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Table 2.1-1 (page 1 of 4)
Fuel Assembly Limits

I. MPC MODEL: MPC-37

A. Allowable Contents

1. Uranium oxide PWR UNDAMAGED FUEL ASSEMBLIES, DAMAGED FUEL ASSEMBLIES, and/or FUEL DEBRIS meeting the criteria in Table 2.1-2, with or without NON-FUEL HARDWARE and meeting the following specifications (Note 1):

a. Cladding Type:	ZR
b. Maximum Initial Enrichment:	5.0 wt. % U-235 with soluble boron credit per LCO 3.3.1 OR burnup credit per Section 2.4
c. Post-irradiation Cooling Time and Average Burnup Per Assembly:	Cooling Time ≥ 3 years Assembly Average Burnup ≤ 68.2 GWD/MTU
d. Decay Heat Per Fuel Storage Location:	As specified in Section 2.3
e. Fuel Assembly Length:	≤ 199.2 inches (nominal design including NON-FUEL HARDWARE and DFC)
f. Fuel Assembly Width:	≤ 8.54 inches (nominal design)
g. Fuel Assembly Weight:	≤ 2050 lbs (including NON-FUEL HARDWARE and DFC)

Table 2.1-1 (page 2 of 4)
Fuel Assembly Limits

I. MPC MODEL: MPC-37 (continued)

B. Quantity per MPC: 37 FUEL ASSEMBLIES with up to twelve (12) DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS in DAMAGED FUEL CONTAINERS (DFCs). DFCs may be stored in fuel storage locations 3-1, 3-3 through 3-7, 3-10 through 3-14, and 3-16 (see Figure 2.1-1). The remaining fuel storage locations may be filled with PWR UNDAMAGED FUEL ASSEMBLIES meeting the applicable specifications. For MPCs utilizing burnup credit, the MPC and DFC loading configuration must also meet the additional requirements of Section 2.4.

C. One (1) Neutron Source Assembly (NSA) is authorized for loading in the MPC-37.

D. Up to thirty (30) BRPAs are authorized for loading in the MPC-37.

Note 1: Fuel assemblies containing BPRAs, TPDs, WABAs, water displacement guide tube plugs, orifice rod assemblies, or vibration suppressor inserts, with or without ITTRs, may be stored in any fuel storage location. Fuel assemblies containing APSRs, RCCAs, CEAs, CRAs, or NSAs may only be loaded in fuel storage Regions 1 and 2 (see Figure 2.1-1).

2.4 Burnup Credit

Criticality control during loading of the MPC-37 is achieved through either meeting the soluble boron limits in LCO 3.3.1 OR verifying that the assemblies meet the minimum burnup requirements in Table 2.4-1.

For those spent fuel assemblies that need to meet the burnup requirements specified in Table 2.4-1, a burnup verification shall be performed in accordance with either Method A OR Method B described below.

<u>Method A: Burnup Verification Through Quantitative Burnup Measurement</u>

For each assembly in the MPC-37 where burnup credit is required, the minimum burnup is determined from the burnup requirement applicable to the loading configuration chosen for the cask (see Table 2.4-1). A measurement is then performed that confirms that the fuel assembly burnup exceeds this minimum burnup. The measurement technique may be calibrated to the reactor records for a representative set of assemblies. The assembly burnup value to be compared with the minimum required burnup should be the measured burnup value as adjusted by reducing the value by a combination of the uncertainties in the calibration method and the measurement itself.

<u>Method B: Burnup Verification Through an Administrative Procedure and Qualitative Measurements</u>

Depending on the location in the basket, assemblies loaded into a specific MPC-37 can either be fresh, or have to meet a single minimum burnup value. The assembly burnup value to be compared with the minimum required burnup should be the reactor record burnup value as adjusted by reducing the value by the uncertainties in the reactor record value. An administrative procedure shall be established that prescribes the following steps, which shall be performed for each cask loading:

- Based on a review of the reactor records, all assemblies in the spent fuel pool that have a burnup that is below the minimum required burnup of the loading curve for the cask to be loaded are identified.
- After the cask loading, but before the release for shipment of the cask, the presence and location of all those identified assemblies is verified, except for those assemblies that have been loaded as fresh assemblies into the cask.
- An independent, third-party verification of the loading process, including the fuel selection process and generation of the fuel move instructions

Additionally, for all assemblies to be loaded that are required to meet a minimum burnup, a qualitative verification shall be performed that verifies that the assembly is not a fresh assembly.

