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June 22, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
FSAR Update Concerning High
Density Spent Fuel Rack
Installation
NRC Docket Nos. 50-237/249

Reference (a): T. A. Ippolito letter to L. DelGeorge
dated October 29, 1982 (Am. 56 to DPR-25).

Dear Mr. Denton:

In accordance with the Dresden Unit 3 DPR-25 license condition 3.M, the Dresden Units 2 and 3 FSAR is being amended to include certain commitments related to the installation of high density fuel storage racks. Attached is a revised Dresden Units 2 and 3 FSAR section 10.1, Fuel Storage and Fuel Handling, which fulfills the requirements of license condition 3.M to DPR-25 (i.e., update the FSAR with these changes by June 29, 1982).

The entire FSAR is being updated in accordance with 10 CFR 50.71(e) with the first update to be submitted by July, 1982. Because the attached change is merely a small portion of the entire update to be provided to you shortly, it is not appropriate to change the existing FSAR pages at this time. Accordingly, a replacement page list and other information required by 10 CFR 50.71(e) is not included.

Please direct any questions you may have concerning this matter to this office. One (1) signed original and twelve (12) copies of this transmittal are provided for your use.

Very truly yours,

Thomas J. Rausch

Thomas J. Rausch
Nuclear Licensing Administrator

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cc: Region III Inspector - Dresden

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# SECTION 10

## AUXILIARY AND EMERGENCY SYSTEMS

## 10.1 FUEL STORAGE AND FUEL HANDLING

The equipment and evaluation presented in this section are applicable to either unit.

### 10.1.1 DESIGN BASIS

The design objectives of the fuel storage and handling equipment are (1) to receive, transfer and store nuclear fuel in such manner as to preclude inadvertent criticality; (2) to provide a fuel storage pool for the underwater storage of of fuel assemblies; (3) to provide a storage pool for underwater storage of reactor vessel internals; (4) to provide adequate protection against the loss of water from the fuel pool storage and; (5) to provide equipment for handling both new and irradiated fuel. To achieve these objectives the fuel storage and handling equipment is designed using the following bases:

1. New fuel will be received, transferred and stored, in a manner which precludes inadvertent criticality.

2. Normal reactor refueling will involve replacement of 25 to 30 percent of the core.

3. The fuel assemblies and other reactor components to be handled are described in Section 3.

4. New or undamaged used flow channels will be installed on new fuel bundles.

5. There will be no release of contamination or exposure of personnel to radiation in excess of 10CFR20 limits.

6. Storage space is provided for approximately two core loads of irradiated fuel.[1]

7. It will be possible, at any time, to perform limited work on irradiated components.

8. Space is provided for used control rods, flow channels and other reactor components.

9. The fuel storage pool is designed to withstand earthquake loadings of a Class I structure.

10. The new fuel storage vault is designed to withstand eqrthquake loading of a Class I structure.

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[1] A modification is in progress to install high density spent fuel storage racks which will result in an ultimate storage capacity of 4.8 core loads per pool.

## 10.1.2 DESCRIPTION

The major components of this system are the new fuel storage vault, spent fuel storage pool, dryer/separator storage pit and the refueling platform. See Figure 12.1.2:1 for a complete layout of the operating floor.

### 10.1.2.1 New Fuel Storage Vault

The new fuel dry storage vault is used in common for Units 2 and 3 fuel. The storage racks in the vault are full length, top entry, and can hold a maximum of 60% of a core load of fuel bundles in an upright position. The center-to-center spacing of bundles in the racks is 6.5 inches by 10 inches minimum. Racks in the vault are designed to prevent an accidental critical array, even in the event that the vault becomes flooded. Vault drainage is provided by an open drain in the vault bottom to prevent possible water collection, and there is a lip around the top of the vault.

The new fuel storage vault is a reinforced-concrete Class I structure, accessible only through top hatches. All entrances to the vault, including hatches and personnel openings, are capable of being locked. An area radiation monitor is located in the vault.

New fuel is brought into the reactor building through the equipment entrance. A rail crane is provided in the equipment access area for removal of new fuel from trucks and for movement of the multi-assembly transfer basket. The new fuel is hoisted to the upper floor for storage utilizing the reactor building crane.

Prior to refueling, the new fuel is transferred to the fuel storage pool, using the new fuel transfer crane for Unit 2, or the reactor building crane for Unit 3. If new fuel channels are to be used, the fuel is channeled on the new fuel channeling apparatus before placement in the pool. If previously irradiated channels are to be used, the fuel is placed into the pool, then channeled under water with special tools.

