature will not exceed 255°F under the site specific ambient temperatures and the cask contents' decay heat; but in no case casks can be spaced closer than 12 feet on center.

4.3 ISFSI Specific Parameters and Analyses

ISFSI specific parameters and analyses that shall need verification by the system user are, as a minimum, as follows:

1. Tornado maximum wind speeds: 360 mph

2. Flood levels up to 57 feet and drag forces up to 45,290 lbs.

3. Seismic loads on the ISFSI pad of up to 0.26g horizontal and 0.17g vertical.

4. Average daily ambient temperatures: $\geq$ -20°F minimum; $\leq$100°F maximum

5. The potential for fires and explosions shall be addressed, based on site-specific considerations. Fires and explosions should be bounded by the cask design bases parameters of 200 gallons of fuel (in the tank of the transporter vehicle) and an external pressure of 25 psig.

6. Supplemental Shielding: In cases where engineered features (i.e. berms, shield walls) are used to ensure that the requirements of 10 CFR 72.104(a) are met, such features are to be considered Important to Safety and must be evaluated to determine the applicable Quality Assurance Category.

Table 4.1-1

TN-68 ASME Code Exceptions

The cask confinement boundary is designed, fabricated and inspected in accordance with the ASME Code Subsection NB to the maximum practical extent. The basket is designed, fabricated and inspected in accordance with ASME Code Subsection NG to the maximum practical extent. The gamma shielding, which is primarily for shielding, but also provides structural support to the confinement boundary during accident events, was designed in accordance with Subsection NF of the code. Inspections of the gamma shielding are performed in accordance with ASME code Subsection NF as detailed in the SAR. Other cask components, such as the protective cover, outer shell and neutron shielding are not governed by the ASME Code.

Component	Reference ASME Code/Section	Code Requirement	Exception, Justification & Compensatory Measures
TN-68 Cask *and Basket*	NB/*NG* -1100/ Subsection NCA NB/*NG* - 2000	Stamping and preparation of reports by the Certificate Holder, Surveillances, Use of ASME Certificate Holders	The TN-68 cask is not N stamped, nor is there a code design specification or stress report generated. A design criteria document is generated in accordance with TN's QA Program and the design and analysis is performed under TN's QA Program and presented in the SAR. The cask may also be fabricated by other than N-stamp holders and materials may be supplied by other than ASME Certificate holders. Surveillances are performed by TN and utility personnel rather than by an Authorized Nuclear Inspector (ANI)
TN-68 Cask *and Basket*	NCA-3800	QA Requirements	The quality assurance requirements of NQA-1 or 10 CFR 72 Subpart G are imposed in lieu of NCA-3800 requirements.
Lid Bolts	NB-3232.3	Fatigue analysis of bolts	A fatigue analysis of the bolts is not performed for storage, since the bolts are not subject to significant cyclical loads.

Table 4.1-1
TN-68 ASME Code Exceptions

Component	Reference ASME Code/Section	Code Requirement	Exception, Justification & Compensatory Measures
Confinement Vessel	NB-6200	Hydrostatic Testing	The confinement vessel is hydrostatically tested in accordance with the requirements of the ASME B&PV Code, Section III, Article NB-6200 with the exception that the confinement vessel is installed in the gamma shield shell during testing. The confinement vessel is supported by the gamma shield during all design and accident events.
Weld of bottom inner plate to the confinement shell	NB-5231	Full penetration corner welded joints require the fusion zone and the parent metal beneath the attachment surface to be UT after welding.	The required UT inspection will be performed on a best efforts basis. The joint will be examined by RT and either PT or MT methods in accordance with ASME Subsection NB requirements. The joint may be welded after the confinement shell is shrink fitted into the gamma shield shell. The geometry of the joint may not allow for UT inspection.
Confinement 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.
Confinement Vessel	NB-7000	Vessels are required to have overpressure protection	No overpressure protection is provided. Function of confinement vessel is to contain radioactive contents under normal, off-normal and accident conditions of storage. Confinement vessel is designed to withstand maximum internal pressure considering 100% fuel rod failure and maximum accident temperatures.

