

3.8 FUEL LOADING AND REFUELING

Applicability: Applies to fuel loading and refueling operations.

Objective: To assure that fuel loading and refueling operations are performed in a responsible manner.

Specification

- 3.8.1 Radiation levels in the Reactor Building refueling area shall be monitored by RM-G6 and RM-G7. Radiation levels in the spent fuel storage area shall be monitored by RM-G9. If any of these instruments become inoperable, portable survey instrumentation, having the appropriate ranges and sensitivity to fully protect individuals involved in refueling operation, shall be used until the permanent instrumentation is returned to service.
- 3.8.2 Core subcritical neutron flux shall be continuously monitored by at least two neutron flux monitors, each with continuous indication available, whenever core geometry is being changed. When core geometry is not being changed, at least one neutron flux monitor shall be in service.
- 3.8.3 At least one decay heat removal pump and cooler shall be operable.
- 3.8.4 During reactor vessel head removal and while loading and unloading fuel from the reactor, the boron concentration shall be maintained at not less than that required for refueling shutdown.
- 3.8.5 Direct communications between the control room and the refueling personnel in the Reactor Building shall exist whenever changes in core geometry are taking place.
- 3.8.6 During the handling of irradiated fuel in the Reactor Building at least one door in each of the personnel and emergency air locks shall be capable of being closed.* The equipment hatch cover shall be in place with a minimum of four bolts securing the cover to the sealing surfaces.

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The equipment hatch may be open if all of the following conditions are met:

- 1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes,
 - 2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and
 - 3) Reactor Building Purge Exhaust System is in service.
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- 3.8.7 During the handling of irradiated fuel in the Reactor Building, each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:
 - 1. Closed by an isolation valve, blind flange, manual valve, or equivalent, or capable of being closed,* or
 - 2. Be capable of being closed by an operable automatic containment purge and exhaust isolation valve.

* Administrative controls shall ensure that the Reactor Building Purge Exhaust System is in service, appropriate personnel are aware that air lock doors and/or other penetrations are open, a specific individual(s) is designated and available to close the air lock doors and other penetrations as part of a required evacuation of containment. Any obstruction(s) (e.g., cable and hoses) that could prevent closure of an air lock door or other penetration will be capable of being quickly removed.

- 3.8.8 If any of the above specified limiting conditions for fuel loading and refueling are not met, movement of fuel into the reactor core shall cease; action shall be initiated to correct the conditions so that the specified limits are met, and no operations which may increase the reactivity of the core shall be made.
- 3.8.9 The reactor building purge isolation valves, and associated radiation monitors which initiate purge isolation, shall be tested and verified to be operable no more than 7 days prior to initial fuel movement in the reactor building.
- 3.8.10 Irradiated fuel shall not be removed from the reactor until the unit has been subcritical for at least 72 hours.
- 3.8.11 During the handling of irradiated fuel in the Reactor Building at least 23 feet of water shall be maintained above the level of the reactor pressure vessel flange, as determined by a shiftly check and a daily verification. If the water level is less than 23 feet above the reactor pressure vessel flange, place the fuel assembly(s) being handled into a safe position, then cease fuel handling until the water level has been restored to 23 feet or greater above the reactor pressure vessel flange.

Bases

Detailed written procedures will be available for use by refueling personnel. These procedures, the above specifications, and the design of the fuel handling equipment as described in Section 9.7 of the UFSAR incorporating built-in interlocks and safety features, provide assurance that no incident could occur during the refueling operations that would result in a hazard to public health and safety. If no change is being made in core geometry, one flux monitor is sufficient. This permits maintenance on the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition. The decay heat removal pump is used to maintain a uniform boron concentration. The shutdown margin indicated in Specification 3.8.4 will keep the core subcritical, even with all control rods withdrawn from the core (Reference 1). The boron concentration will be sufficient to maintain the core $k_{eff} \leq 0.99$ if all the control rods were removed from the core, however only a few control rods will be removed at any one time during fuel shuffling and replacement. The k_{eff} with all rods in the core and with refueling boron concentration is approximately 0.9. Specification 3.8.5 allows the control room operator to inform the reactor building personnel of any impending unsafe condition detected from the main control board indicators during fuel movement.