### 10.1.2.2 Spent Fuel Storage Pool

The spent fuel storage pool has been adequately designed to withstand the anticipated earthquake loadings as a Class I structure. It is a reinforced concrete structure, completely lined with seam-welded stainless steel plates welded to reinforcing members (channels, I beams, etc.) embedded in concrete. The 3/16 inch stainless steel liner will prevent leakage even in the unlikely event that the concrete develops cracks. To avoid unintentional draining of the pool, there are no penetrations that would permit the pool to be drained below a safe storage level, and all lines extending below this level are equipped with suitable valving to prevent backflow. The passage between the fuel storage pool and the refueling cavity above the reactor vessel is provided with two double sealed gates with a monitored drain between the gates. This arrangement permits detection of leaks from the passage and repair of a gate in the event of such leakage. The depth of water in the pool is 39 feet and the depth of water in the transfer canal during refueling is 22 feet 9 inches. The water in the pool is continuously filtered and cooled by the fuel pool cooling and cleanup system described in Section 10.2.

In addition to the current capacity for approximately two core loads of fuel assemblies, the storage pool holds discarded LPRM's, control blades and temporary control curtains, and can hold control blades being used and small reactor vessel components in the event of a complete core unloading. A corner of the pool floor is reinforced with a concrete cask pad and is reserved for loading a spent fuel shipping cask. Additional storage for large components, e.g. steam dryer and separator, is provided in a separate storage pool adjacent to the reactor cavity.

To increase the spent fuel storage capacity of the pool, 33 new high density spent fuel storage racks (see Figures 10.1.2:1 through 10.1.2:3) will be installed in each pool. This will allow the storage capacities of the spent fuel pools to be increased from 1400 fuel assembies for Unit 2, and from 1420 fuel assemblies for Unit 3, to 3537 fuel assemblies for each pool. The fuel pool cooling water sparger has been modified to eliminate interference with placement of the high density racks. Approximately the bottom half was removed so that now the sparger extends only to a depth slightly above the top of the high density racks. An analysis of the convective cooling in the pool with the shortened sparger was made by NSC[1] to confirm that sufficient circulation would/will still be provided.

Five new 9 by 11 array high density spent fuel storage racks were installed during late 1981 in the northernmost part of Unit 3's pool, increasing its storage capacity to 1610 fuel assemblies. This was done because the Unit 3 pool would otherwise have been 104 spaces short of full core discharge capacity (FCDC) for the January 1982 refueling outage. The remaining racks are expected to be installed at a later date yet to be determined. The following conditions are orders of, or commitments to, the Atomic Safety and Licensing Board made in the process of amending the license so that the high density racks could be installed:

1. Fuel stored in the spent fuel pool shall have a U-235 loading less than or equal to 14.8 grams per axial centimeter.

2. No loads heavier than the weight of a single spent fuel assembly shall be carried over fuel stored in the spent fuel pool.

3. A corrosion surveillance program for the racks will be conducted to ensure that any loss of neutron absorber material and/or swelling of the storage tubes will be detected.

4. In situ (sic, i.e. racks installed) neutron attenuation tests will be performed to verify that tubes and racks contain a sufficient number of Boral plates such that K-effective will not be greater than 0.95 when the spent fuel is in place.

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[1]Nuclear Services Corp., now a subsidiary of Quadrex.

