Enclosure 2

MFN 15-065

GEH ABWR DCD Draft Revision 6 Markups for Items 18b, 19 and 20

2.5.6 Fuel Storage Facility

Design Description

The Fuel Storage Facility provides storage racks for the temporary and long-term storage of new and spent fuel and associated equipment. The ~~new and spent~~ fuel storage racks ~~use the same configuration and~~ prevent inadvertent criticality.

are designed to

The racks are classified as non-safety-related.

new fuel and

Racks provide storage for spent fuel in the spent fuel storage pool in the Reactor Building. ~~New fuel, 40% of reactor core, is stored in the new fuel storage vault in the Reactor Building.~~ The racks are top loading, with fuel bail extended above the rack. The spent fuel racks have a minimum storage capacity of 270% of the reactor core, which is equivalent to a minimum of 2354 fuel storage positions. The new and spent fuel racks maintain a subcriticality of at least 5% Δk under dry or flooded conditions. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks and allows flow to prevent the water from exceeding 100°C.

normal and abnormal

fuel storage racks

The racks are classified as Seismic Category I.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.5.6 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria, which will be undertaken for the ~~new and spent~~ fuel storage racks.

2.15.3 Cranes and Hoists

Design Description

Cranes and Hoists are used for maintenance and refueling tasks.

During refueling/servicing, the Reactor Building (R/B) crane handles the shield plugs, drywell and reactor vessel heads, and the steam dryer/separators. The minimum crane coverage includes the R/B refueling floor laydown area, and the R/B equipment storage pit. During plant operation, the crane handles new fuel shipping containers and the spent fuel shipping casks. For these activities, the minimum crane coverage includes ~~the new fuel vault,~~ the R/B equipment hatches, and the spent fuel cask loading and washdown pits.

The upper drywell hoists are used during outages to service valves and equipment inside the upper drywell.

The lower drywell hoists service valves and equipment inside the lower drywell during outages.

The Cranes and Hoists are classified as non-safety-related.

The R/B crane is interlocked to prevent movement of heavy loads over the spent fuel storage portion of the spent fuel storage pool. The hoisting and braking system of the R/B crane are redundant.

The R/B crane has a lifting capacity greater than or equal to the heaviest expected load.

The upper drywell hoists and lower drywell hoists are classified as Seismic Category I.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.15.3 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria, which will be undertaken for the Cranes and Hoists.

1.2.2.6.4 RPV Internal Servicing Equipment

The majority of internal servicing equipment was designed to be attached to the refueling platform auxiliary hoist and used when the reactor is open. A variety of equipment (e.g., grapples, guides, plugs, holders, caps, strongbacks and sampling stations) is used for internal servicing. In addition to these are the RIP handling devices for repair and/or installation. Lifting tools are designed for a safety factor of 10 or better with respect to the ultimate strength of the material used.

1.2.2.6.5 Refueling Equipment

The fuel servicing equipment includes a 1.471 MN Reactor Building crane, refueling machine, and other related tools for reactor servicing.

inspected

The Reactor Building crane handles the spent fuel cask from the transport device to the cask loading pit. The refueling machine transfers the fuel assemblies between the storage area and the reactor core. New fuel bundles are handled by the Reactor Building crane. The bundles are stored ~~in the new fuel vault~~ on the reactor refueling floor and are transferred ~~from the vault~~ to the spent fuel pool with the Reactor Building crane auxiliary hook.

The handling of the reactor head, removable internals, reactor insulation, and drywell head during refueling is accomplished using the Reactor Building crane.

1.2.2.6.5.1 Refueling Interlocks

A system of interlocks that restricts movement of refueling equipment and control rods when the reactor is in the refueling and startup modes is provided to prevent an inadvertent criticality during refueling operation. The interlocks backup procedural controls that have the same objective. The interlocks affect movement of the refueling machine, refueling machine hoists, fuel grapple, and control rods.

1.2.2.6.6 Fuel Storage Facility

New and spent fuel storage racks are designed to prevent inadvertent criticality and load buckling. Sufficient cooling and shielding are provided to prevent excessive pool heatup and personnel exposure, respectively. The design of the fuel pool provides for corrosion resistance, adherence to Seismic Category I requirements, and prevention of k_{eff} from reaching 0.95 ~~under dry or flooded conditions~~.

1.2.2.6.7 Undervessel Servicing Equipment

This equipment is used for the installation and removal work associated with the fine motion control rod drive (FMCRD), RIP, incore monitoring (ICM) and so on. A handling platform provides a working surface for equipment and personnel performing work in the undervessel area. The polar platform is capable of rotating 360 degrees, and has an FMCRD handling trolley with full traverse capability across the vessel diameters. All equipment is designed to minimize

Table 1.9-1 Summary of ABWR Standard Plant COL License Information (Continued)

Item No.	Subject	Subsection
8.41	Periodic Testing of Class 1E Battery Chargers	8.3.4.35
8.42	Periodic Testing of Class 1E Diesel Generators	8.3.4.36
9.1	New Fuel Storage Racks Criticality Analysis	deleted
9.2	Dynamic and Impact Analysis of New Fuel Storage Racks	deleted
9.3	Spent Fuel Storage Racks Criticality Analysis	9.1.6.3
9.4	Spent Fuel Rack Load Drop Analysis	9.1.6.4
9.5	New Fuel Inspection Stand Seismic Capability	9.1.6.5
9.6	Overhead Load Handling System Information	9.1.6.6
9.7	Spent Fuel Racks Structural Evaluation	9.1.6.7
9.8	Spent Fuel Racks Thermal-Hydraulic Analysis	9.1.6.8
9.9	Spent Fuel Firewater Makeup Procedures and Training	9.1.6.9
9.10	Protection of RHR System Connections to FPC System	9.1.6.10
9.11	HECW System Refrigerator Requirements	9.2.17.1
9.12	Reactor Service Water System Requirements	9.2.17.2
9.12a	Not Used	9.3.12.1
9.13	Not Used	9.3.12.2
9.14	Not Used	9.3.12.3
9.15	Radioactive Drain Transfer System	9.3.12.4
9.16	Service Building HVAC System	9.4.10.1
9.17	Radwaste Building HVAC System	9.4.10.2
9.18	Contamination of DG Combustion Air Intake	9.5.13.1
9.19	Use of Communication System in Emergencies	9.5.13.2
9.20	Maintenance and Testing Procedures for Communication Equipment	9.5.13.3
9.21	Use of Portable Hand Light in Emergency	9.5.13.4
9.22	Vendor Specific Design of Diesel Generator Auxiliaries	9.5.13.5
9.23	Diesel Generator Cooling Water System Design Flow and Heat Removal Requirements	9.5.13.6
9.24	Fire Rating for Penetration Seals	9.5.13.7
9.25	Diesel Generator Requirements	9.5.13.8
9.26	Applicant Fire Protection Program	9.5.13.9
9.27	HVAC Pressure Calculations	9.5.13.10

3.1.2.6.2 Criterion 61—Fuel Storage and Handling and Radioactivity Control

3.1.2.6.2.1 Criterion 61 Statement

The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed:

(1) With a capability to permit appropriate periodic inspection and testing of components important to safety

(2) With suitable shielding for radiation protection

(3) With appropriate containment, confinement, and filtering systems

(4) With a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal

(5) To prevent significant reduction in fuel storage coolant inventory under accident conditions

3.1.2.6.2.2 Evaluation Against Criterion 61

3.1.2.6.2.2.1 Fuel Storage and Handling System

Fuel storage pools have adequate water shielding for stored spent fuel. Adequate shielding for transporting fuel is also provided. Liquid level sensors are installed to detect low pool water level. Buildings are designed to meet Regulatory Guide 1.13 criteria. The fuel storage pools are designed with no penetrations below the water level that is needed for maintenance of adequate shielding at the operating f[illegible]sed in pool circulation lines to prevent siphoning in the event of a break of such a line.

is contained in storage racks

spent fuel pool

New fuel storage racks are located in the concrete fuel storage vault. ~~No cooling or air filtering system is required~~. These storage racks preclude accidental criticality (see evaluation against Criterion 62). ~~The new fuel storage racks do not require any special inspection and testing for nuclear safety purposes.~~

The fuel storage and handling system is designed to assure adequate safety under normal and postulated accident conditions. The design of these systems meets the requirements of Criterion 61.

Per Regulatory Guide 1.143, the substructure of the radwaste building is designed as Seismic Category I and it is sufficient to contain the maximum liquid inventory expected to be in the building.

For further discussion, see the following sections:

Chapter/Section	Title
5.4.7	Residual Heat Removal System
6.2	Containment Systems
9.1	Fuel Storage and Handling
11	Radioactive Waste Management
12	Radiation Protection

3.1.2.6.3 Criterion 62—Prevention of Criticality in Fuel Storage and Handling

3.1.2.6.3.1 Criterion 62 Statement

Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

3.1.2.6.3.2 Evaluation Against Criterion 62

Appropriate plant fuel handling and storage facilities are provided to preclude accidental criticality for new and spent fuel. Criticality in new and spent fuel storage is prevented by presence of fixed neutron absorbing material. Fuel elements are limited by rack design to only top-loaded fuel assembly positions. The new and spent fuel racks are Seismic Category I components.

New fuel is placed in dry storage in the top-loaded new fuel storage vault. This vault contains a drain to prevent the accumulation of water. Neutron absorbing material in the new fuel storage vault racks prevents an accident DELETE event the vault becomes flooded or subjected to seismic loadings.

The center-to-center new fuel assembly spacing limits the k_{eff} of the array to not more than 0.95 for new dry fuel.

The new and spent fuel is stored under water in the spent fuel pool. A full array of loaded ~~spent~~ fuel racks is designed to be subcritical, by at least 5% Δk. Neutron-absorbing material, as an integral part of the design, is employed to assure that the calculated k_{eff}, including biases and uncertainties, will not exceed 0.95 under all normal and abnormal conditions. The abnormal conditions accounted for are an earthquake, accidental dropping of equipment, or impact caused by the horizontal movement of fuel handling equipment without first disengaging the fuel from the hoisting equipment.

9.0 Auxiliary Systems

9.1 Fuel Storage and Handling

The new-fuel storage vault stores a 40% core load of new fuel assemblies. The fuel is stored in the new-fuel storage racks in the DELETE close as practicable to the spent-fuel storage pool work area to facilit DELETE eparation. The new-fuel inspection stand is close to the new-fuel storage vault to minimize fuel transport distance.

Spent fuel removed from the reactor vessel must be stored underwater while awaiting disposition. Spent-fuel storage racks, which are used for this purpose, are located at the bottom of the fuel storage pool under sufficient water to provide radiological shielding. This pool water is processed through the Fuel Pool Cooling and Cleanup System (FPC) to provide cooling to the spent fuel in storage and for maintenance of fuel pool water quality. The spent-fuel pool storage capacity is 270% of the reactor core.

a minimum of

The new-fuel and spent-fuel storage racks are the same high density design. The new- fuel racks can be used for either dry or submerged storage of fuel. The design of the new-fuel racks will be described. Information on the spent-fuel racks will only be presented when the design is different.

9.1.1 New-Fuel Storage

Replace with:
"New fuel will be stored in the spent-fuel storage racks in the fuel storage pool."

9.1.1.1 Design Bases

9.1.1.1.1 Nuclear Design

A full array of loaded new-fuel racks is designed to be subcritical, by at least 5% Δk.

(1) Monte Carlo techniques are employed in the calculations performed to assure that k_{eff} does not exceed 0.95 under all normal and abnormal conditions.

(2) The assumption is made that the storage array is infinite in all directions. Since no credit is taken for neutron leakage, the values reported as effective neutron multiplication factors are, in reality, infinite neutron multiplication factors.

(3) The biases between the calculated results and experimental results, as well as the uncertainty involved in the calculations, are taken into account as part of the calculational procedure to assure that the specific k_{eff} limit is met.

The new-fuel storage racks are purchased equipment. The purchase specification for these racks will require the vendor to provide the information requested in Question 430.180 on criticality analysis for the inadvertent placement of a fuel assembly in other than prescribed locations. See Subsection 9.1.6 for COL license information requirements.

Replace with:
"See Subsection 9.1.2.1.1

9.1.1.1.2 Storage Design

The new-fuel storage racks provided in the new-fuel storage vault provide storage for 40% of one full core fuel load.

Replace with:
"See Subsection 9.1.2.1.2

9.1.1.1.3 Mechanical and Structural Design

See Subsection 9.1.2.1.3.

9.1.1.1.4 Thermal-Hydraulic Design

See Subsection 9.1.2.1.4.

9.1.1.1.5 Material Considerations

See Subsection 9.1.2.1.5.

9.1.1.1.6 Dynamic and Impact Analysis

The new-fuel storage racks are purchased equipment. The purchase specification for the new-fuel storage racks will require the vendor to perform confirmatory dynamic analyses. The SSE input excitation for these analyses will utilize the horizontal and vertical response spectra provided in Subsection 3 DELETE

Vertical impact analysis is required because the fuel assembly is held in the storage rack by its own weight without any mechanical holddown devices. Therefore, when the downward acceleration of the storage rack exceeds 1g, contact between the fuel assembly and the storage rack is lost. Horizontal impact analysis is required because a clearance exists between the fuel assembly and the storage rack walls.

See Subsection 9.1.6.2 for COL license information requirements.

9.1.2.1.3

9.1.1.1.7 Not Used

The new fuel is stored in the spent fuel pool, which is described in more detail in section 9.1.2.2.

9.1.1.2 Facilities Description (New-Fuel Storage)

(1) The new-fuel storage vault is located on the refueling floor of the Reactor Building (R/B) (see Figure REPLACE

(2) The R/B, a Seismic Category I building, protects the new fuel from seismic events and externally generated missiles. There are no non-seismic systems, high or moderate energy pipes, or rotating machinery located in the vicinity of the new-fuel storage vault.

(3) The R/B HVAC system monitors the building exhausts for radioactivity. If radioactivity is encountered, the system is isolated and the SGTS starts operation. This prevents the possible release of radioactivity from any fuel handling accident.

(4) The new-fuel storage racks are top-entry racks designed to preclude the possibility of criticality under normal and abnormal conditions. The upper tieplate of the fuel element rests against the module to provide lateral support. The lower tieplate sits in the bottom of the rack, which supports the weight of the fuel.