Per Specification 3.8.6 and 3.8.7, the personnel and emergency air lock doors, and penetrations may be open during movement of irradiated fuel in the containment provided a minimum of one door in each of the air locks, and penetrations are capable of being closed in the event of a fuel handling accident, and the plant is in REFUELING SHUTDOWN or REFUELING OPERATION with at least 23 feet of water above the fuel seated within the reactor pressure vessel. The minimum water level specified is the basis for the accident analysis assumption of a decontamination factor of 200 for the release to the containment atmosphere from the postulated damaged fuel rods located on top of the fuel core seated in the reactor vessel. Should a fuel handling accident occur inside containment, a minimum of one door in each personnel and emergency air lock, and the open penetrations will be closed following an evacuation of containment. Administrative controls will be in place to assure closure of at least one door in each air lock, as well as other open containment penetrations, following a containment evacuation.

Specification 3.8.6 is modified by a NOTE:

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The equipment hatch may be open if all of the following conditions are met:

- 1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes,
- 2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and
- 3) Reactor Building Purge Exhaust System is in service.

These restrictions include administrative controls to allow the opening of the reactor building equipment hatch during the handling of irradiated fuel in the Reactor Building provided that 1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes, 2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and 3) Reactor Building Purge Exhaust System is in service. The Reactor Building Equipment Hatch Missile Shield Barrier includes steel plating on the bottom of the shield structure, which acts to restrict a release of post-accident fission products. The capability to close the reactor building missile shield barrier includes requirements that the barrier is capable of being closed and that any cables or hoses across the opening have quick disconnects to ensure the barrier is capable of being closed within 45 minutes. The 45-minute closure time for the reactor building missile shield barrier starts when the control room communicates the need to shut the Reactor Building Equipment Hatch Missile Shield Barrier. This 45-minute requirement is significantly less than the fuel handling accident analysis assumption that the reactor building remains open to the outside environment for a two-hour period subsequent to the accident. Placing reactor building purge exhaust in service will ensure any release from the reactor building will be monitored, and ensure continued air flow into the Reactor Building in the event of a fuel handling accident. The Reactor Building purge valve high radiation interlock will be bypassed to ensure continued air flow into the Reactor Building in the event of a Fuel Handling Accident.

The administrative controls will also include the responsibility to be able to communicate with the control room, and the responsibility to ensure that the reactor building missile shield barrier is capable of being closed in the event of a fuel handling accident. These administrative controls will ensure reactor building closure would be established in the event of a fuel handling accident inside containment.

Provisions for equivalent isolation methods in Technical Specification 3.8.7 include use of a material (e.g. temporary sealant) that can provide a temporary, atmospheric pressure ventilation barrier for other containment penetrations during fuel movements.

Specification 3.8.9 requires testing of the reactor building purge isolation system. This system consists of the four reactor building purge valves and the associated reactor building purge radiation monitor(s). The test verifies that the purge valves will automatically close when they receive initiation signals from the radiation detectors that monitor reactor building purge exhaust, and the valves remain open when the isolation system is bypassed. The test is performed no more than 7 days prior to the start of fuel movement in the reactor building to ensure that the monitors, purge valves, and associated interlocks are functioning prior to operations that could result in a fuel handling accident within the reactor building. The Fuel Handling Accident analysis assumes that the four purge valves remain open.

Specification 3.8.10 is required as the safety analysis for the fuel handling accident was based on the assumption that the reactor had been shutdown for 72 hours (Reference 2).

REFERENCES

- (1) UFSAR, Section 14.2.2.1 - "Fuel Handling Accident"
- (2) UFSAR, Section 14.2.2.1(2) - "FHA Inside Containment"