Table 4.1-1
TN-68 ASME Code Exceptions

Component	Reference ASME Code/Section	Code Requirement	Exception, Justification & Compensatory Measures
Confinement Vessel *and Basket*	NB/*NG*-8000	Requirements for nameplates, stamping and reports per NCA-8000	TN-68 cask is to be marked and identified in accordance with 10 CFR72 requirements. Code stamping is not required. QA data package to be in accordance with Transnuclear approved QA program.
Confinement Vessel	NB-1131	The design specification shall define the boundary of a component to which other component is attached.	A code design specification was not prepared for the TN-68 cask. A TN design criteria was prepared in accordance with TN's QA program. The confinement boundary is specified in Chapter 1 of the SAR.
Basket poison and aluminum plates	NG-2000	Use of ASME Materials	The poison material and the aluminum plates are not used for structural analysis, but to provide criticality control and heat transfer. They are not code materials.
Basket Rails	NG-2000	Use of ASME Materials	The fuel basket rail material is not a Class 1 material. It was selected for its properties. Aluminum has excellent thermal conductivity and a high strength to weight ratio. NUREG-3854 and 1617 allow materials other than ASME Code materials to be used in the cask fabrication. ASME Code does provide the material properties for the aluminum alloy up to 400°F and also allows the material to be used for Section III applications (Class 2 and 3). The construction of the aluminum rails will meet the requirements of Section III, Subsection NG.

Table 4.1-1
TN-68 ASME Code Exceptions

Component	Reference ASME Code/Section	Code Requirement	Exception, Justification & Compensatory Measures
Basket Compartment longitudinal weld joint	NG-5231	Table NG-3352-1 specifies that in order to utilize a quality factor of 0.9 for a full penetration weld, examination must be in accordance with NG-5231. NG-5231 specifies that either a liquid penetrant or magnetic particle examination be performed "of the root, each subsequent layer, and on the external weld surfaces and adjacent base material for ½" on each side of the weld."	*If these welds are made in a single pass, the requirement of NG-5231 is satisfied by surface examination on the outside of the compartment, and the inside for one diameter's length from each end. Automated autogenous PAW welds followed by autogenous GTAW in the same pass through the welding equipment may be regarded as a single pass in accordance with Code Case N-642.* *This is a clarification, not an exception.*

5.0 ADMINISTRATIVE CONTROLS

5.1 Training Module

Training modules shall be developed under the general licensee's training program as required by 10 CFR 72.212(b)(6). Training modules shall require a comprehensive program for the operation and maintenance of the TN-68 spent fuel storage cask and the independent spent fuel storage installation (ISFSI). The training modules shall include the following elements, at a minimum:

- TN-68 cask design (overview)
- ISFSI Facility design (overview)
- Systems, Structures, and Components Important to Safety (overview)
- TN-68 Dry Storage Cask Safety Analysis Report (overview)
- NRC Safety Evaluation Report (overview)
- Certificate of Compliance conditions
- TN-68 Technical Specifications
- Applicable Regulatory Requirements (e.g.,10 CFR72, Subpart K, 10CFR 20, 10 CFR Part 73)
- Required Instrumentation and Use
- Operating Experience Reviews
- TN-68 Cask Operating and Maintenance procedures, including:
  Fuel qualification and loading
  Rigging and handling
  Loading Operations as described in Chapter 8 of the SAR
  Unloading Operations including reflooding as described in Chapter 8 of the SAR
  Auxiliary equipment operations and maintenance (i.e. vacuum drying, helium backfilling and leak testing, reflooding)
  Transfer operations including loading and unloading of the Transport Vehicle
  ISFSI Surveillance operations
  Radiation Protection
  Maintenance
  Security
  Off-normal and accident conditions, responses and corrective actions.

5.0 ADMINISTRATIVE CONTROLS

5.2 Programs

The following programs shall be established, implemented, and maintained.

5.2.1 Cask Sliding Evaluation

The TN-68 cask has been evaluated for sliding in the unlikely events of storm winds, missile impacts, flood forces and earthquakes. A static coefficient of 0.35 is used in these analyses. This program provides a means for evaluating the coefficient of friction to ensure that the cask will not slide during the seismic event.

a. Pursuant to 10 CFR 72.212, this program shall evaluate the site-specific ISFSI pad configurations/conditions to ensure that the cask would not slide during the postulated design basis earthquake. The program shall conclude that the surface static friction coefficient of friction is greater than or equal to 0.35.

b. Alternatively, for site-specific ISFSI pad configurations/conditions with a lower coefficient of friction than 0.35, the program shall evaluate the site specific conditions to ensure that the TN-68 cask will not slide during the postulated design basis earthquake. The program shall also evaluate storm winds, missile impacts and flood forces to ensure that the cask will not slide such that it could result in impact with other casks or structures at the ISFSI. The program shall ensure that these alternative analyses are documented and controlled.

5.2.2 Cask Transport Evaluation Program

This program provides a means for evaluating various transport configurations and transport route conditions to ensure that the design basis drop limits are met.

a. Pursuant to 10 CFR 72.212, this program shall evaluate the site-specific transport conditions. The program shall evaluate the site-specific conditions to ensure that the end-drop loading does not exceed 60g. The program shall ensure that these analyses are documented and controlled.

b. This program shall establish administrative controls and procedures to ensure that cask TRANSPORT OPERATIONS are conducted within the limits imposed by the Technical Specifications or the alternative analysis described above.