(5) The rack arrangement is designed to prevent accidental insertion of fuel assemblies or bundles between adjacent racks. The storage rack is designed to provide accessibility to the fuel bail for grappling purposes.

(6) The floor of the new-fuel storage vault is sloped to a drain located at the low point. This drain [illegible] ay be accidentally and unknowingly introduced into the va[illegible] floor drain subsystem of the Liquid Radwaste System.

DELETE

(7) The radiation monitoring equipment for the new-fuel storage areas is described in Subsection 12.3.4.

9.1.1.3 Safety Evaluation

9.1.1.3.1 Criticality Control

The design of the new-fuel storage racks provides for an effective multiplication factor (k_{eff}) for both normal and abnormal storage conditions equal to or less than 0.95 in the new-fuel storage racks. To ensure that design criteria are met, the following normal and abnormal new-fuel storage conditions were analyzed:

(1) Normal positioning in the new fuel array

(2) Eccentric positioning in the new fuel array

The new-fuel storage area will accommodate fuel (k_{inf} < 1.35 at 20°C in standard core geometry) with no safety implications.

9.1.1.3.2 Structural Design

(1) The new-fuel vault contains one or more fuel storage racks which provides storage for fuel a maximum of 40% of one full core fuel load.

(2) The new-fuel storage racks are designed to be freestanding (i.e., no supports above the base). This means that the support structure also provides the required dynamic stability.

(3) The racks include individual solid tube storage compartments which provide lateral restraints over the entire length of the fuel assembly.

Replace with:
"See Subsection 9.1.2.3.1

Replace with:
"See Subsection 9.1.2.3.2

(4) The weight of the fuel assembly or bundle is supported axially by the rack lower support.

(5) The racks are fabricated from materials used for construction, in accordance with the latest applicable ASTM specifications.

(6) Lead-in guides at the top of the storage spaces provide guidance of the fuel during insertion.

(7) The racks are designed to withstand, while maintaining the nuclear safety design basis, the impact force generated by the vertical free-fall drop of a fuel assembly from a height [illegible]

DELETE

(8) The rack is designed to withstand a pullup force of 17.79 kN and a horizontal force of 4.45 kN.

(9) The new-fuel storage racks require no periodic special testing or inspection for nuclear safety purposes.

9.1.1.3.3 Protection Features of the New-Fuel Storage Facilities

the Fuel Storage Facility

The new-fuel storage vault is housed in the Reactor Building. The vault and Reactor Buildings are Seismic Category I, and are designed to withstand natural phenomena such as tornadoes, tornado missiles, floods and high winds. Fire protection features are described in Subsection 9.5.1 and Appendix 9A.

spent fuel storage pool

spent fuel storage pool

Procedural fuel-handling requirements and equipment design dictate that no more than one bundle at a time can be handled over the storage racks and at a maximum height of 1.8m above the upper rack. Therefore, the racks cannot be displaced in a manner causing critical spacing as a result of impact from a falling object.

The auxiliary hoist on the Reactor Building crane can traverse the full length of the refueling floor. This hoist is used to move new fuel from the entry point into the Reactor Building, up the main equipment hatch to the refueling floor and from there to the new-fuel storage vault. This hoist can move fuel to the new-fuel inspection stand and rechanneling area at the end of the spent-fuel storage pool.

Should it become necessary to move major loads along or over the pools, administrative controls require that the load be moved over the empty portion of the spent-fuel pool and avoid the area of the new-fuel storage vault. The shipping cask cannot be lifted or moved above the new-fuel vault because of their relative locations on the refueling floor.

9.1.2 Spent-Fuel Storage

9.1.2.1 Design Bases

9.1.2.1.1 Nuclear Design

A full array in the loaded spent-fuel rack is designed to be subcritical, by at least 5% Δk. Neutron-absorbing material, as an integral part of the design, is employed to assure that the calculated k_{eff}, including biases and uncertainties, will not exceed 0.95 under all normal and abnormal conditions.

9.1.2.1.2 Storage Design

The fuel storage racks provided in the spent-fuel storage pool provide storage for 270% of one full core fuel load.

a minimum of

9.1.2.1.3 Mechanical and Structural Design

The spent-fuel storage racks in the Reactor Building contain storage space for fuel assemblies (with channels) or bundles (without channels). They are designed to withstand all credible static and seismic loadings. The racks are designed to protect the fuel assemblies and bundles from excessive physical damage which may cause the release of radioactive materials in excess of 10CFR20 and 10CFR100 requirements, under normal and abnormal conditions caused by impacting from either fuel assemblies, bundles or other equipment.

6.4 mm (minimum) thick

The spent-fuel pool is a reinforced concrete structure with a stainless steel liner. The fuel storage pool liner seismic classification is provided in Table 3.2-1. The bottom of all pool gates are sufficiently high to maintain the water level over the spent-fuel storage racks to provide adequate shielding and cooling. All pool fill and drain lines enter the pool above the safe shielding water level. Redundant anti-siphon ~~vacuum breakers are located at the high point of the pool circulation lines~~ to preclude a pipe break from siphoning the water from the pool and jeopardizing the safe water level.

protection is provided

"discharge"

by locating two holes in each pool recirculation line at 10 mm and 510 mm below the lowest normal water level.

The racks are constructed in accordance with a quality assurance program that ensures that the design, construction and testing requirements are met.

The fuel storage racks are designed to handle irradiated fuel assemblies. The expected radiation levels are well below the design levels.

In accordance with Regulatory Guide 1.29, the fuel storage racks are Seismic Category I. The structural integrity of the rack will be demonstrated for the load combinations described ~~below using linear elastic design methods.~~

in SRP 3.8.4, Appendix D

~~The applied loads to the rack are~~:

~~(1) Dead loads, which are weight of rack and fuel assemblies, and hydrostatic loads~~

(2) Live loads—effect of lifting an empty rack during installation

(3) Thermal loads—the uniform thermal expansion due to pool temperature changes

(4) Seismic forces of the SSE

(5) Accidental drop of fuel assembly from maximum possible height 1.8m above rack

(6) Postulated stuck DELETE pward force of 13.35 kN

The load combinations considered in the rack design are:

(1) Live loads

(2) Dead loads plus SSE

(3) Dead loads plus fuel drop

Thermal loads are not included in the above combinations because they are negligible due to the design of the rack (i.e., the rack is free to expand/contract under pool temperature changes).

The loads experienced under a stuck fuel assembly condition are typically less than those calculated for the seismic conditions and, therefore, need not be included as a load combination.

The storage racks are designed to counteract the tendency to overturn from horizontal loads and to lift from vertical loads. The analysis of the rack assumes an adequate supporting structure, and loads were generated accordingly.

an acceptable dynamic analysis method

Stress analyses will be performed by the vendor using classical methods based upon shears and moments developed by the dynamic method. Using the given loads, load conditions and analytical methods, stresses will be calculated at critical sections of the rack and compared to acceptance criteria referenced in ASME Section III, Subsection NF. ~~Compressive stability will be calculated according to the AISI code for light gauge structures~~.

The loads in the three orthogonal directions are considered to be acting simultaneously and are combined using the SRSS method suggested in Regulatory Guide 1.92.

Under fuel drop loading conditions, the acceptance criterion is that, although deformation may occur, k_{eff} must remain <0.95. The rack is designed such that, should the drop of a fuel assembly damage the tubes and dislodge a plate of poison material, the k_{eff} would still be <0.95 as required.

The effect of the gap between the fuel and the storage tube is taken into account on a local effect basis. Dynamic response analysis has shown that the fuel contacts the tube over a large portion of its length, thus preventing an overloaded condition of both fuel and tube.

The vertical impact load of the fuel onto its seat is considered conservatively as being slowly applied without any benefit for strain rate effects. See Subsection 9.1.6.7 for COL license information requirements.

9.1.2.1.4 Thermal-Hydraulic Design

The fuel storage racks are designed to provide sufficient natural convection coolant flow to remove decay heat without reaching excessive water temperatures (100°C).

In the spent-fuel storage pool, the bundle decay heat is removed by recirculation flow to the fuel pool cooling heat exchanger to maintain the pool temperature. Although the design pool exit temperature to the fuel pool cooling heat exchanger is far below boiling, the coolant temperature within the rack is higher, depending on the naturally induced bundle flow which carries away the decay heat generated by the spent fuel. The purchase specification for the fuel storage racks requires the vendor to perform the thermal-hydraulic analyses to evaluate the rate of naturally circulated flow and the maximum rack water exit temperature. See Subsection 9.1.6.8 for COL license information requirements.

9.1.2.1.5 Material Considerations

All structural material used in the fabrication of the fuel storage racks is in accordance with the latest issue of the applicable ASTM specification at the time of equipment order. This material is chosen due to its corrosion resistance and its ability to be formed and welded with consistent quality. The normal pool water operating temperatures are 16 to 66°C.

°C

The storage tube material is permanently marked with identification traceable to the material certifications. The fuel storage tube assembly is compatible with the environment of treated water and provides a design life of 60 years.

9.1.2.2 Facilities Description (Spent-Fuel Storage)

(1) The spent-fuel storage pool is located in the R/B (Figure 1.2-12).

(2) The R/B is a Seismic Category I building protecting the spent fuel from seismic events and externally generated missiles. There are no non-seismic systems, high or moderate energy pipes, or rotating machinery located in the vicinity of the spent-fuel pool or cask loading area on the refueling floor.

(3) The spent-fuel storage and adjacent cask loading area are separated by Seismic Category I gates. These gates isolate the cask loading area from the spent-fuel pool. The gates between the spent-fuel pool and other pools are all Seismic Category I.

(4) The shipping cask is placed in a walled off and drained portion of the spent-fuel pool. The drained volume is flooded, and the Seismic Category I gates removed. The spent fuel is then transferred. This process is reversed to remove the cask. The ratio of the

two volumes is such that failure of the gates will not lower water level enough to be unacceptable. Interlocks on the main crane prevent the shipping cask from being carried over any other portion of the spent-fuel storage pool.

(5) The spent fuel storage racks provide storage in the R/B spent-fuel pool for spent fuel received from the reactor vessel during the refueling operation. The spent-fuel storage racks are top-entry racks designed to preclude the possibility of criticality under normal and abnormal conditions. The upper tieplate of the fuel elements rests against the rack to provide lateral support. The lower tieplate sits in the bottom of the rack, which supports the weight of the fuel.

(6) The rack arrangement is designed to prevent accidental insertion of fuel assemblies or bundles between adjacent modules. The storage rack is designed to provide accessibility to the fuel bail for grappling purposes.

9.1.2.3 Safety Evaluation

9.1.2.3.1 Criticality Control

Replace:
The fuel storage racks are designed to be supported vertically by the pool floor. The fuel storage racks allow sufficient pool water flow for natural convection cooling of the stored fuel. The fuel rack modules are freestanding (i.e. not attached to the floor and can be removed).

The sper
fuel stor
430.190
associate
license information requirements.

9.1.2.3.2 Structural Design and Material Compatibility Requirements

(1) The spent-fuel pool racks provide storage for 270% of the reactor core.

(2) The fuel storage racks are designed to be supported above the pool floor by a support structure. The support structure allows sufficient pool water flow for natural convection cooling of the stored fuel. Since the modules are freestanding (i.e., no supports above the base), the support structure also provides the required dynamic stability.

(3) The racks include individual solid tube storage compartments, which provide lateral restraints over the entire length of the fuel assembly or bundle.

(4) The racks are fabricated from materials used for construction and are specified in accordance with the latest issue of applicable ASTM specifications at the time of equipment order.

(5) Lead-in guides at the top of the storage spaces provide guidance of the fuel during insertion.

not used

exception of the RHR System connections for safety-related makeup and supplemental cooling. The RHR System connections will be protected from the effects of pipe whip, internal flooding, internally generated missiles, and the effects of a moderate pipe rupture within the vicinity. See Subsection 9.1.6.10 for COL license information.

From the foregoing analysis, it is concluded that the FPC System meets its design bases.

9.1.3.4 Inspection and Testing Requirements

No special tests are required because, normally, one pump, one heat exchanger and one filter-demineralizer are operating while fuel is stored in the pool. The spare unit is operated periodically to handle abnormal heat loads or to replace a unit for servicing. Routine visual inspection of the system components, instrumentation and trouble alarms is adequate to verify system operability.

9.1.3.5 Radiological Considerations

The water level in the spent-fuel storage pool is maintained at a height which is sufficient to provide shielding for normal building occupancy. Radioactive particulates removed from the fuel pool are collected in filter-demineralizer units which are located in shielded cells. For these reasons, the exposure of plant personnel to radiation from the FPC System is minimal. Further details of radiological considerations for this and other systems are described in Chapters 11, 12, and 15.

9.1.4 Light Load Handling System (Related to Refueling)

9.1.4.1 Design Bases

The fuel-handling system is designed to provide a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after post-irradiation cooling. Safe handling of fuel includes design considerations for maintaining occupational radiation exposures as low as reasonably achievable (ALARA).

Design criteria for major fuel-handling system equipment are provided in Tables 9.1-2 through 9.1-4, which list the safety class, quality group and seismic category. Where applicable, the appropriate ASME, ANSI, Industrial and Electrical Codes are identified. Additional design criteria are shown below and expanded further in Subsection 9.1.4.2.

The transfer of new fuel assemblies between the uncrating area and the new-fuel inspection stand ~~and/or the new fuel storage vault~~ to the fuel storage pool is accomplished using a 49.82 kN auxiliary hoist on the R/B crane equipped with a general purpose grapple.From this point on, the fuel will either be handled by the telescoping grapple (or auxiliary hoist) on the refueling machine.

The refueling machine is Seismic Category I from a structural standpoint in accordance with 10CFR50, Appendix A. The refueling machine is constructed in accordance with a quality

9.1.4.2.2 Overhead Bridge Cranes

9.1.4.2.2.1 Reactor Building Crane

The Reactor Building (R/B) crane is a seismically analyzed piece of equipment. The crane consists of two crane girders and a trolley which carries two hoists. The runway track, which supports the crane girders, is supported from the R/B walls at elevation 34,600. The trolley travels laterally on the crane girders carrying the main hoist and auxiliary hoist.

