CHAPTER 10

OPERATING CONTROLS AND LIMITS

10.0 OPERATING CONTROLS AND LIMITS

The H. B. Robinson (HBR) Independent Spent Fuel Storage Installation (ISFSI) is a totally passive system which requires minimum operating controls. In the following sections, the operating controls and limits that are pertinent to the ISFSI are specified. The conditions and other items to be controlled are based on the safety assessments for normal and postulated accident conditions provided in Chapter 8 of this report.

The following operating controls and limits are specified:

10.1 Fuel Specifications

10.2 Limits for the Surface Dose Rate of the HSM While the DSC is in Storage

10.3 Limits for the Maximum Air Temperature Rise After Storage

10.4 Surveillance of the HSM Air Inlets

10.5 Surveillance of the HSM Inside Cavity

10.1 FUEL SPECIFICATIONS

1.1 Title: Fuel Specifications

1.2 Specifications: Type 15 x 15 PWR Fuel

Burnup	$\leq$ 35,000 MWd/MT
Initial (Beginning of Life) Enrichment	$\leq$ 3.5% U-235
Post Irradiation Time	$\geq$ 5 years
Weight Per Distance Between Adjacent Spacers Per Assembly	$\leq$ 106.56 kg
Distance Between Spacers	$\leq$ 0.65 m

Any fuel not specifically filling the above requirements may still be stored in the ISFSI if all the following requirements are met:

Decay Power	$\leq$ 1 kw/assembly
Neutron Source	1.67 x 10^8 n/sec/assembly
Gamma Source	5.73 x 10^{15} photons/sec/canister With spectrum bounded by that shown in Table 10.1-1
End of Life Fissile Content	0.8% U-235 0.5% Pu-239 0.1% Pu-241

1.3 Applicability: This specification is applicable to all fuel to be stored in the ISFSI.

1.4 Objective: This specification was derived to insure that the peak fuel rod temperatures, surface doses and nuclear subcriticality are below the design values.

1.5 Action: If this specification is not met, additional analysis and/or data must be presented before the fuel can be placed in the DSC.

1.6 Surveillance Requirements: The fuel selected for storage must have the parameter values specified in 1.2 above verified prior to fuel loading. No other surveillance is required.

1.7 Basis: The fuel parameters specified in this operating control and limit were selected to bound the types of PWR fuel which were in use at the time the HBR ISFSI was installed and loaded with spent fuel.

TABLE 10.1-1

ACCEPTABLE RADIOLOGICAL CRITERIA FOR
STORAGE OF MATERIAL IN THE HBR ISFSI

CRITERION	VALUE
GAMMA SOURCE PER CANISTER (total)	1.48×10^{16} Mev/sec
Fractional Breakdown[1]	
Above 1.3 Mev	0.004
Between 1.3 Mev and 0.8 Mev	0.114
Between 0.8 Mev and 0.4 Mev	0.808
Below 0.4 Mev	0.074
NEUTRON SOURCE PER CANISTER (total)[2]	1.17×10^{9} n/sec
Fractional Breakdown	
Above 5 Mev	5.40×10^{7} n/sec = 5.41%
Between 2.5 and 5 Mev	2.43×10^{8} n/sec = 24.32%
Between 1 and 2.5 Mev	4.56×10^{8} n/sec = 45.67%
Below 1 Mev	2.45×10^{8} n/sec = 24.53%

1 Fractional breakdown is based on isotopic composition and resulting gamma spectrum calculated by ORIGEN2 analysis.

2 Spectrum from U-235 fission, total number of neutrons per second from ORIGEN2 analysis.

10.2 LIMITS FOR THE SURFACE DOSE RATE OF THE HSM WHILE THE DSC IS IN STORAGE

2.l Title: Surface Dose Rates on the HSM While the DSC is in Storage

2.2 Specification: Surface dose rates at the following locations

1) Outside of HSM door on centerline of DSC — 200 mrem/hr
2) Center of air inlets — 200 mrem/hr
3) Center of air outlets — 200 mrem/hr

Average Dose rates for the following surfaces

1) Roof — 50 mrem/hr
2) Front/Back — 50 mrem/hr
3) Side — 50 mrem/hr

Dose rates one meter from the center of the following surfaces of a unit of modules

1) Front/Back — 20 mrem/hr
2) Side — 20 mrem/hr

2.3 Applicability: This specification is applicable to the ISFSI.

2.4 Objective: The objective of this specification is to maintain as-low-as-reasonably-achievable dose rates on the modules.