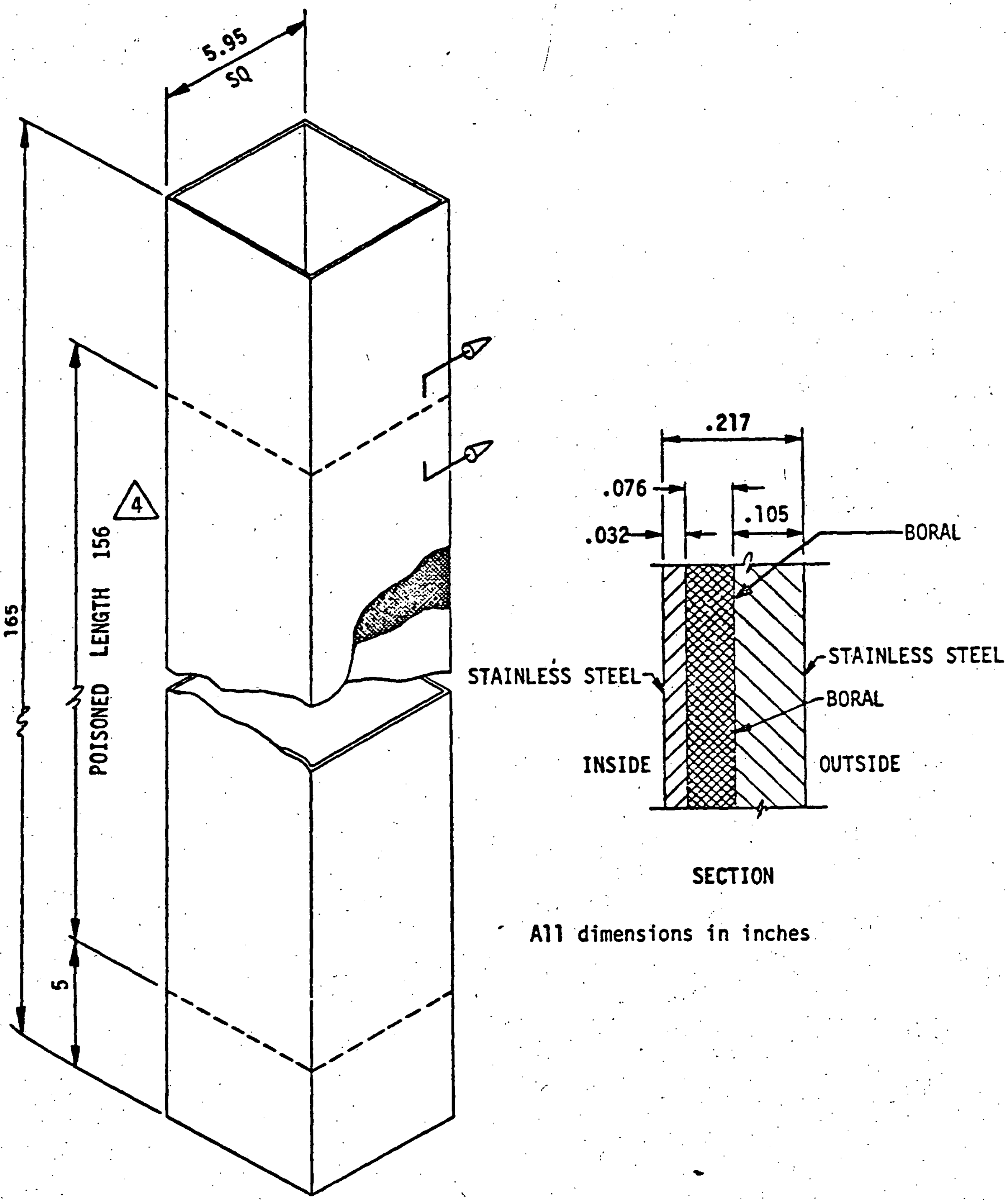


FIGURE 10.1.2:1 STAINLESS STEEL TUBE WITH BORAL CORE FOR HIGH DENSITY SPENT FUEL RACKS

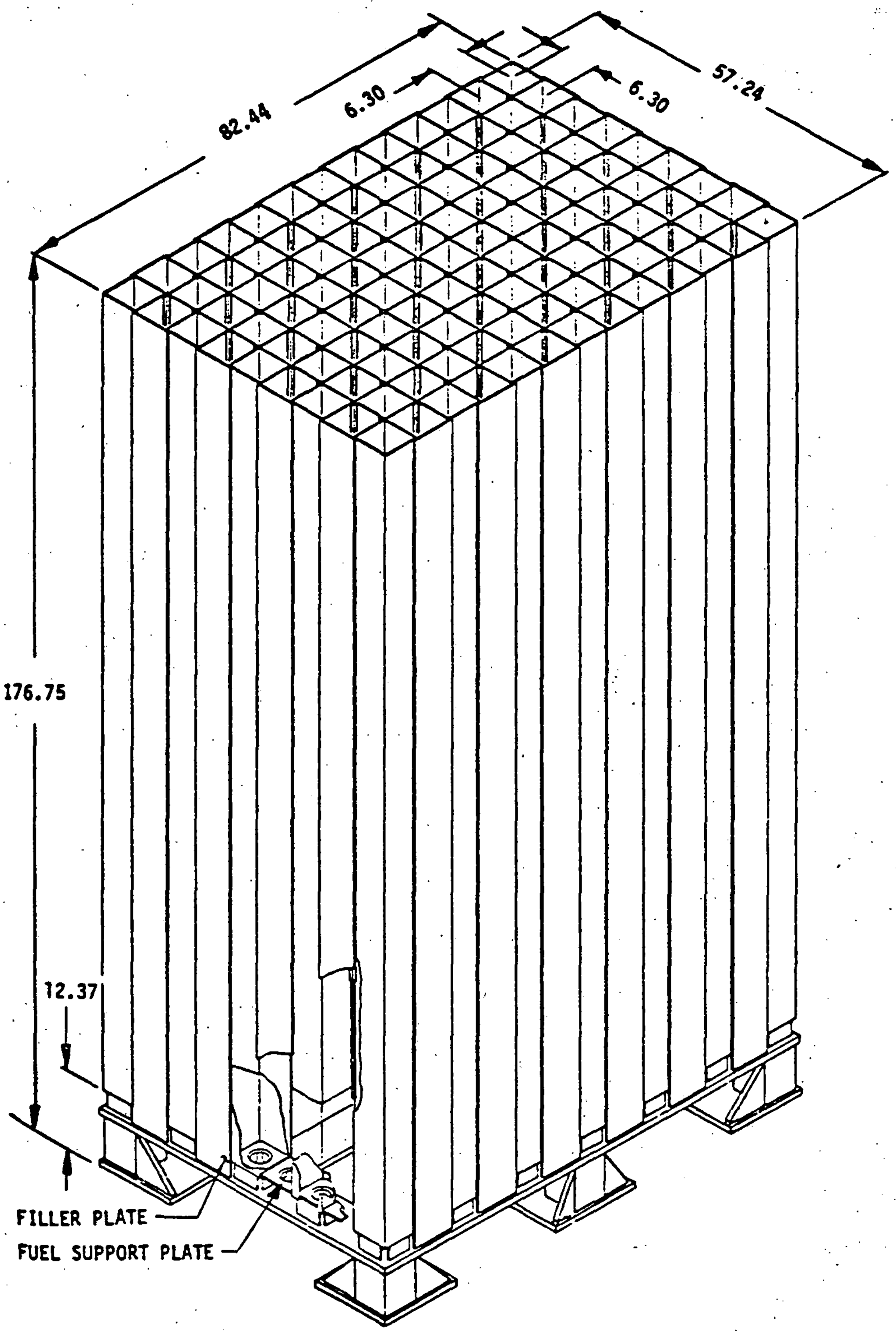


FIGURE 10.1.2:2 HIGH DENSITY SPENT FUEL RACK - 9 x 13

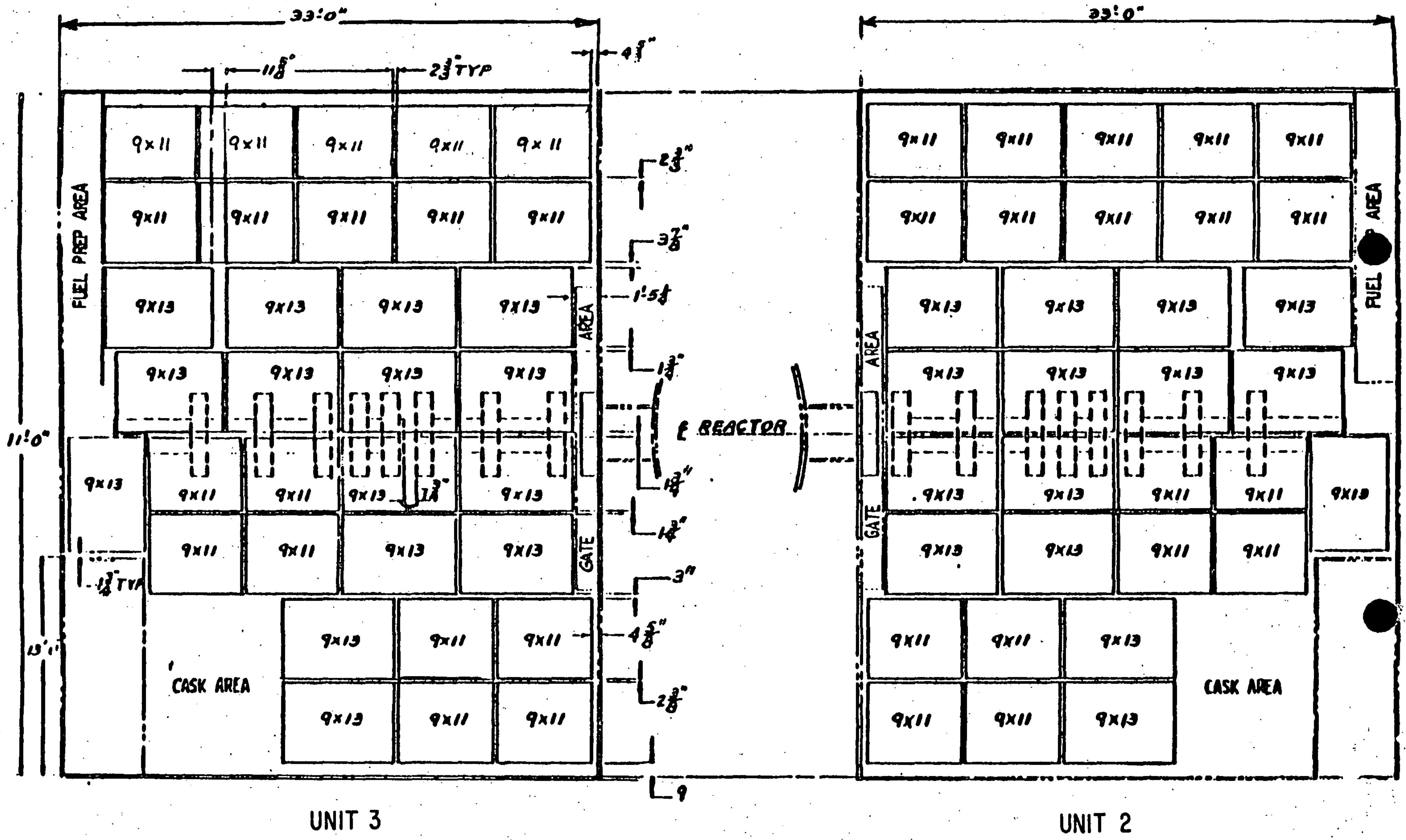


FIGURE 10.1.2:3 SPENT FUEL STORAGE POOL ARRANGEMENT

5. If one Boral plate is detected missing, the associated tube will be blocked to prohibit insertion of a fuel assembly. If more than one Boral plate is detected missing per pool, the storage rack or racks containing any additional missing Boral plates will be removed from the pool. Such storage racks will not be replaced in the pool until a specific criticality analysis covering the proposed corrective action has been submitted to and approved by the NRC.

6. Before any storage rack is placed in the Dresden pools, each storage location will be checked with a plug gauge to confirm that the minimum dimension between the lead-in clips at the top of each storage location is at least 5.758 inches. If necessary, the storage clips will be ground down to ensure this dimension is achieved.