The R/B crane is used to move all of the major components (reactor vessel head, shroud head and separator, dryer assembly and pool gates) as required by plant operations. The R/B crane is used for handling new fuel from the R/B entry hatch to ~~new fuel storage,~~ the new fuel inspection stand and the spent-fuel pool. It also is used for handling the spent fuel cask. The principal design criteria for the R/B crane are described in Subsection 9.1.5.

9.1.4.2.3 Fuel Servicing Equipment

The fuel servicing equipment described below has been designed in accordance with the criteria listed in Table 9.1-2. Items not listed as Seismic Category I, such as hoists, tools and other equipment used for servicing, shall either be removed during operation, moved to a location where they are not a potential hazard to safety-related equipment, or seismically restrained to prevent them from becoming missiles.

9.1.4.2.3.1 Fuel Prep Machine

Two fuel preparation machines (Figure 9.1-3) are mounted on the wall of the spent-fuel pool and are used for stripping reusable channels from the spent fuel and for rechanneling of the new fuel. The machines are also used with the fuel inspection fixture to provide an underwater inspection capability.

Each fuel preparation machine consists of a work platform, a frame, and a movable carriage. The frame and movable carriage are located below the normal water level in the spent fuel pool, thus providing a water shield for the fuel assemblies being handled. The fuel preparation machine carriage has a permanently installed up-travel-stop to prevent raising fuel above the safe water shield level.

9.1.4.2.3.2 New-Fuel Inspection Stand

The new-fuel inspection stand (Figure 9.1-4) serves as a support for the new-fuel bundles undergoing receiving inspection and provides a working platform for technicians engaged in performing the inspection.

The new-fuel inspection stand consists of a vertical guide column, a lift unit to position the work platform at any desired level, bearing seats and upper clamps to hold the fuel bundles in position.

fuel assemblies to and from the pool storage racks. Simultaneously, the RIP, FMCRD hydraulic system, and the Neutron Monitoring System may be serviced from beneath the vessel.

During refueling, the refueling machine transfers the spent fuel from the core to the spent fuel pool. The spent fuel assembly is placed in the fuel preparation machine, where its channel is removed and fitted to the new-fuel bundle previously placed in the machine. During channeling, the spent fuel bundle is placed in the storage racks by the refueling platform. The refueling platform then places another new-fuel bundle in the fuel preparation machine for channeling.

When refueling and servicing are completed, the steam separator assembly is replaced in the vessel, the steamline plugs removed and the steam dryer returned to the vessel. At this point, the gates are installed, isolating the reactor well from the other pools. The reactor well is then drained to the main condenser. With the reactor well empty, the vessel and drywell heads are replaced.

directly to the refueling floor where the new fuel is examined for damage during shipment.

9.1.4.2.10.2.1 New Fuel Preparation

9.1.4.2.10.2.1.1 Receipt and Inspection of New Fuel

The incoming new fuel will be delivered to a receiving station within the Reactor Building (R/B). The crates are unloaded from the transport vehicle and examined for damage during shipment.

one of the following locations:
- Fuel prep machine for storage in the spent fuel pool
- New fuel inspection stand for further inspection

...ons are approximately 813 x 813 x 5486 mm. Each crate contains two fuel ...d by an inner metal container. Shipping weight of each unit is approximately ...eiving station shall include a separate area where the crate cover and the inner ...n be removed from the crate. Both inner and outer shipping containers are ...g during uncrating is accomplished by use of the R/B cranes. The inner container is tilted to a position which is almost vertical, while the fuel bundles are unstrapped and removed from the container with the R/B crane. They are then transported to storage in the new-fuel storage racks located in the new-fuel storage vault or to the new-fuel inspection stand located on the refueling floor.

The actual inspection of the new fuel is normally deferred until all the reusable containers are emptied and the area around the new-fuel vault cleared. At that time, the individual fuel bundles are removed from the vau... DELETE ...inspection stand, dimensionally and visually inspected, and ret... ...o await assembly with channels. The new-fuel inspection stand accommodates two fuel assemblies at one time.

9.1.4.2.10.2.1.2 Channeling New Fuel

New fuel is unloaded from the new-fuel vault and transported to the fuel racks in the spent fuel pool. Usually, channeling new fuel is done concurrently with dechanneling spent fuel. Two fuel

The new fuel can be channeled using new channels in the new fuel inspection stand. If previously irradiated channels are to be used, the procedure is as follows:

preparation machines are locate[illegible] DELETE [illegible]e used for dechanneling spent fuel and the other to channel new fue[illegible]ows:

Using the refueling platform, a spent fuel bundle is transported to the fuel prep machine. The channel is unbolted from the bundle using the channel bolt wrench. The channel handling tool is fastened to the top of the channel and the fuel prep machine carriage is lowered removing the fuel from the channel. The channel is then positioned over a new-fuel bundle located in fuel prep machine No. 2 and the process reversed. The channeled new fuel is stored in the pool storage racks ready for insertion into the reactor.

9.1.4.2.10.2.1.3 Equipment Preparation

Another ingredient in a successful refueling outage is equipment and new fuel readiness. Equipment long lying dormant must be brought to life. All tools, grapples, slings, strongbacks, stud tensioners, etc., will be given a thorough inspection and operational check, and any defective (or well worn) parts will be replaced. Air hoses on grapples will be checked. Crane cables will be routinely inspected. All necessary maintenance will be performed to preclude outage extension due to equipment failure.

9.1.4.2.10.2.2 Reactor Shutdown

The reactor is shut down according to a prescribed planned procedure. During cooldown, the reactor pressure vessel is vented and filled to above flange level to promote cooling.

9.1.4.2.10.2.2.1 Drywell Head Removal

Immediately after cooldown, the work to remove the drywell head can begin. The drywell head will be attached by a quick disconnect mechanism. To remove the head, the quick disconnect pins are withdrawn and stored separately for reinsertion when the head is replaced. The drywell head is lifted by the R/B crane to its storage space on the refueling floor. The drywell seal surface protector is installed before any other activity proceeds in the reactor well area.

9.1.4.2.10.2.2.2 Reactor Well Servicing

When the drywell head has been removed, several pipe lines are exposed. These lines penetrate the reactor well through openings. The piping must be removed and the openings sealed. There are also various vent openings which must be made watertight.

Water level in the vessel is now lowered to flange level in preparation for head removal.

9.1.4.2.10.2.3 Reactor Vessel Opening

9.1.4.2.10.2.3.1 Vessel Head Removal

The combination head strongback and carousel stud tensioner is transported by the R/B crane and positioned on the reactor vessel head.

The lifting capacity of each crane or hoist is designed to at least the maximum actual or anticipated weight of equipment and handling devices in a given area serviced. The hoists, cranes, or other lifting devices shall comply with the requirements of ANSI N14.6, ANSI B30.9, ANSI B30.10 and NUREG-0612, Subsection 5.1.1(4) or 5.1.1(5). Cranes and hoists are also designed to criteria and guidelines of NUREG-0612, Subsection 5.1.1(7), ANSI B30.2 and CMAA-70 specifications for electrical overhead traveling cranes, including ANSI B30.11, ANSI B30.16, and NUREG-0554 as applicable.

9.1.5.2 System Description

9.1.5.2.1 Reactor Building Crane

The Reactor Building (R/B) is a reinforced concrete structure which encloses the reinforced concrete containment vessel, the refueling floor, ~~new-fuel storage vault~~, the storage pools for spent-fuel and the dryer and separator and other equipment. The R/B crane provides heavy load lifting capability for the refueling floor. The main hook 1.471 MN will be used to lift the concrete shield blocks, drywell head, reactor pressure vessel (RPV) head insulation, RPV head, dryer, separator strongback, RPV head strongback carousel, new-fuel shipping containers, and spent-fuel shipping cask. The orderly placement and movement paths of these components by the R/B crane precludes transport of these heavy loads over the spent fuel storage pool ~~or over the new-fuel storage vault~~.

The R/B crane will be used during refueling/servicing as well as when the plant is online. During refueling/servicing, the crane handles the shield plugs, drywell and reactor vessel heads, steam dryer and separators, etc. (Table 9.1-7). Minimum crane coverage includes R/B refueling floor laydown areas, and R/B equipment storage pit. During normal plant operation, the crane will be used to handle new-fuel shipping containers and the spent-fuel shipping casks. Minimum crane coverage must include ~~the new-fuel vault~~, the R/B equipment hatches, and the spent-fuel cask loading and washdown pits. A description of the refueling procedure can be found in Section 9.1.4.

The R/B crane will be interlocked to prevent movement of heavy loads over the spent-fuel storage portion of the spent-fuel storage pool. Since the crane is used for handling large heavy objects over the open reactor, the crane is of Type I design. The R/B crane shall be designed to meet the single-failure-proof requirements of NUREG-0554.

9.1.5.2.2 Other Overhead Load Handling System

9.1.5.2.2.1 Upper Drywell Servicing Equipment

The upper drywell arrangement provides servicing access for the main steam isolation valves (MSIVs), feedwater isolation valves, safety/relief valves (SRVs), emergency core cooling systems (ECCS) isolation valves, and drywell cooling coils, fans and motors. Access to the space is via the R/B through either the upper drywell personnel lock or equipment hatch. All equipment is removed through the upper drywell equipment hatch. Platforms are provided for

9.1.6 COL License Information

9.1.6.1

Extensive Changes to Section 9.1.6. See Insert 1 on following pages.

The COL applicant shall provide the NRC a confirmatory criticality analysis for the inadvertent placement of a fuel assembly in other that prescribed locations, as required by Subsection 9.1.1.1.1.

9.1.6.2 Dynamic and Impact Analyses of New Fuel Storage Racks

The COL applicant shall provide the NRC confirmatory dynamic and impact analyses of the new fuel storage racks, as requested by Subsection 9.1.1.1.6.

9.1.6.3 Spent Fuel Storage Racks Criticality Analysis

The COL applicant shall provide the NRC a confirmatory critically analysis for the inadvertent placement of a fuel assembly in other than prescribed locations, as required by Subsection 9.1.2.3.1.

9.1.6.4 Spent Fuel Racks Load Drop Analysis

The COL applicant shall provide the NRC a confirmatory load drop analysis, as required by Subsection 9.1.4.3.

9.1.6.5 New Fuel Inspection Stand Seismic Capability

The COL applicant shall install the new fuel inspection stand firmly to the wall so that it does not fall into or dump personnel into the spent fuel pool during an SSE (Subsection 9.1.4.2.3.2).

9.1.6.6 Overhead Load Handling System Information

The COL applicant shall provide a list of all cranes, hoists, and elevators and their lifting capacities, including any limit and safety devices required for automatic and manual operation. In addition, for all such equipment, the COL applicant shall provide:

(1) Heavy load handling system operating and equipment maintenance procedures.

(2) Heavy load handling system and equipment maintenance procedures and/or manuals.

(3) Heavy load handling system and equipment inspection and test plans; NDE, visual, etc.

(4) Heavy load handling safe load paths and routing plans.

(5) QA program to monitor and assure implementation and compliance of heavy load handling operations and controls.

(6) Operator qualifications, training and control program.

9.1.6 COL License Information

9.1.6.1 Not Used

9.1.6.2 Not used

9.1.6.3 Spent Fuel Storage Racks Criticality Analysis

The COL applicant shall provide the NRC a confirmatory critically analysis for the inadvertent placement of a fuel assembly in other than prescribed locations, as required by Subsection 9.1.2.3.1. A confirmatory criticality analysis for spent fuel storage will be prepared and verified in accordance with ITAAC 2.5.6.1, 2.5.6.2 and 2.5.6.3.

The analysis will document:

(1) Assumptions and input parameters (i.e. number of racks, fuel capacity, rack material, neutron poison content, fuel center to center distances). Assumptions include highest reactivity fuel assembly and optimum moderator under normal and accident conditions.

(2) The highest reactivity fuel storage array is maintained subcritical ($k_{eff} \leq 0.95$) when fully loaded under optimum moderator condition.

(3) Maximum uplift forces from fuel handling equipment will not increase $k_{eff} > 0.95$ for fuel array

(4) Failure of non-safety related structures in vicinity of spent fuel storage, fuel load drop or missiles generated by surrounding equipment will not increase $k_{eff} > 0.95$

(5) Rack design precludes inadvertent placement of fuel in other than design locations

9.1.6.4 Spent Fuel Racks Load Drop Analysis

The COL applicant shall provide the NRC a confirmatory load drop analysis, as required by Subsection 9.1.4.3. This analysis is dependent on a vendor specific design and the as-built configuration of spent-fuel storage racks.

The load drop analysis will confirm that $k_{eff} \leq 0.95$ for a drop of one fuel assembly and its associated handling tool from a height of 1.8 m above the spent fuel racks.

9.1.6.5 New Fuel Inspection Stand Seismic Capability

The COL applicant shall install the new fuel inspection stand firmly to the wall so that it does not fall into or dump personnel into the spent fuel pool during an SSE (Subsection 9.1.4.2.3.2).

9.1.6.6 Overhead Load Handling System Information

The COL applicant shall provide a list of all cranes, hoists, and elevators and their lifting capacities, including any limit and safety devices required for automatic and manual operation.

In addition, for all such equipment, the COL applicant shall provide

(1) Heavy load handling system operating and equipment maintenance procedures.

(2) Heavy load handling system and equipment maintenance procedures and/or manuals.

(3) Heavy load handling system and equipment inspection and test plans; NDE, visual, etc.

(4) Heavy load handling safe load paths and routing plans.

(5) QA program to monitor and assure implementation and compliance of heavy load handling operations and controls.

(6) Operator qualifications, training and control program.

9.1.6.7 Spent Fuel Racks Structural Evaluation

The COL applicant shall provide the NRC a confirmatory structural evaluation of the spent fuel racks, as outlined in Subsection 9.1.2.1.3. This evaluation is dependent on a vendor specific design and the as-built configuration of spent fuel storage racks.

Structural integrity of the racks will be demonstrated for the load combinations described in SRP 3.8.4 Appendix D. The fuel storage racks meet Seismic Category 1 requirements.

9.1.6.8 Spent Fuel Racks Thermal-Hydraulic Analysis

The COL applicant shall provide the NRC confirmatory thermal-hydraulic analysis that evaluates the rate of naturally circulated flow and the maximum rack water exit temperatures, as required by Subsection 9.1.2.1.4. A confirmatory thermal-hydraulic analysis will be prepared and verified in accordance with ITAAC 2.5.6.4.