5.2.3 Cask Surface Dose Rate Evaluation Program

This program provides a means to help ensure that ISFSI's using TN-68 casks do not violate the requirements of 10 CFR Part 72 and Part 20 regarding radiation doses and dose rates. The TN-68 design incorporates the use of an optional shield ring above the radial neutron shield. This shield ring may be installed to ensure that the dose rates meet the requirements identified below. The shield ring does not need to be installed on casks which have been surveyed and meet the dose rate limits identified in 5.2.3.2 and 5.2.3.3 without installation of the shield ring.

1. As part of its evaluation pursuant to 10 CFR 72.212, the licensee shall perform an analysis to confirm that the limits of 10 CFR Part 20 and 10 CFR 72.104 will be satisfied under the actual site conditions and configurations considering the planned number of casks to be used and the planned fuel loading conditions.

2. On the basis of the analysis in TS 5.2.3.1, the licensee shall establish a set of cask surface dose rate limits which are to be applied to TN-68 casks used at the site. Limits shall establish average gamma-ray and neutron dose rates for:

    a. The top of the TN-68 cask (protective cover),
    b. The sides of the radial neutron shield,
    c. The side of the cask above the radial neutron shield, and
    d. The side of the cask below the radial neutron shield.

3. Notwithstanding the limits established in TS 5.2.3.2, the dose rate limits may not exceed the following values as calculated for a content of design basis fuel as follows:

    a. *175* mr/hr gamma and *15* mr/hr neutron on the top (protective cover)
    b. *125* mr/hr gamma and *30* mr/hr neutron on the sides of the radial neutron shield.
    c. *550* mr/hr gamma and *125* mr/hr neutron on the side surfaces of the cask above the radial neutron shield.
    d. *400* mr/hr gamma and *300* mr/hr neutron on the side surfaces of the cask below the radial neutron shield.

4. Prior to transport of a TN-68 containing spent fuel to the ISFSI, the licensee shall measure the cask surface dose rates and calculate average values as described in TS 5.2.3.7 and 5.2.3.8.

    The measured average dose rates shall be compared to the limits established in TS 5.2.3.2 or the limits in TS 5.2.3.3, whichever are lower. When needed to meet this specification (TS 5.2.3), the optional *external shield ring* above the radial neutron shield is required to be in place.

5. If the measured average surface dose rates do not meet the limits of TS 5.2.3.2 or TS 5.2.3.3, whichever are lower, the licensee shall take the following actions:

    a. Notify the U.S. Nuclear Regulatory Commission (Director of the Office of Nuclear Material Safety and Safeguards) within 30 days.
    b. Administratively verify that the correct fuel was loaded, and
    c. Perform an analysis to determine that placement of the as-loaded cask at the ISFSI will not cause the ISFSI to exceed the radiation exposure limits of 10 CFR Part 20 and 72.

6. If the analysis in 5.2.3.5.c shows that placement of the as-loaded cask at the ISFSI will cause the ISFSI to exceed the radiation exposure limits of 10 CFR Part 20 and 72, the licensee shall remove all fuel assemblies from the cask within 30 days of the time of cask loading.

7. Surface dose rates shall be measured approximately at the following points (see also Figure 5.2.3-1).

    a. Above the Radial Neutron Shield (A): Midway between the top of the cask body flange and the top of the radial neutron shield. At least six measurements equally spaced circumferentially.

    b. Sides of Radial Neutron Shield (B,C,D): one sixth, one half, and five sixths of the distance from the top of the radial neutron shield. At least six measurements equally spaced circumferentially at each elevation, two of which shall be at the circumferential location of the cask trunnions. However, no measurement shall be taken directly over the trunnion.

    c. Below Radial Neutron Shield (E): Midway between the bottom of the radial neutron shield and the bottom of the cask. At least six measurements equally spaced circumferentially.

    d. Top of Cask (F, G, and H): At the center of the protective cover, one measurement (F). Halfway between the center and the knuckle at least four measurements equally spaced circumferentially (G). At the knuckle at least four measurements equally spaced circumferentially (H).

8. The average dose rates shall be determined as follows.

    In each of the four measurement zones in TS 5.2.3.7, the sum of the dose rate measurements is divided by the number of measurements to determine the average for that zone. The neutron and gamma-ray dose rates are averaged separately. Uniformly spaced dose rate measurement locations are chosen such that each point in a given zone represents approximately the same surface area.

Figure 5.2.3-1
Contact Dose Rate Measurement Locations