A refueling platform, equipped with a refueling grapple and two 1/2 ton auxiliary hoists is provided. Either of these hoists can be positioned for servicing the reactor cavity or the fuel storage pool.

The operating floor is serviced by the reactor building crane, which is equipped with a 125-ton main hoist and a 9-ton auxiliary hoist. These hoists can reach any equipment storage area on the operating floor. A radiation monitor is mounted on the crane bottom, and an interlock with the crane controls prevents raising (or stops further raising) of either hoist on a high radiation level, although lowering or lateral movements are still permitted.

Underwater vacuum-cleaning equipment is available for removal of dirt and small particles from sections of the pool floor not obstructed by racks or other equipment. A variety of special tools for remote handling of fuel and reactor internals, and for exchanging fuel channels, is provided.

Six area radiation monitors are located on the refueling floor (three for each unit) in addition to the one located in the new fuel storage vault:

| | | |
|---|---|---|
| 1. | Refueling floor high range | $10\text{-}10^6$ mr/hr |
| 2. | Refueling floor low range | 0.1 - 1000 mr/hr |
| 3. | Refueling floor equipment hatch | 0.01 - 100 mr/hr |

The low range and equipment hatch monitors for each unit have local alarms as well as control room indication, alarm, and multipoint recorder (see Section 7.6.3).

Four process radiation monitors, similar to the area radiation monitors, monitor the fuel pools (two for each unit). The fuel pool monitors have a range of $1\text{-}10^6$ mr/hr. These, along with the reactor building ventilation exhaust duct monitors, provide for isolation of reactor building ventilation and initiation of the standby gas treatment system (for the affected unit) on high radiation level; this mitigates the consequences of postulated refueling accidents. Section 7.6.2 describes the trip logic.