Fuel bundle data in the analysis will use maximum decay heat generation rates for worst case power history. Natural circulation flow through the rack arrangement prevents water temperatures from exceeding 100°C under normal, abnormal, and accident conditions.

9.1.6.9 Spent Fuel Firewater Makeup Procedures and Training

Table 9.1-8 Heavy Load Operations (Continued)

Hardware Handling Tasks	Handling Systems*	Handling Equipment	In-Plant Location Elevation*
Steam Plugs Temporary Tool Installation and removal	RBS	RB Crane Auxiliary Hoist 4447 N Chain Hoist Service Platform Refueling Machine	RF 26700 IRV 15500
Steam Separator/Shroud Head Removal, storage and reinstallation. Include unbolting shroud head bolts from Refueling Platform	RBS	RB Crane Main Hoist Dryer/Separator Refueling Machine	RW 18700 IRV 9500 D/SP 18700
Fuel Bundle Sampler Tool Positioning, sampling and removal, storage	RBS	Refueling Machine or RB Crane Auxiliary Hoists	RW 18700 IRV 9100
Refueling Operations:			
New-Fuel: Receive at G/F & lift to RF Receiving, inspection, remove outer container	RBS	RB Crane Auxiliary Hoist	RB 7300 RF 26700
Remove inner container and ~~store fuel bundle in new fuel vault rack.~~ Move fuel to new fuel inspection stand, inspect and return to storage. [...and perform inspection]	RBS	RB Crane Auxiliary Hoist	RF 26700 NFS 18700 NFI 18700
Move new fuel from vault [inspection stand] to fuel pool, storage of fuel channel fixtures. Channel new fuel and store. Move channeled fuel and load into reactor core.	RBS	RB Crane Auxiliary Hoist Refueling Machine Auxiliary Hoist Fuel Grapple	NFS 18700 FSP 14800 FCF 14800 RF 26700 RVC 9500
Spent-Fuel:			
Remove spent fuel from RPV core. Transport spent fuel to storage racks and/or fuel channel fixture remove channels and store spent fuel bundles	RBS	Refueling Machine Auxiliary Hoists Fuel Grapple Channel Handling Boom	RW 18700 FSP 14880 FCF 14800 RVC 9500

Table 9.1-9 Legend for In-Plant Locations/Elevations

Elevations	Legend	Location/Description
18700	D/SP	Dryer/Separator Storage Pool
14800	FCF	Fuel Channeling Fixtures
18700 14800	FSP	Fuel Storage Pool
14800	FLP	Fuel Cask Load Pit
18700	FWP	Fuel Cask Wash Pit
7300	G/F	Ground Floor Equipment Access
18700 3000	IRV	Inside Reactor Vessel
(–)6700	LDW	Lower Drywell Area Receiving
7300	MST	Main Steam Tunnel Area
18700	NFI	New Fuel Inspection Stand
~~18700~~	~~NFS~~	~~New Fuel Storage Vault~~
33200 to 7300	RB	Reactor Building
26700	RF	Refueling Floor
9500	RVC	Reactor Vessel Core (TOP)
18700	RW	Reactor Well (TOP RPV)
18700(C) (–)6700(A) & (B)	SRM	Service Rooms: (a) CRD (b) RIP (c) MSIV & SRV
26,700 to 7300	D/W	Drywell Area
	LDS	Lower Drywell Servicing
	MSS	Main Steam Tunnel Servicing
	RBS	Reactor Building Servicing
	SSR	Special Service Rooms
	UDS	Upper Drywell Servicing

Table 9.1-10 Single-Failure-Proof Cranes

1.	Reactor Building crane
2.	Refueling machine crane

(a) The functions are located in a separate fire-resistive enclosure.

(b) The means of fire detection, suppression and alarming are provided and accessible.

(13) Remarks—None.

9A.4.1.6.12 Corridor B SLC Area (Rm No. 622)

(1) Fire Area—F4201

(2) Equipment: See Table 9A [(Rm 665)]

Safety-Related	Provides Core Cooling
Yes, D1, and D2	No

(3) Radioactive Material Present—None that can be released as a result of fire.

(4) Qualifications of Fire Barriers—The ceiling, the walls common with the spent fuel pool (Rm 693), ~~the new fuel storage pit and~~ the new fuel inspection pit (Rms 664 and 665 respectively), the D/G (B) exhaust fan room (Rm 625), the elevator (Rm 194) and stairwell area (Rm 293) serve as fire barriers between adjacent fire areas and are of 3 h fire-resistant concrete construction. The remainder of the walls and floor are not rated as they are internal to fire area F4201. Access is provided from the elevator and stairwell, and from cross-corridor B/C (Rm 634) through a 3 h fire-resistive door. A hallway (Rm 643) opens directly into the room.

(5) Combustibles Present:

Fire Loading	Total Heat of Combustion (MJ)
None	727 MJ/m^2 NCLL (727 MJ/m^2 maximum average) applies

(6) Detection Provided—Class A supervised POC in the room and manual alarm pull stations at Col.2.8-F.1 and 2.7-C.0.

(8) Fire Protection Design Criteria Employed:

(a) The function is located in a separate fire-resistive enclosure.

(b) Fire detection and suppression capability is provided and accessible.

(c) Fire stops are provided for cable tray and piping penetrations through rated fire barriers.

(9) Consequences of Fire—The postulated fire assumes loss of the function. There are no emergency core cooling or safe shutdown system components in the area.

Smoke from a fire will be removed by the normal HVAC System operating in its smoke removal mode.

(10) Consequences of Fire Suppression—Suppression extinguishes the fire. Refer to Section 3.4 “Water Level (Flood) Design”, for the drain system.

(11) Design Criteria Used for Protection Against Inadvertent Operation, Careless Operation or Rupture of the Suppression System:

(a) Location of the manual hose suppression system external to the room

(b) Provision of raised supports for the equipment

(c) Refer to Section 3.4 “Water Level (Flood) Design”, for the drain system.

(d) ANSI B31.1 standpipe (rupture unlikely)

(12) Fire Containment or Inhibiting Methods Employed:

(a) The functions are located in a separate fire-resistive enclosure.

(b) The means of fire detection, suppression and alarming are provided and accessible.

(13) Remarks—None.

9A.4.1.6.39 Pits and Pools

(1) Fire Area—See individual pits and pools location.

The following pits and pools occupy space at this elevation of the building:

(a) ~~New Fuel Storage Pit~~ deleted

(b) Cask Washdown Pit

(c) D/S Transfer Canal

Smoke control is by the normal HVAC System functioning in the smoke control mode. Refer to 9.5.1.1.6 for additional information.

(10) Consequences of Fire Suppression—Suppression extinguishes the fire. Refer to Section 3.4, "Water Level (Flood) Design," for the drain system.

(11) Design Criteria Used for Protection Against Inadvertent Operation, Careless Operation or Rupture of the Suppression System:

(a) Refer to Section 3.4, "Water Level (Flood) Design," for the drain system.

(b) Provision of raised supports for the equipment

(c) Location of manual suppression system in an area external to the room containing the safety-related equipment

(d) ANSI B31.1 standpipe (rupture unlikely)

(12) Fire Containment or Inhibiting Methods Employed:

(a) The functions are located in a separate fire-resistive enclosure.

(b) The means of detection, suppression and alarming are provided and accessible.

(c) Fire stops are provided for cable tray and piping penetrations through rated fire barriers.

(13) Remarks—The chiller unit “B” provides cooling for the control room HVAC “B” system which serves the safety-related multidivisional equipment in the control room and the RCW “B”. This equipment is also required to function to support equipment required for remote shutdown and therefore is in a fire area separate from the control room and its HVAC equipment.

9A.4.2.6.4 HVAC “B” Supply and Exhaust (Rm Nos. 624, 625, 627, 661 ~~and 664~~)

(1) Fire Area—FC1210

(2) Equipment: See Table 9A.6-3

Safety-Related	Provides Core Cooling
Yes, D2	Yes, See Remarks.

(3) Radioactive Material Present—None.

Rm 624

(4) Qualification of Fire Barriers—The building exterior wall, common to Rm Nos. 624 ~~and 664~~, is a fire barrier and is of three hour fire-resistive concrete construction. The walls common to fire area FC4310 (Rm Nos. 622, 626, 628, 662 and 633) are fire

and 661

barriers of three hour fire-resistive concrete construction. The wall of Rm No. 661 common to Rm No. 623 is a fire barrier. The internal walls of Rm Nos. 624, 625, 627, 661 and 664 are common to fire area FC1210 are not designated fire barriers. The supply duct through the building exterior wall in room 624 and the exhaust duct through the ceiling in Rm No. 661 do not have fire dampers. See Subsection 9.5.1.1.6 for a discussion and justification of this design feature. The ceiling is a building exterior wall and is of three hour fire-resistive concrete construction. Sections of the floor, common to fire areas FC5010 and FC5110 below, are also of three hour fire-resistive concrete construction. Access to the area is provided from Rm No. 622 via a three hour fire-resistive door. Access to Rm Nos. 625, 627 and 661 from room 624 is via removable panels.

(5) Combustibles Present—(NCLL Applies)

Type	**Fire Loading Total Heat of Combustion (MJ)**
Cable in trays Bag filters	727 MJ/m^2 NCLL (727 MJ/m^2 maximum average) applies

(6) Detection Provided—Class A Supervised POC detection system in the fire area and manual pull alarm station at 1.42-J.67.

(7) Suppression Available:

Type	**Location/Actuation**
Standpipe and hose reel	1.30 - K.52 & 1.37-J.67/Manual
ABC hand extinguishers	1.42-J.67 and 1.30-K.55/Manual

(8) Fire Protection Design Criteria Employed:

(a) The function is located in a fire area which is separate from fire areas providing alternate means of performing the safety or shutdown function.

(b) Fire detection and suppression capability is provided and accessible.

(c) Fire stops are provided for cable tray and piping penetrations though designated fire barriers.

(9) Consequences of Fire—Postulated fire assumes loss of the function and possibly the shutdown of RCW “B” and consequential loss of division 2 due to fire generated smoke and heat. HVAC Supplies and Exhaust “A” and “C” would remain operational.

has two independently adjustable trip alarm circuits, one is set to trip on high radiation and the other is set to trip on downscale indication (loss of sensor input). Also, each ARM monitor is equipped with self-test feature that monitors for gross failures and will activate an alarm on loss of power or when a failure is detected. Auxiliary units with local alarms are provided in selected local areas for radiation indication and for activating the local audible alarms on abnormal levels. Each area radiation channel is powered from the non-Class 1E vital 120 VAC source, which is continuously available during loss of offsite power. The recording devices are powered from the 120 VAC instrument bus.

12.3.4.2 ARM Detector Location and Sensitivity

The location of each area detector is shown on the plant layout drawings for each building (Figures 12.3-56 through 12.3-73). The specific area radiation channels for each building are listed in Tables 12.3-3 through 12.3-7, along with reference to map location of the detector, the channel sensitivity range, and the areas for the local alarms. The range and sensitivity of each area radiation channel is classified as follows:

(1) Range 0.10 µGy/h to 1 mGy/h-H (High Sensitivity)

(2) Range 1 µGy/h to 10 mGy/h-M (Medium Sensitivity)

(3) Range 10 µGy/h to 10^2 mGy/h-L (Low Sensitivity)

(4) Range 1 mGy/h to 10 Gy/h-LL (Low Low Sensitivity)

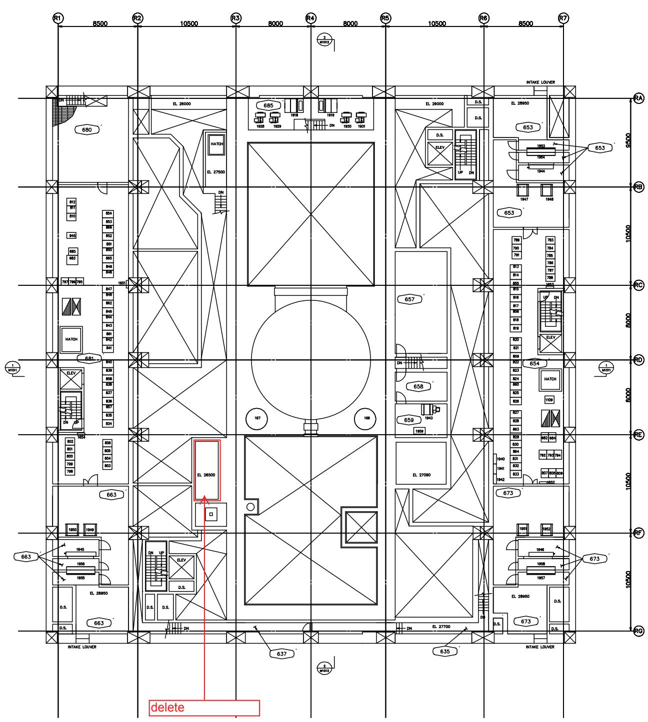
(5) Range 1 mGy/h to 10^2 Gy/h-VL (Very Low Sensitivity)

and spent

12.3.4.3 Pertinent Design Parameters and Requirements

Two high-range radiation channels are provided to monitor radiation from accidental fuel handling. One detector is positioned near the fuel pool and the other located in the fuel handling area. Criticality detection monitors are not needed to satisfy the criticality accident requirements of 10CFR70.24, when specialized high density fuel storage racks preclude the possibility of criticality accident under normal and abnormal conditions. The new fuel bundles are ~~stored in racks that are located in the fuel vault while the spent fuel bundles are~~ stored in racks that are placed at the bottom of the fuel storage pool. A full array of loaded fuel storage racks are designed to be subcritical, as defined in Sections 9.1 and 9.2. The COL applicant must verify and certify that the design meets the criteria specified in Subsection 12.3.7.3.

The detectors and radiation monitors are responsive to gamma radiation over an energy range of 0.013 pJ to 1.12 pJ. The energy dependence from 0.016 pJ to 0.481 pJ is accurate within ±20% . The overall system design accuracy is within 9.5% of equivalent linear full-scale recorder output for any decade.