TABLE 2.4-1

POYNOMIAL FUNCTIONS FOR THE MINIMUM BURNUP AS A FUNCTION OF INITIAL ENRICHMENT

Assembly Classes	Configuration[1]	Cooling Time, years	Minimum Burnup (GWd/mtU) as a Function of the Initial Enrichment (wt% ^{235}U)
15x15B, C, D, E, F, H, I and 17x17A, B, C, D, E	Uniform	≥3.0 and <7.0	f(x) = -7.9224e-02 * x^3 -7.6419e-01 * x^2 +2.2411e+01 * x^1 -4.1183e+01
		≥7.0	f(x) = +1.3212e-02 * x^3 -1.6850e+00 * x^2 +2.4595e+01 * x^1 -4.2603e+01
	Regionalized	≥3.0 and <7.0	f(x) = +3.6976e-01 * x^3 -5.8233e+00 * x^2 +4.0599e+01 * x^1 -5.8346e+01
		≥7.0	f(x) = +3.3423e-01 * x^3 -5.1647e+00 * x^2 +3.6549e+01 * x^1 -5.2348e+01
16x16A, B, C	Uniform	≥3.0 and <7.0	f(x) = -1.0361e+00 * x^3 +1.1386e+01 * x^2 -2.9174e+01 * x^1 +2.0850e+01
		≥7.0	f(x) = -9.6572e-01 * x^3 +1.0484e+01 * x^2 -2.5982e+01 * x^1 +1.7515e+01
	Regionalized	≥3.0 and <7.0	f(x) = -2.1456e-01 * x^3 +2.4668e+00 * x^2 +2.1381e+00 * x^1 -1.2560e+01
		≥7.0	f(x) = -5.9154e-01 * x^3 +5.8403e+00 * x^2 -6.9339e+00 * x^1 -4.7951e+00
		Combined[2] (>3.0)	f(x) = -4.9680e-01 * x^3 +4.9471e+00 * x^2 -4.2373e+00 * x^1 -7.3936e+00

[1] Uniform configuration refers to Configuration 1 in Table 2.4-2. Regionalized configuration refers to Configuration 2, 3, or 4 in Table 2-4-2.
[2] The combined cooling time loading curve is applicable for fuel with above 3 years cooling time.

TABLE 2.4-2
BURNUP CREDIT CONFIGURATIONS

Configuration	Description
Configuration 1	Spent UNDAMAGED fuel assemblies are placed in all positions of the basket
Configuration 2	Fresh UNDAMAGED fuel assemblies are placed in locations 3-4, 3-5, 3-12, and 3-13 (see Figure 2.1-1); spent UNDAMAGED fuel assemblies are placed in the remaining positions
Configuration 3	Damaged Fuel Containers (DFCs) with spent DAMAGED fuel assemblies are placed in locations 3-1, 3-3, 3-4, 3-5, 3-6, 3-7, 3-10, 3-11, 3-12, 3-13, 3-14, and 3-16 (see Figure 2.1-1); spent UNDAMAGED fuel assemblies are placed in the remaining positions
Configuration 4	DFCs with fresh FUEL DEBRIS are placed in locations 3-1, 3-7, 3-10, and 3-16 with locations 2-1, 2-5, 2-8, and 2-12 (see Figure 2.1-1) empty; spent UNDAMAGED fuel assemblies are placed in the remaining positions

TABLE 3-1
List of ASME Code Alternatives for Multi-Purpose Canisters (MPCs)

MPC Enclosure Vessel and Lid	NB-6111	All completed pressure retaining systems shall be pressure tested.	The MPC vessel is welded in the field following fuel assembly loading. Pressure tests (Hydrostatic or pneumatic) will not be performed because lack of accessibility for leakage inspections precludes a meaningful pressure retention capability test. The different models of MPCs available in the industry are not subject to pressure tests because of the dose to the crew, the proven ineffectiveness of the pressure tests to reveal any leaks and the far more effective tests performed on the MPC confinement boundary, such as: All MPC enclosure vessel welds (except closure ring and vent/drain cover plate) are inspected by volumetric examination. All MPC shell and baseplate materials are UT tested. Finally,the MPC lid-to-shell weld shall be verified by progressive PT examination. PT must include the root and final layers and each approximately 3/8 inch of weld depth. The inspection results, including relevant findings (indications) shall be made a permanent part of the user's records by video, photographic, of other means which provide an equivalent record of weld integrity. The video or photographic records should be taken during the final interpretation period described in ASME Section V, Article 6, T-676. The vent/drain cover plate and the closure ring welds are confirmed by liquid penetrant examination. The inspection of the weld must be performed by qualified personnel and shall meet the acceptance requirements of ASME Code Section III, NB-5350.
MPC Enclosure Vessel	NB-7000	Vessels are required to have overpressure protection.	No overpressure protection is provided. Function of MPC enclosure vessel is to contain radioactive contents under normal, off-normal, and accident conditions of storage. MPC vessel is designed to withstand maximum internal pressure considering 100% fuel rod failure and maximum accident temperatures.