

3.9 REFUELING

Applicability: Applies to fuel handling operations during refueling.

Objective: To assure that criticality does not occur during refueling.

- Specification:
- A. Fuel shall not be loaded into a reactor core cell unless the control rod in that core cell is fully inserted.
 - B. During CORE ALTERATIONS the reactor mode switch shall be locked in the refuel position.
 - C. The refueling interlocks shall be OPERABLE with the fuel grapple hoist loaded switch set at ≤ 485 lb. during the fuel handling operations with the head off the reactor vessel. If the frame-mounted auxiliary hoist, the trolley-mounted auxiliary hoist or the service platform hoist is to be used for handling fuel with the head off the reactor vessel the load limit switch on the hoist to be used shall be set at ≤ 400 lb.
 - D. During CORE ALTERATIONS at least two (2) source range monitor (SRM) channels shall be OPERABLE and inserted to the normal operating level. One of the OPERABLE SRM channel detectors shall be located in the core quadrant where CORE ALTERATIONS are being performed, and another shall be located in an adjacent quadrant.
 - E. Removal of one control rod or rod drive mechanism may be performed provided that all the following specifications are satisfied.
 - 1. The reactor mode switch is locked in the refuel position.
 - 2. At least two (2) sources range monitor (SRM) channels shall be OPERABLE and inserted to the normal operation level. One of the OPERABLE SRM channel detectors shall be located in the core quadrant where the control rod is being removed and one shall be located in an adjacent quadrant.
 - F. Removal of any number of control rods or rod drive mechanisms may be performed provided all the following specifications are satisfied:
 - 1. The reactor mode switch is locked in the refuel position and all refueling interlocks are OPERABLE as required in Specification 3.9.C. The refueling interlocks associated with the control rods being withdrawn may be bypassed as required after the fuel assemblies have been removed from the core cell surrounding the control rods as specified in 4, below.
 - 2. At least two (2) source range monitor (SRM) channels shall be OPERABLE and inserted to the normal operation level. One of the OPERABLE SRM channel detectors shall be located in the core quadrant where a control rod is

being removed and one shall be located in an adjacent quadrant.

3. All other control rods are fully inserted with the exception of one rod which may be partially withdrawn not more than two notches to perform refueling interlock surveillance.
4. The four fuel assemblies are removed from the core cell surrounding each control rod or rod drive mechanism to be removed.
5. The SHUTDOWN MARGIN requirements of Specification 3.2.A are met.
6. An evaluation will be conducted for each refuel/reload to ensure that actual core criticality of the proposed order of defueling and refueling is bounded by previous analysis performed to support such defueling and refueling activities, otherwise a new analysis shall be performed.

The new analysis must show that sufficient conservatism exists for the proposed order of defueling and refueling before such operation shall be allowed to proceed.

- G. With any of the above requirements not met, cease CORE ALTERATIONS or control rod removal as appropriate, and initiate action to satisfy the above requirements.

Basis:

During refueling operations, the reactivity potential of the core is being altered. It is necessary to require certain interlocks and restrict certain refueling procedures such that there is assurance that inadvertent criticality does not occur.

Addition of large amounts of reactivity to the core is prevented by operating procedures, which are in turn backed up by refueling interlocks (1) on rod withdrawal and movement of the refueling platform. When the mode switch is in the "Refuel" position, interlocks prevent the refueling platform from being moved over the core if a control rod is withdrawn and fuel is on a hoist. Likewise, if the refueling platform is over the core with fuel on a hoist control rod motion is blocked by the interlocks. With the mode switch in the refuel position only one control rod can be withdrawn (1, 2).

The one rod withdrawal interlock may be bypassed in order to allow multiple control rod removal for repair, modifications, or core unloading. The requirements for simultaneous removal of more than one control rod are more stringent than the requirements for removal of a single control rod, since in the latter case Specification 3.2.A assures that the core will remain subcritical.

Fuel handling is normally conducted with the fuel grapple hoist. The total load on this hoist when the interlock is required consists of the weight of the fuel grapple and the fuel assembly. This total is approximately 773 lbs. in the extended position in comparison to the load limit of 485 lbs. Provisions have also been made to allow fuel handling with either of the three auxiliary hoists and still maintain the refueling interlocks. The 400 lb load trip setting on these hoists is adequate to trip the interlock when one of the more than 600 lb. fuel bundles is being handled.

The source range monitors provide neutron flux monitoring capabilities with the reactor in the refueling and shutdown modes (3). Specifications 3.9.D, 3.9.E and 3.9.F require the OPERABILITY of at least two source range monitors during CORE ALTERATIONS and when control rods are to be removed. This requirement ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

REFERENCES:

- (1) FDSAR, Volume I, Section VII-7.2.5
- (2) FDSAR, Volume I, Section XIII-2.2
- (3) FDSAR, Volume I, Section VII-4.2.2 and VII-4.3.1