T.M.S.L. 27200 (3.5F)

EQUIPMENT IDENTIFICATION AND LOCATION LIST

REF NO	DESCRIPTION
864	FMCRD POWER DISTB
	PANEL (CR GRP 3)
865	FMCRD POWER DISTB
	PANEL (CR GRP 3)
866	FMCRD POWER DISTB
	PANEL (CR GRP 3)
945	ROD POSITION MONITORING PANEL
1109	ROD POSITION MONITORING PANEL
1651	RB FIRE WTR SP B3
	RM 681 HOSE STA
1652	RB FIRE WTR SP C2
	RM 654 HOSE STA
1653	RB FIRE WTR SP A2
	RM 654 HOSE STA
1654	RB FIRE WTR SP B4
	RM 681 HOSE STA
1918	MAIN STEAM TUNNEL
1919	MAIN STEAM TUNNEL
1928	MAIN STEAM TUNNEL
1929	MAIN STEAM TUNNEL
1930	MAIN STEAM TUNNEL
1931	MAIN STEAM TUNNEL
1940	120V NON-CLASS 1E
	INST PWR DP 200A2
1941	208/120V NON-CLASS
	1E INST PWR DP 201A2
1942	208/120V INST POWER
	PANEL NON-CLASS 1E
1943	CAMS ROOM A
1944	ELECTRICAL EQUIPMENT
	AREA DIVISION A
1945	ELECTRICAL EQUIPMENT
	AREA DIVISION B
1946	ELECTRICAL EQUIPMENT
	AREA DIVISION C
1947	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1948	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1949	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1950	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1951	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1952	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1959	CONTINUOUS H2 AND O2
	SAMPLE PANEL
1953	ROUGHING FILTER FOR
	EL EQUIP AREA DIV A
1954	AFTER FILTER FOR
	ELEC EQUIP DIV A
1955	ROUGHING FILTER FOR
	EL EQUIP AREA DIV
1956	AFTER FILTER FOR
	EL EQUIP AREA DIV B
1957	ROUGHING FILTER FOR
	EL EQUIP AREA DIV C
1958	AFTER FILTER FOR
	EL EQUIP AREA DIV C

EQUIPMENT IDENTIFICATION AND LOCATION LIST

REF NO	DESCRIPTION
166	SKIMMER SURGE TANK A
	FUEL POOL OVERFLOW
167	SKIMMER SURGE TANK B
	FUEL POOL OVERFLOW
682	RAPI AUX PANEL A
683	RAPI AUX PANEL B
684	EMERGENCY ROD INSERTION PANEL
685	EMERGENCY ROD INSERTION PANEL
783	CRD REMOTE COMMUNICATION CAB
784	CRD REMOTE COMMUNICATION CAB
785	CRD REMOTE COMMUNICATION CAB
786	CRD REMOTE COMMUNICATION CAB
787	CRD REMOTE COMMUNICATION CAB
788	CRD REMOTE COMMUNICATION CAB
789	CRD REMOTE COMMUNICATION CAB
790	CRD REMOTE COMMUNICATION CAB
791	CRD REMOTE COMMUNICATION CAB
792	CRD REMOTE COMMUNICATION CAB
793	CRD REMOTE COMMUNICATION CAB
794	CRD REMOTE COMMUNICATION CAB
795	CRD REMOTE COMMUNICATION CAB
796	CRD REMOTE COMMUNICATION CAB
797	CRD REMOTE COMMUNICATION CAB
798	CRD REMOTE COMMUNICATION CAB
799	CRD REMOTE COMMUNICATION CAB
800	CRD REMOTE COMMUNICATION CAB
801	CRD REMOTE COMMUNICATION CAB
802	CRD REMOTE COMMUNICATION CAB
803	CRD REMOTE COMMUNICATION CAB
804	CRD REMOTE COMMUNICATION CAB
805	CRD REMOTE COMMUNICATION CAB
806	CRD REMOTE COMMUNICATION CAB
807	CRD BRAKE CONTROLLER CABINET
808	CRD BRAKE CONTROLLER CABINET
809	CRD BRAKE CONTROLLER CABINET
810	CRD BRAKE CONTROLLER CABINET
811	CRD BRAKE CONTROLLER CABINET
812	CRD BRAKE CONTROLLER CABINET
813	FM DRIVE CABINET CR GRP 1
814	FM DRIVE CABINET CR GRP 1
815	FM DRIVE CABINET CR GRP 1
816	FM DRIVE CABINET CR GRP 1
817	FM DRIVE CABINET CR GRP 1
818	FM DRIVE CABINET CR GRP 1
819	FM DRIVE CABINET CR GRP 1
820	FM DRIVE CABINET CR GRP 2
821	FM DRIVE CABINET CR GRP 2
822	FM DRIVE CABINET CR GRP 2
823	FM DRIVE CABINET CR GRP 2
824	FM DRIVE CABINET CR GRP 2
825	FM DRIVE CABINET CR GRP 2
826	FM DRIVE CABINET CR GRP 2
827	FM DRIVE CABINET CR GRP 3
828	FM DRIVE CABINET CR GRP 3
829	FM DRIVE CABINET CR GRP 3
830	FM DRIVE CABINET CR GRP 3
831	FM DRIVE CABINET CR GRP 3
832	FM DRIVE CABINET CR GRP 3
833	FM DRIVE CABINET CR GRP 3
834	FM DRIVE CABINET CR GRP 1
835	FM DRIVE CABINET CR GRP 1
836	FM DRIVE CABINET CR GRP 1
837	FM DRIVE CABINET CR GRP 1
838	FM DRIVE CABINET CR GRP 1
839	FM DRIVE CABINET CR GRP 1
840	FM DRIVE CABINET CR GRP 1
841	FM DRIVE CABINET CR GRP 2
842	FM DRIVE CABINET CR GRP 2
843	FM DRIVE CABINET CR GRP 2
844	FM DRIVE CABINET CR GRP 2
845	FM DRIVE CABINET CR GRP 2
846	FM DRIVE CABINET CR GRP 2
847	FM DRIVE CABINET CR GRP 2
848	FM DRIVE CABINET CR GRP 3
849	FM DRIVE CABINET CR GRP 3
850	FM DRIVE CABINET CR GRP 3
851	FM DRIVE CABINET CR GRP 3
852	FM DRIVE CABINET CR GRP 3
853	FM DRIVE CABINET CR GRP 3
854	FM DRIVE CABINET CR GRP 3
855	FMCRD POWER DISTB
	PANEL (CR GRP 1)
856	FMCRD POWER DISTB
	PANEL (CR GRP 1)
857	FMCRD POWER DISTB
	PANEL (CR GRP 1)
858	FMCRD POWER DISTB
	PANEL (CR GRP 1)
859	FMCRD POWER DISTB
	PANEL (CR GRP 2)
860	FMCRD POWER DISTB
	PANEL (CR GRP 2)
861	FMCRD POWER DISTB
	PANEL (CR GRP 2)
862	FMCRD POWER DISTB
	PANEL (CR GRP 2)
863	FMCRD POWER DISTB
	PANEL (CR GRP 3)

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

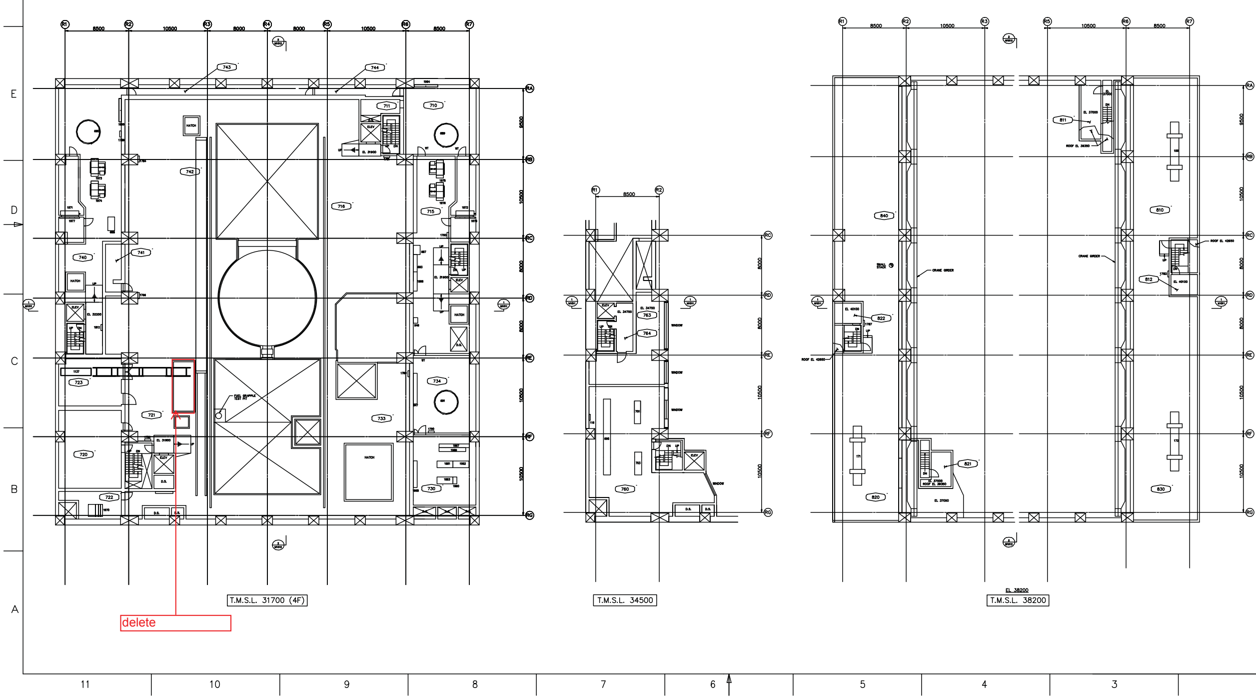
   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE

2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 1.2-11 REACTOR BUILDING, ARRANGEMENT PLAN AT ELEVATION 27200mm



EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
116	RB FIRE WTR SP B4
	RM 760 HOSE STA
155	EXHAUST SILENCER
171	EXHAUST SILENCER
172	EXHAUST SILENCER
687	REMOTE MULTIPLEXING UNIT
688	REMOTE MULTIPLEXING UNIT
689	RBCW SURGE TANK A
	SHARED WITH ECW SYS
690	RBCW SURGE TANK B
	SHARED WITH ECW SYS
691	RBCW SURGE TANK C
	SHARED WITH ECW SYS
693	480V NON-CLASS 1E MCC 630C3
695	REFUELING MACHINE CONTROL PANEL
701	REFUELING MACHINE CONT STAT
703	REFUELING MACHINE CONT COMP
946	R/B TRIAXIAL ACCELEROMETER
947	480V NON-CLASS 1E MCC 630B3
1137	RIP INSPECTION TANK
1781	RB FIRE WTR SP A1
	RM 716 HOSE STA
1782	RB FIRE WTR SP A2
	RM 810 HOSE STA
1787	RB FIRE WTR SP B4
	RM 820 HOSE STA
1784	RB FIRE WTR SP B1
	RM 742 HOSE STA
1785	RB FIRE WTR SP B2
	RM 721 HOSE STA
1786	RB FIRE WTR SP B3
	RM 740 HOSE STA
1789	RB FIRE WTR SP C1
	RM 733 HOSE STA
1790	RB FIRE WTR SP C2
	RM 715 HOSE STA
1793	RB FIRE WTR SP A2
	RM 715 HOSE STA
1796	RB FIRE WTR SP B2
	RM 721 HOSE STA
1812	RB FIRE WTR SP B4
	RM 740 HOSE STA
1960	GEIEMS CONCENTRATOR PROCESSOR
1961	REMOTE MULTIPLEXING UNIT
1962	REMOTE MULTIPLEXING UNIT
1963	REMOTE MULTIPLEXING UNIT
1964	NITROGEN BOTTLE RACK
1965	NITROGEN BOTTLE RACK
1966	480V NON-CLASS 1E MCC 630A3
1967	480V NON-CLASS 1E MCC 650A3
1968	480V NON-CLASS 1E MCC 650B3
1969	480V NON-CLASS 1E MCC 650C3
1970	REFUELING MACHINE
	CONTROL ROOM 760
1971	RIP ASD ZONE B
1972	RIP ASD ZONE A
1973	RIP ASD ZONE B
1974	RIP ASD ZONE B
1975	RIP ASD ZONE A
1976	RIP ASD ZONE A
1977	ROUGHING FILTER RIP ASD ZONE B
1978	ROUGHING FILTER RIP ASD ZONE A

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE
   WT – WATERTIGHT DOOR

2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 1.2–12 REACTOR BUILDING, ARRANGEMENT PLAN AT ELEVATION 31700/38200mm