10.1.2.3 Refueling

In preparation for refueling, the concrete shield plugs in the reactor cavity and the transfer canal are removed by the reactor building crane. The drywell head, head insulation, and reactor vessel head are removed, using the same crane.

The steam dryer assembly is moved to the dryer/separator storage pit. The steam separator assembly is unbolted from the core structure using a special hand tool. Contaminated demineralized water from any of several sources as convenient is pumped into the reactor until the reactor cavity and the dryer/separator storage pit are flooded to the normal level of the fuel storage pool. The steam separator assembly is then transferred to the dryer/separator storage pit.

The reactor cleanup system is operated to assure sufficient water clarity for fuel moving, then the fuel storage pool gates are removed. Spent fuel is removed from the reactor, using the main fuel grapple, and placed in racks in the fuel storage pool. The same equipment is used to transfer the new fuel from the fuel storage pool to the reactor. The racks in which fuel assemblies are placed are designed and arranged to ensure sub-criticality in the pool.

At the completion of reactor refueling, the fuel storage pool gates are set back in place. The steam separator assembly is returned to the reactor. The water in the dryer/separator storage pit and reactor cavity is pumped down to the reactor vessel flange. The steam separator assembly is bolted down and the steam dryer assembly, reactor vessel head, insulation, drywell head, and concrete shield blocks are replaced.

During and after refueling operations, some fuel channels may be removed from the fuel using the underwater channeling equipment. Fuel channels on spent fuel may be taken off and put onto new fuel, or swapped with those on partially spent fuel, if they are relatively undeformed (i.e. not bowed, bulging, or twisted past certain limits). Channels which can no longer be used are temporarily stored in the pool and eventually disposed of off-site as solid radwaste.

If the spent fuel is to be moved off-site, a spent fuel shipping cask is set into the pool using the reactor building crane. The spent fuel is loaded into the cask under water. The cask is closed and removed from the pool. After decontamination, the spent fuel shipping cask is lowered by the reactor building crane to a truck or railway car in the equipment access area.

## 10.1.3 PERFORMANCE ANALYSIS

The spacing of fuel bundles in the new fuel storage vault maintains $k_{eff}$ less than or equal to 0.90 dry and $k_{eff}$ less than or equal to 0.95 flooded. The vault floor drain prevents flooding. A radiation monitor in the new fuel storage vault provides warning of any radiation level increase.

The spacing of fuel bundles in the spent fuel storage pool maintains $k_{eff}$ less than or equal to 0.95.

Fuel stored in the fuel storage pool is covered with sufficient water for radiation shielding, and fuel being moved or loaded into a cask is at all times covered by a minimum depth of eight feet of water.

Protective interlocks prevent handling of fuel over the reactor when a control rod is withdrawn and another set of interlocks prevents control rod withdrawal when fuel is being handled over the reactor. Due to the physical nature of the telescoping fuel grapple, it cannot lift any load, including fuel assemblies, above a point about 8 feet below the normal water level; at this point the grapple is fully retracted.

A float type level switch in the fuel pool will actuate an alarm in the control room on high pool level. High and low level alarms are provided for the skimmer surge tank. There is no pool low level alarm other than that inherent in the skimmer surge tank low level alarm.

Prior to initial reactor fueling, the fuel storage pool, reactor head cavity, and reactor internals storage pit were filled with water and checked for leakage. Dummy fuel assemblies were run through a complete cycle from the new fuel storage vault to the fuel storage pool. Prior to fuel handling, all hoists, cranes and tools are inspected and tested to assure safe operation.

To preclude the possibility of dropping a spent fuel cask during handling operations over the spent fuel pool, modifications have been made to the existing reactor building crane and cask yoke assemblies to meet the intent of NUREG 0554. Crane modifications consisted of a new trolley utilizing a dual load path hoisting system for the main hoist. This system will prevent all postulated credible single-component failures over the entire supporting load path: from the cast supporting system to the redundant cask lifting yoke, redundant hook, dual load path hoisting system, and crane bridge structure. The cask lifting yoke used will depend on the model of cask being used. Some components required to be redundant meet the guidelines of NUREG 0554 by having a safety factor of 10 for the single component, rather than having dual components, each with a safety factor of 5.