2.5 Action: If the dose rates are exceeded, temporary shielding must be placed so as to reduce the dose rates to the specified levels. When temporary shielding is used, the outlet air temperature must be measured after the shielding is installed to verify that the air flow has not been restricted.

2.6 Surveillance: The HSM shall be monitored to verify that this specification has been met immediately after the DSC is placed in storage and the HSM front and rear accesses are closed.

2.7 Basis: The dose rates stated in this specification were selected to maintain as-low-as-reasonably-achievable exposures to personnel performing air duct clearing on the HSM. These dose rates are within industry accepted standards for contact handling, operation and maintenance of radioactive material. Maintenance personnel will be required to remove any potential air blockage. At 200 mrem/hr the dose for a one hour job of unblocking the air inlets (or outlets) would be less than 200 mrem (whole body) and hence would be only 4% of the total yearly burden. Furthermore, analysis provided in Chapter 7 of the HBR ISFSI SAR shows that the expected dose rates around the HSM surface will be well below the specifications listed above.

10.3 LIMITS FOR THE MAXIMUM AIR TEMPERATURE RISE AFTER STORAGE

3.1	Title:	Maximum Air Temperature Rise from HSM Inlet to Outlet
3.2	Specification:	Maximum air temperature rise l00°F (55.6°C)
3.3	Applicability:	This specification is applicable to the ISFSI.
3.4	Objective:	To limit the maximum air temperature around the DSC.
3.5	Action:	If the temperature rise is greater than l00°F (55.6°C), the air inlets and exits should be checked for blockage. If the blockage is cleared and the temperature still exceeds this limit, the DSC must be removed from the module or additional information and analysis shall be provided that will prove the existing condition does not represent an unsafe condition.
3.6	Surveillance:	The temperature rise shall be checked at the time the DSC is stored in the HSM, again 24 hours later, and again after 7 days.
3.7	Basis:	The l00°F (55.6°C) temperature rise was selected to limit the hottest rod in the DSC to below 716°F (380°C). If this temperature rise is maintained, then the hottest rod will be below the 716°F (380°C) limit even on the hottest day conditions of 125°F (5l.7°C). The expected temperature rise is less than 100EF (i.e., 82EF (45.5EC) per NUHOMS Topical Report (Reference 8.1), Section 8.1.3) and hence, the current design provides adequate margin for this specification. If the temperature rise is within the specifications, then the HSM and DSC are performing as designed and no further temperature measurements are required during normal surveillance.

10.4 SURVEILLANCE OF THE HSM AIR INLETS AND OUTLETS

4.1 Title: Surveillance of the HSM Air Inlets and Outlets

4.2 Specifications: Normal visual inspection frequency: Daily
Accident visual inspection frequency: Within 24 hours after an accident

4.3 Applicability: This specification is applicable to the ISFSI.

4.4 Objective: To assure that no HSM air inlets or outlets are plugged for more than 48 hours and to assure that complete blockage of all inlets and exits due to an accident will be removed in less than 48 hours.

4.5 Action: If the air inlets or outlets are plugged, they should be cleared. If the screen is damaged, it should be replaced.

4.6 Surveillance: The HSM shall be inspected to verify that the air inlets are free from obstructions.

4.7 Basis: Analysis in Chapter 8 of the HBR ISFSI SAR showed that no temperature limits are exceeded if a module is completely plugged for 48 hours. Furthermore, analysis showed that blockage of the air inlet alone did not result in unacceptable temperatures. Therefore, for normal operations, an inspection of the inlets once per day will assure that any local obstructions can be removed. Likewise, after an accident (such as those described in Chapter 8) the HSMs should be examined within 24 hours to assure that if a module is completely buried, flow can be restored within another 24 hours.