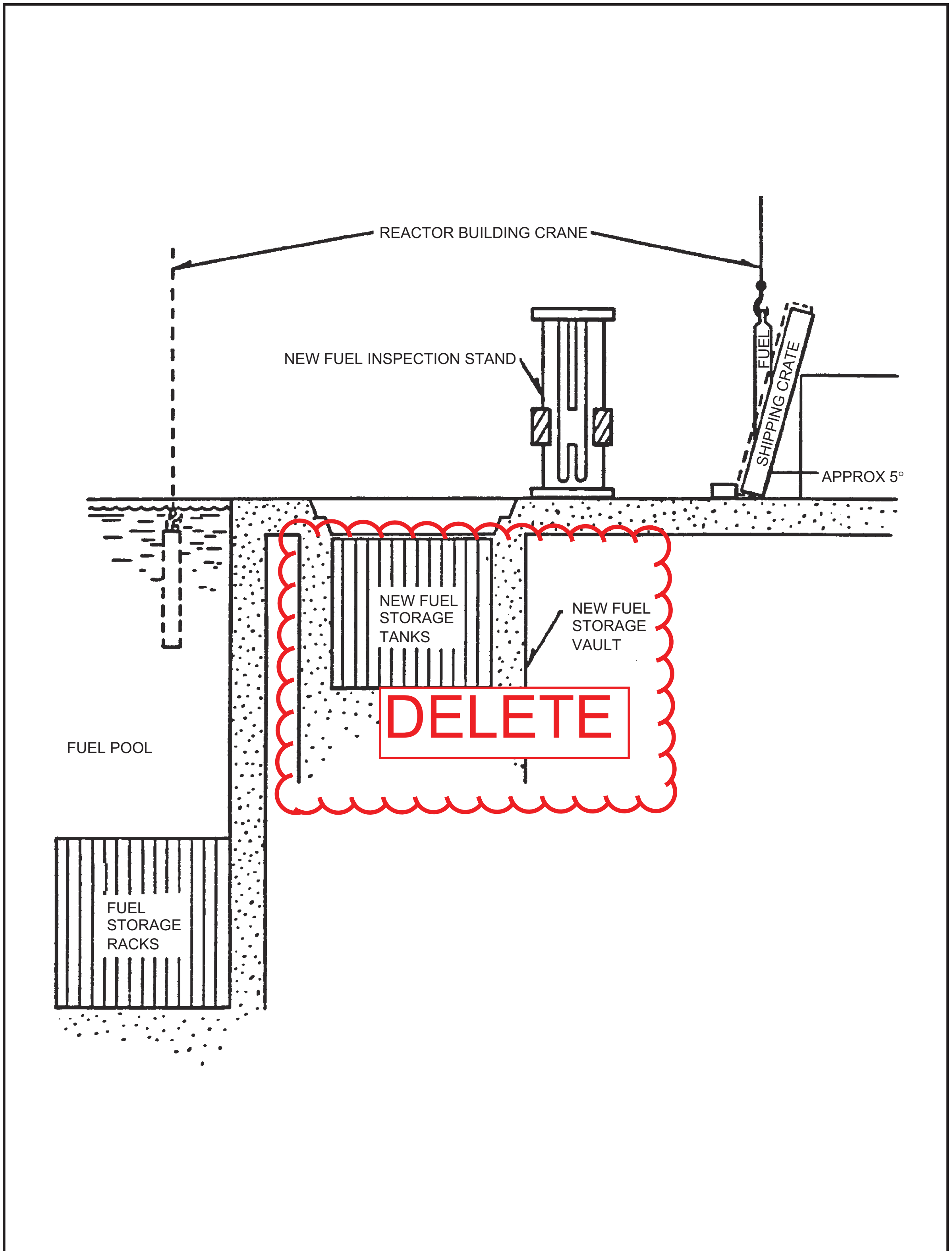


Figure 9.1-14 Simplified Section of New-Fuel Handling Facilities

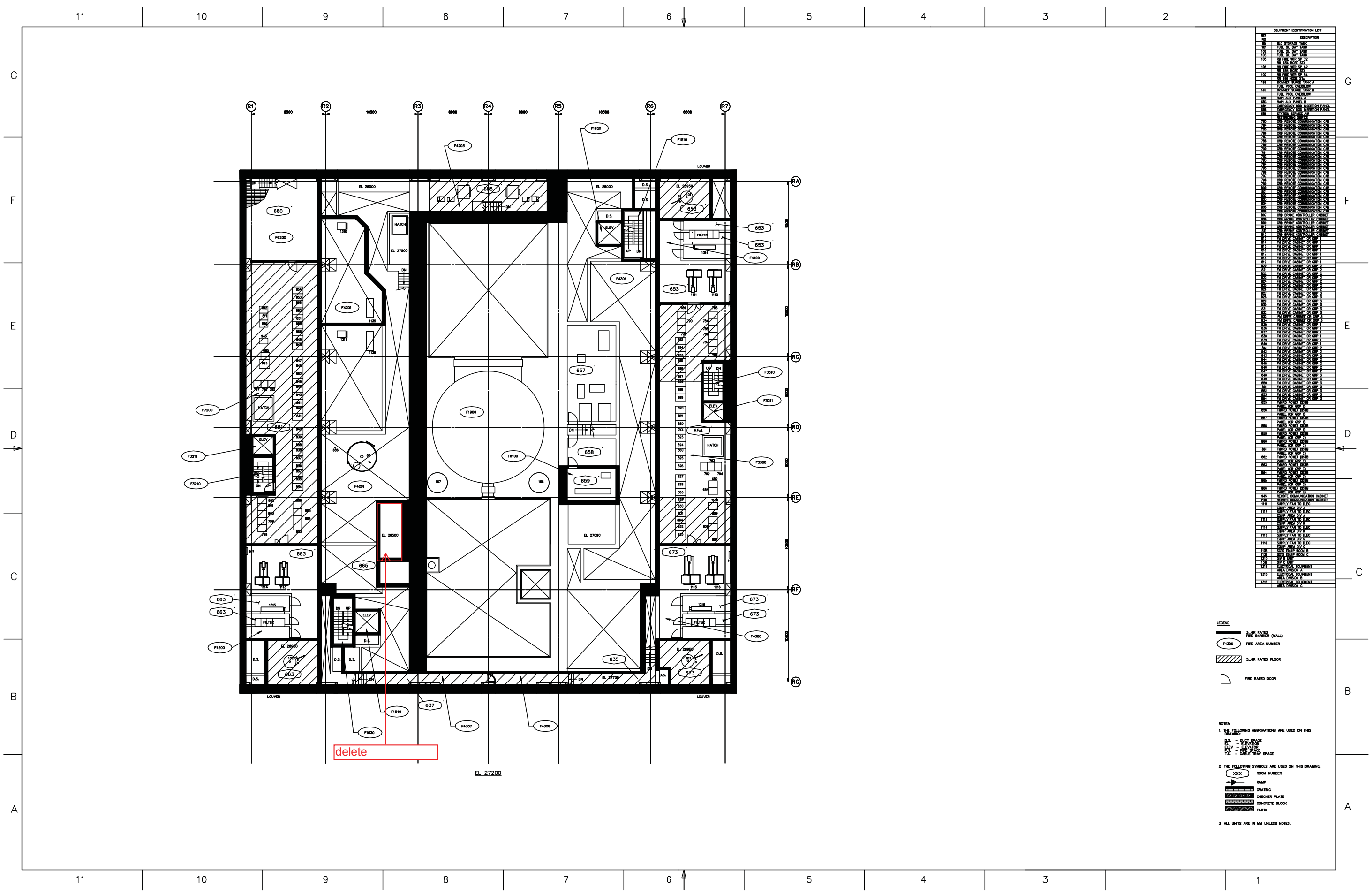


FIGURE 9A.4–7 REACTOR BUILDING FIRE PROTECTION AT ELEVATION 27200mm

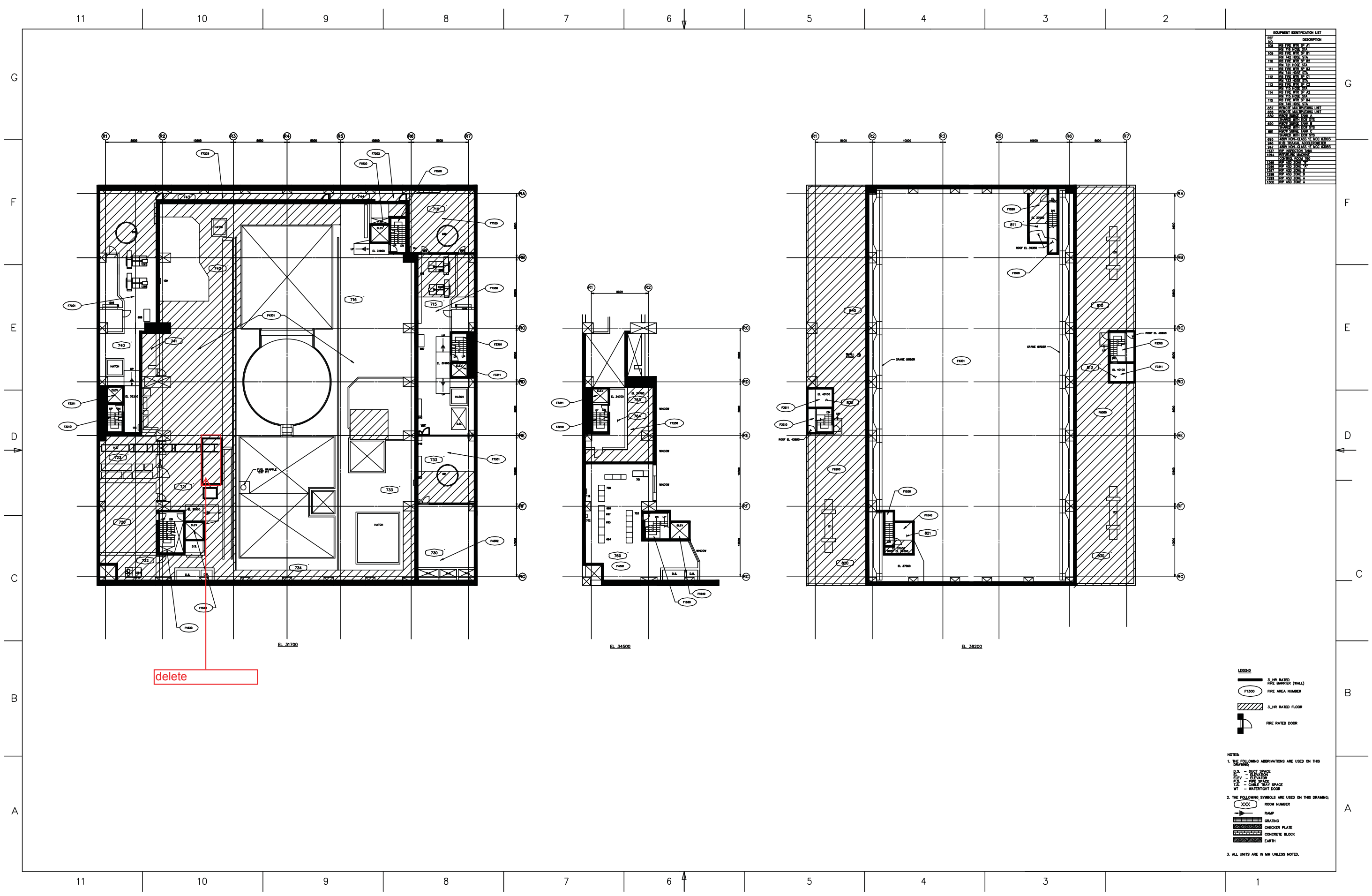
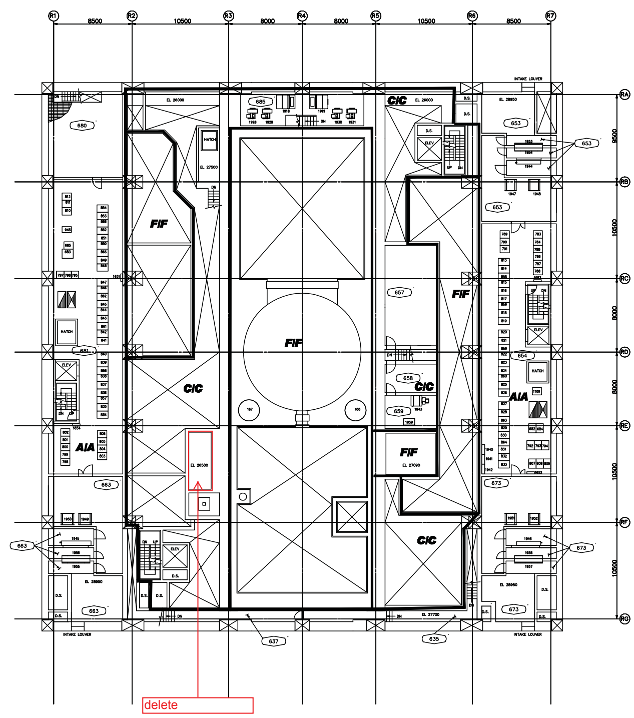


FIGURE 9A.4-8 REACTOR BUILDING FIRE PROTECTION AT ELEVATION 31700/38200mm



T.M.S.L. 27200 (3.5F)

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
864	FMCRD POWER DISTB
	PANEL (CR GRP 3)
865	FMCRD POWER DISTB
	PANEL (CR GRP 3)
866	FMCRD POWER DISTB
	PANEL (CR GRP 3)
945	ROD POSITION MONITORING PANEL
1109	ROD POSITION MONITORING PANEL
1651	RB FIRE WTR SP B3
	RM 681 HOSE STA
1652	RB FIRE WTR SP C2
	RM 654 HOSE STA
1653	RB FIRE WTR SP A2
	RM 654 HOSE STA
1654	RB FIRE WTR SP B4
	RM 681 HOSE STA
1918	MAIN STEAM TUNNEL
1919	MAIN STEAM TUNNEL
1928	MAIN STEAM TUNNEL
1929	MAIN STEAM TUNNEL
1930	MAIN STEAM TUNNEL
1931	MAIN STEAM TUNNEL
1940	120V NON-CLASS 1E
	INST PWR DP 200A2
1941	208/120V NON-CLASS
	1E INST PWR DP 201A2
1942	208/120V INST POWER
	PANEL NON-CLASS 1E
1943	CAMS ROOM A
1944	ELECTRICAL EQUIPMENT
	AREA DIVISION A
1945	ELECTRICAL EQUIPMENT
	AREA DIVISION B
1946	ELECTRICAL EQUIPMENT
	AREA DIVISION C
1947	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1948	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1949	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1950	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1951	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1952	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1959	CONTINUOUS H2 AND O2
	SAMPLE PANEL
1953	ROUGHING FILTER FOR
	EL EQUIP AREA DIV A
1954	AFTER FILTER FOR
	ELEC EQUIP DIV A
1955	ROUGHING FILTER FOR
	EL EQUIP AREA DIV
1956	AFTER FILTER FOR
	EL EQUIP AREA DIV B
1957	ROUGHING FILTER FOR
	EL EQUIP AREA DIV C
1958	AFTER FILTER FOR
	EL EQUIP AREA DIV C

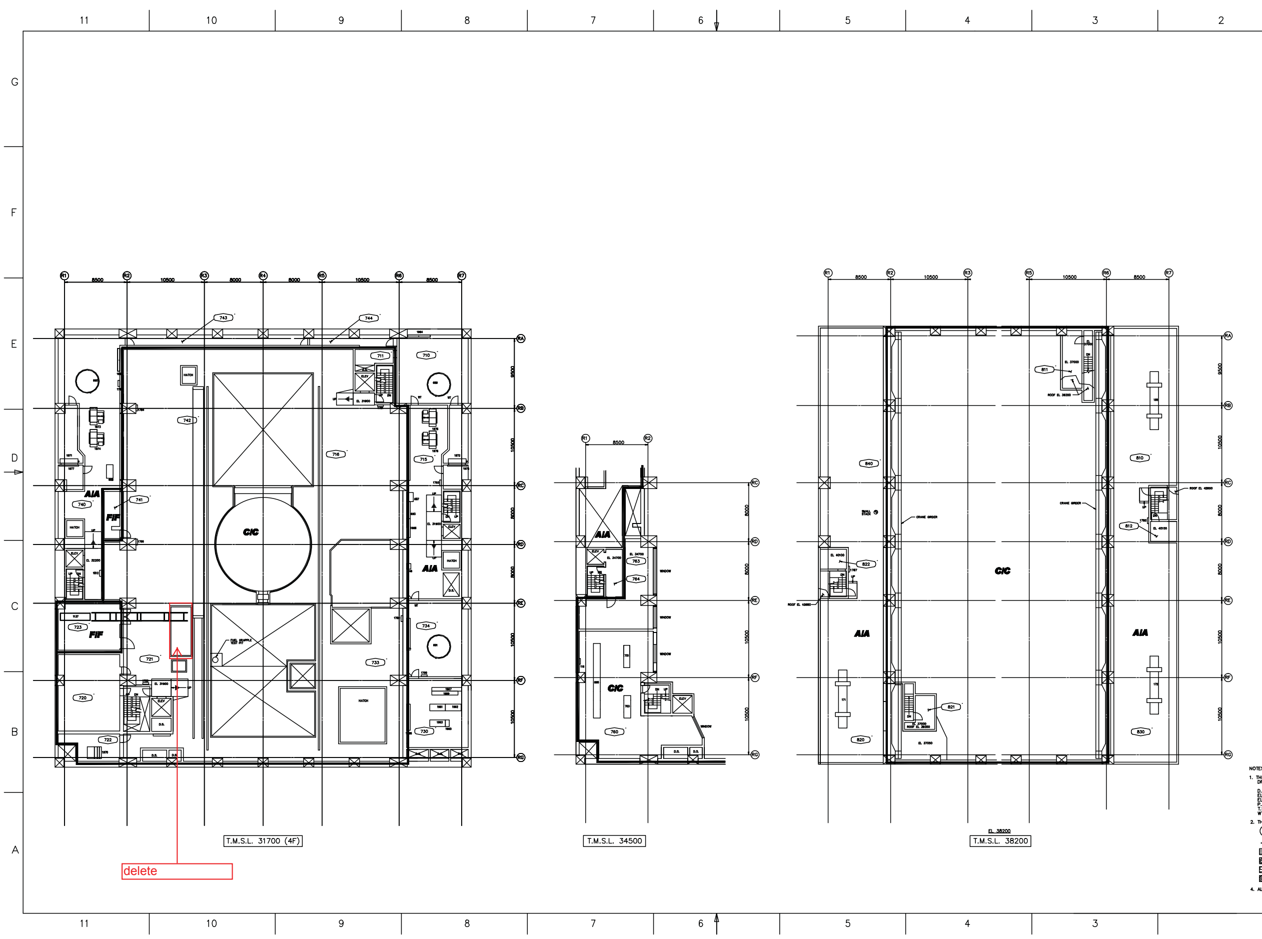
EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
166	SKIMMER SURGE TANK A
	FUEL POOL OVERFLOW
167	SKIMMER SURGE TANK B
	FUEL POOL OVERFLOW
682	RAPI AUX PANEL A
683	RAPI AUX PANEL B
684	EMERGENCY ROD INSERTION PANEL
685	EMERGENCY ROD INSERTION PANEL
783	CRD REMOTE COMMUNICATION CAB
784	CRD REMOTE COMMUNICATION CAB
785	CRD REMOTE COMMUNICATION CAB
786	CRD REMOTE COMMUNICATION CAB
787	CRD REMOTE COMMUNICATION CAB
788	CRD REMOTE COMMUNICATION CAB
789	CRD REMOTE COMMUNICATION CAB
790	CRD REMOTE COMMUNICATION CAB
791	CRD REMOTE COMMUNICATION CAB
792	CRD REMOTE COMMUNICATION CAB
793	CRD REMOTE COMMUNICATION CAB
794	CRD REMOTE COMMUNICATION CAB
795	CRD REMOTE COMMUNICATION CAB
796	CRD REMOTE COMMUNICATION CAB
797	CRD REMOTE COMMUNICATION CAB
798	CRD REMOTE COMMUNICATION CAB
799	CRD REMOTE COMMUNICATION CAB
800	CRD REMOTE COMMUNICATION CAB
801	CRD REMOTE COMMUNICATION CAB
802	CRD REMOTE COMMUNICATION CAB
803	CRD REMOTE COMMUNICATION CAB
804	CRD REMOTE COMMUNICATION CAB
805	CRD REMOTE COMMUNICATION CAB
806	CRD REMOTE COMMUNICATION CAB
807	CRD BRAKE CONTROLLER CABINET
808	CRD BRAKE CONTROLLER CABINET
809	CRD BRAKE CONTROLLER CABINET
810	CRD BRAKE CONTROLLER CABINET
811	CRD BRAKE CONTROLLER CABINET
812	CRD BRAKE CONTROLLER CABINET
813	FM DRIVE CABINET CR GRP 1
814	FM DRIVE CABINET CR GRP 1
815	FM DRIVE CABINET CR GRP 1
816	FM DRIVE CABINET CR GRP 1
817	FM DRIVE CABINET CR GRP 1
818	FM DRIVE CABINET CR GRP 1
819	FM DRIVE CABINET CR GRP 1
820	FM DRIVE CABINET CR GRP 2
821	FM DRIVE CABINET CR GRP 2
822	FM DRIVE CABINET CR GRP 2
823	FM DRIVE CABINET CR GRP 2
824	FM DRIVE CABINET CR GRP 2
825	FM DRIVE CABINET CR GRP 2
826	FM DRIVE CABINET CR GRP 2
827	FM DRIVE CABINET CR GRP 3
828	FM DRIVE CABINET CR GRP 3
829	FM DRIVE CABINET CR GRP 3
830	FM DRIVE CABINET CR GRP 3
831	FM DRIVE CABINET CR GRP 3
832	FM DRIVE CABINET CR GRP 3
833	FM DRIVE CABINET CR GRP 3
834	FM DRIVE CABINET CR GRP 1
835	FM DRIVE CABINET CR GRP 1
836	FM DRIVE CABINET CR GRP 1
837	FM DRIVE CABINET CR GRP 1
838	FM DRIVE CABINET CR GRP 1
839	FM DRIVE CABINET CR GRP 1
840	FM DRIVE CABINET CR GRP 1
841	FM DRIVE CABINET CR GRP 2
842	FM DRIVE CABINET CR GRP 2
843	FM DRIVE CABINET CR GRP 2
844	FM DRIVE CABINET CR GRP 2
845	FM DRIVE CABINET CR GRP 2
846	FM DRIVE CABINET CR GRP 2
847	FM DRIVE CABINET CR GRP 2
848	FM DRIVE CABINET CR GRP 3
849	FM DRIVE CABINET CR GRP 3
850	FM DRIVE CABINET CR GRP 3
851	FM DRIVE CABINET CR GRP 3
852	FM DRIVE CABINET CR GRP 3
853	FM DRIVE CABINET CR GRP 3
854	FM DRIVE CABINET CR GRP 3
855	FMCRD POWER DISTB
	PANEL (CR GRP 1)
856	FMCRD POWER DISTB
	PANEL (CR GRP 1)
857	FMCRD POWER DISTB
	PANEL (CR GRP 1)
858	FMCRD POWER DISTB
	PANEL (CR GRP 1)
859	FMCRD POWER DISTB
	PANEL (CR GRP 2)
860	FMCRD POWER DISTB
	PANEL (CR GRP 2)
861	FMCRD POWER DISTB
	PANEL (CR GRP 2)
862	FMCRD POWER DISTB
	PANEL (CR GRP 2)
863	FMCRD POWER DISTB
	PANEL (CR GRP 3)

FULL POWER/ SHUTDOWN RADIATION LEVEL IN (uSv/h)
A ≤ 6
B < 10
C < 50
D < 250
E < 1000
F ≥ 1000

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;
   - D.S. – DUCT SPACE
   - EL – ELEVATION
   - ELEV – ELEVATOR
   - P.S. – PIPE SPACE
   - T.S. – CABLE TRAY SPACE
2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;
   - XXX ROOM NUMBER
   - RAMP
   - GRATING
   - CHECKER PLATE
   - CONCRETE BLOCK
   - EARTH
4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 12.3–8 REACTOR BUILDING RADIATION ZONE MAP FOR FULL POWER AND SHUTDOWN OPERATION AT ELEVATION 27200 mm



EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
116	RB FIRE WTR SP B4
	RM 760 HOSE STA
155	EXHAUST SILENCER
171	EXHAUST SILENCER
172	EXHAUST SILENCER
687	REMOTE MULTIPLEXING UNIT
688	REMOTE MULTIPLEXING UNIT
689	RBCW SURGE TANK A
	SHARED WITH ECW SYS
690	RBCW SURGE TANK B
	SHARED WITH ECW SYS
691	RBCW SURGE TANK C
	SHARED WITH ECW SYS
693	480V NON-CLASS 1E MCC 630C3
695	REFUELING MACHINE CONTROL PANEL
701	REFUELING MACHINE CONT STAT
703	REFUELING MACHINE CONT COMP
946	R/B TRIAXIAL ACCELEROMETER
947	480V NON-CLASS 1E MCC 630B3
1137	RIP INSPECTION TANK
1781	RB FIRE WTR SP A1
	RM 716 HOSE STA
1782	RB FIRE WTR SP A2
	RM 810 HOSE STA
1787	RB FIRE WTR SP B4
	RM 820 HOSE STA
1784	RB FIRE WTR SP B1
	RM 742 HOSE STA
1785	RB FIRE WTR SP B2
	RM 721 HOSE STA
1786	RB FIRE WTR SP B3
	RM 740 HOSE STA
1789	RB FIRE WTR SP C1
	RM 733 HOSE STA
1790	RB FIRE WTR SP C2
	RM 715 HOSE STA
1793	RB FIRE WTR SP A2
	RM 715 HOSE STA
1796	RB FIRE WTR SP B2
	RM 721 HOSE STA
1812	RB FIRE WTR SP B4
	RM 740 HOSE STA
1960	GEIEMS CONCENTRATOR PROCESSOR
1961	REMOTE MULTIPLEXING UNIT
1962	REMOTE MULTIPLEXING UNIT
1963	REMOTE MULTIPLEXING UNIT
1964	NITROGEN BOTTLE RACK
1965	NITROGEN BOTTLE RACK
1966	480V NON-CLASS 1E MCC 630A3
1967	480V NON-CLASS 1E MCC 650A3
1968	480V NON-CLASS 1E MCC 650B3
1969	480V NON-CLASS 1E MCC 650C3
1970	REFUELING MACHINE
	CONTROL ROOM 760
1971	RIP ASD ZONE B
1972	RIP ASD ZONE A
1973	RIP ASD ZONE B
1974	RIP ASD ZONE B
1975	RIP ASD ZONE A
1976	RIP ASD ZONE A
1977	ROUGHING FILTER RIP ASD ZONE B
1978	ROUGHING FILTER RIP ASD ZONE A

FULL POWER/ SHUTDOWN RADIATION LEVEL IN (uSv/h)
A ≤ 6
B < 10
C < 50
D < 250
E < 1000
F ≥ 1000

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

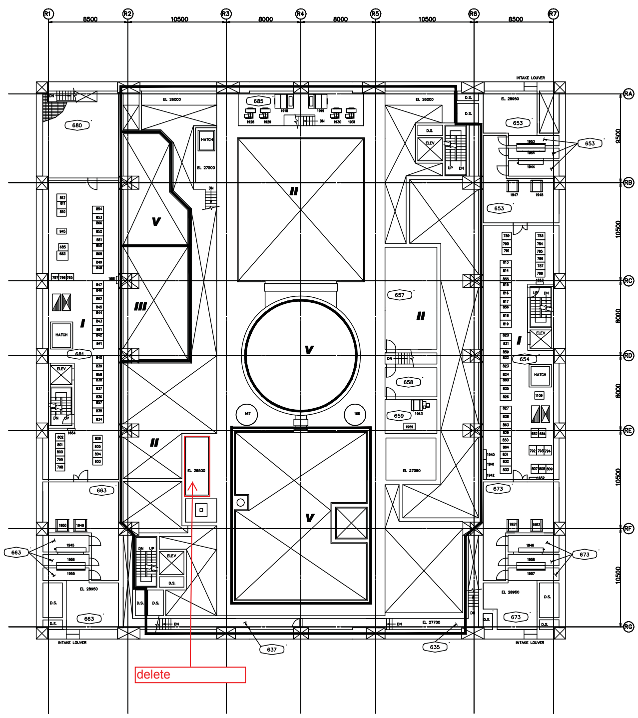
   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE
   WT – WATERTIGHT DOOR

2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX – ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 12.3-9 REACTOR BUILDING RADIATION ZONE MAP FOR FULL POWER AND SHUTDOWN OPERATION AT ELEVATION 31700/38200 mm



T.M.S.L. 27200 (3.5F)

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
864	FMCRD POWER DISTB
	PANEL (CR GRP 3)
865	FMCRD POWER DISTB
	PANEL (CR GRP 3)
866	FMCRD POWER DISTB
	PANEL (CR GRP 3)
945	ROD POSITION MONITORING PANEL
1109	ROD POSITION MONITORING PANEL
1651	RB FIRE WTR SP B3
	RM 681 HOSE STA
1652	RB FIRE WTR SP C2
	RM 654 HOSE STA
1653	RB FIRE WTR SP A2
	RM 654 HOSE STA
1654	RB FIRE WTR SP B4
	RM 681 HOSE STA
1918	MAIN STEAM TUNNEL
1919	MAIN STEAM TUNNEL
1928	MAIN STEAM TUNNEL
1929	MAIN STEAM TUNNEL
1930	MAIN STEAM TUNNEL
1931	MAIN STEAM TUNNEL
1940	120V NON-CLASS 1E
	INST PWR DP 200A2
1941	208/120V NON-CLASS
	1E INST PWR DP 201A2
1942	208/120V INST POWER
	PANEL NON-CLASS 1E
1943	CAMS ROOM A
1944	ELECTRICAL EQUIPMENT
	AREA DIVISION A
1945	ELECTRICAL EQUIPMENT
	AREA DIVISION B
1946	ELECTRICAL EQUIPMENT
	AREA DIVISION C
1947	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1948	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1949	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1950	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1951	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1952	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1959	CONTINUOUS H2 AND O2
	SAMPLE PANEL
1953	ROUGHING FILTER FOR
	EL EQUIP AREA DIV A
1954	AFTER FILTER FOR
	ELEC EQUIP DIV A
1955	ROUGHING FILTER FOR
	EL EQUIP AREA DIV
1956	AFTER FILTER FOR
	EL EQUIP AREA DIV B
1957	ROUGHING FILTER FOR
	EL EQUIP AREA DIV C
1958	AFTER FILTER FOR
	EL EQUIP AREA DIV C

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
166	SKIMMER SURGE TANK A
	FUEL POOL OVERFLOW
167	SKIMMER SURGE TANK B
	FUEL POOL OVERFLOW
682	RAPI AUX PANEL A
683	RAPI AUX PANEL B
684	EMERGENCY ROD INSERTION PANEL
685	EMERGENCY ROD INSERTION PANEL
783	CRD REMOTE COMMUNICATION CAB
784	CRD REMOTE COMMUNICATION CAB
785	CRD REMOTE COMMUNICATION CAB
786	CRD REMOTE COMMUNICATION CAB
787	CRD REMOTE COMMUNICATION CAB
788	CRD REMOTE COMMUNICATION CAB
789	CRD REMOTE COMMUNICATION CAB
790	CRD REMOTE COMMUNICATION CAB
791	CRD REMOTE COMMUNICATION CAB
792	CRD REMOTE COMMUNICATION CAB
793	CRD REMOTE COMMUNICATION CAB
794	CRD REMOTE COMMUNICATION CAB
795	CRD REMOTE COMMUNICATION CAB
796	CRD REMOTE COMMUNICATION CAB
797	CRD REMOTE COMMUNICATION CAB
798	CRD REMOTE COMMUNICATION CAB
799	CRD REMOTE COMMUNICATION CAB
800	CRD REMOTE COMMUNICATION CAB
801	CRD REMOTE COMMUNICATION CAB
802	CRD REMOTE COMMUNICATION CAB
803	CRD REMOTE COMMUNICATION CAB
804	CRD REMOTE COMMUNICATION CAB
805	CRD REMOTE COMMUNICATION CAB
806	CRD REMOTE COMMUNICATION CAB
807	CRD BRAKE CONTROLLER CABINET
808	CRD BRAKE CONTROLLER CABINET
809	CRD BRAKE CONTROLLER CABINET
810	CRD BRAKE CONTROLLER CABINET
811	CRD BRAKE CONTROLLER CABINET
812	CRD BRAKE CONTROLLER CABINET
813	FM DRIVE CABINET CR GRP 1
814	FM DRIVE CABINET CR GRP 1
815	FM DRIVE CABINET CR GRP 1
816	FM DRIVE CABINET CR GRP 1
817	FM DRIVE CABINET CR GRP 1
818	FM DRIVE CABINET CR GRP 1
819	FM DRIVE CABINET CR GRP 1
820	FM DRIVE CABINET CR GRP 2
821	FM DRIVE CABINET CR GRP 2
822	FM DRIVE CABINET CR GRP 2
823	FM DRIVE CABINET CR GRP 2
824	FM DRIVE CABINET CR GRP 2
825	FM DRIVE CABINET CR GRP 2
826	FM DRIVE CABINET CR GRP 2
827	FM DRIVE CABINET CR GRP 3
828	FM DRIVE CABINET CR GRP 3
829	FM DRIVE CABINET CR GRP 3
830	FM DRIVE CABINET CR GRP 3
831	FM DRIVE CABINET CR GRP 3
832	FM DRIVE CABINET CR GRP 3
833	FM DRIVE CABINET CR GRP 3
834	FM DRIVE CABINET CR GRP 1
835	FM DRIVE CABINET CR GRP 1
836	FM DRIVE CABINET CR GRP 1
837	FM DRIVE CABINET CR GRP 1
838	FM DRIVE CABINET CR GRP 1
839	FM DRIVE CABINET CR GRP 1
840	FM DRIVE CABINET CR GRP 1
841	FM DRIVE CABINET CR GRP 2
842	FM DRIVE CABINET CR GRP 2
843	FM DRIVE CABINET CR GRP 2
844	FM DRIVE CABINET CR GRP 2
845	FM DRIVE CABINET CR GRP 2
846	FM DRIVE CABINET CR GRP 2
847	FM DRIVE CABINET CR GRP 2
848	FM DRIVE CABINET CR GRP 3
849	FM DRIVE CABINET CR GRP 3
850	FM DRIVE CABINET CR GRP 3
851	FM DRIVE CABINET CR GRP 3
852	FM DRIVE CABINET CR GRP 3
853	FM DRIVE CABINET CR GRP 3
854	FM DRIVE CABINET CR GRP 3
855	FMCRD POWER DISTB
	PANEL (CR GRP 1)
856	FMCRD POWER DISTB
	PANEL (CR GRP 1)
857	FMCRD POWER DISTB
	PANEL (CR GRP 1)
858	FMCRD POWER DISTB
	PANEL (CR GRP 1)
859	FMCRD POWER DISTB
	PANEL (CR GRP 2)
860	FMCRD POWER DISTB
	PANEL (CR GRP 2)
861	FMCRD POWER DISTB
	PANEL (CR GRP 2)
862	FMCRD POWER DISTB
	PANEL (CR GRP 2)
863	FMCRD POWER DISTB
	PANEL (CR GRP 3)

ZONE	DOSE RATE (Gy/h)
I	≤ 0.005
II	< 0.05
III	< 0.5
IV	< 5
V	< 50
VI	≥ 50

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE

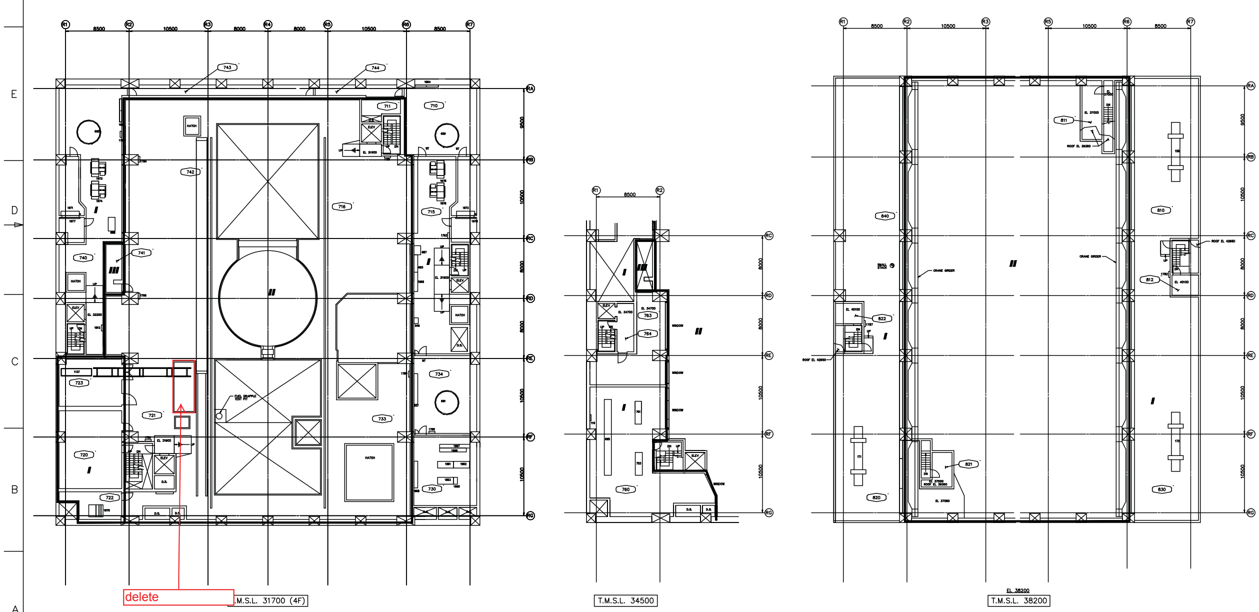
2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 12.3–19 REACTOR BUILDING, RADIATION ZONE MAP POST–LOCA AT ELEVATION 27200 mm

ABWR DCD REV 5 25A5675BJ 21–601



EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
116	RB FIRE WTR SP B4
	RM 760 HOSE STA
155	EXHAUST SILENCER
171	EXHAUST SILENCER
172	EXHAUST SILENCER
687	REMOTE MULTIPLEXING UNIT
688	REMOTE MULTIPLEXING UNIT
689	RBCW SURGE TANK A
	SHARED WITH ECW SYS
690	RBCW SURGE TANK B
	SHARED WITH ECW SYS
691	RBCW SURGE TANK C
	SHARED WITH ECW SYS
693	480V NON-CLASS 1E MCC 630C3
695	REFUELING MACHINE CONTROL PANEL
701	REFUELING MACHINE CONT STAT
703	REFUELING MACHINE CONT COMP
946	R/B TRIAXIAL ACCELEROMETER
947	480V NON-CLASS 1E MCC 630B3
1137	RIP INSPECTION TANK
1781	RB FIRE WTR SP A1
	RM 716 HOSE STA
1782	RB FIRE WTR SP A2
	RM 810 HOSE STA
1787	RB FIRE WTR SP B4
	RM 820 HOSE STA
1784	RB FIRE WTR SP B1
	RM 742 HOSE STA
1785	RB FIRE WTR SP B2
	RM 721 HOSE STA
1786	RB FIRE WTR SP B3
	RM 740 HOSE STA
1789	RB FIRE WTR SP C1
	RM 733 HOSE STA
1790	RB FIRE WTR SP C2
	RM 715 HOSE STA
1793	RB FIRE WTR SP A2
	RM 715 HOSE STA
1796	RB FIRE WTR SP B2
	RM 721 HOSE STA
1812	RB FIRE WTR SP B4
	RM 740 HOSE STA
1960	GEIEMS CONCENTRATOR PROCESSOR
1961	REMOTE MULTIPLEXING UNIT
1962	REMOTE MULTIPLEXING UNIT
1963	REMOTE MULTIPLEXING UNIT
1964	NITROGEN BOTTLE RACK
1965	NITROGEN BOTTLE RACK
1966	480V NON-CLASS 1E MCC 630A3
1967	480V NON-CLASS 1E MCC 650A3
1968	480V NON-CLASS 1E MCC 650B3
1969	480V NON-CLASS 1E MCC 650C3
1970	REFUELING MACHINE
	CONTROL ROOM 760
1971	RIP ASD ZONE B
1972	RIP ASD ZONE A
1973	RIP ASD ZONE B
1974	RIP ASD ZONE B
1975	RIP ASD ZONE A
1976	RIP ASD ZONE A
1977	ROUGHING FILTER RIP ASD ZONE B
1978	ROUGHING FILTER RIP ASD ZONE A

ZONE	DOSE RATE (Gy/h)
I	≤ 0.005
II	< 0.05
III	< 0.5
IV	< 5
V	< 50
VI	≥ 50

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

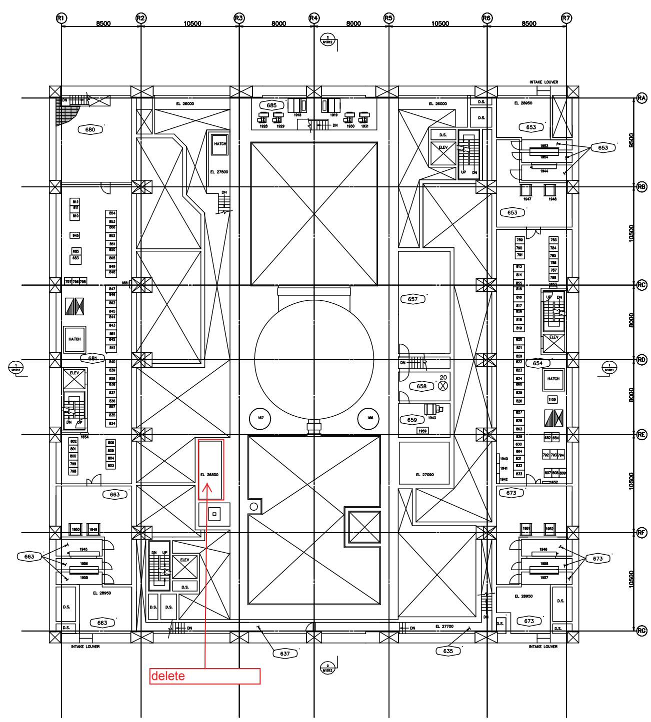
   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE
   WT – WATERTIGHT DOOR

2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 12.3-20 REACTOR BUILDING, RADIATION ZONE MAP POST-LOCA AT ELEVATION 31700/38200 mm



T.M.S.L. 27200 (3.5F)

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
864	FMCRD POWER DISTB
	PANEL (CR GRP 3)
865	FMCRD POWER DISTB
	PANEL (CR GRP 3)
866	FMCRD POWER DISTB
	PANEL (CR GRP 3)
945	ROD POSITION MONITORING PANEL
1109	ROD POSITION MONITORING PANEL
1651	RB FIRE WTR SP B3
	RM 681 HOSE STA
1652	RB FIRE WTR SP C2
	RM 654 HOSE STA
1653	RB FIRE WTR SP A2
	RM 654 HOSE STA
1654	RB FIRE WTR SP B4
	RM 681 HOSE STA
1918	MAIN STEAM TUNNEL
1919	MAIN STEAM TUNNEL
1928	MAIN STEAM TUNNEL
1929	MAIN STEAM TUNNEL
1930	MAIN STEAM TUNNEL
1931	MAIN STEAM TUNNEL
1940	120V NON-CLASS 1E
	INST PWR DP 200A2
1941	208/120V NON-CLASS
	1E INST PWR DP 201A2
1942	208/120V INST POWER
	PANEL NON-CLASS 1E
1943	CAMS ROOM A
1944	ELECTRICAL EQUIPMENT
	AREA DIVISION A
1945	ELECTRICAL EQUIPMENT
	AREA DIVISION B
1946	ELECTRICAL EQUIPMENT
	AREA DIVISION C
1947	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1948	SUPPLY FAN TO ELEC
	EQUIP AREA DIV A
1949	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1950	SUPPLY FAN TO ELEC
	EQUIP AREA DIV B
1951	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1952	SUPPLY FAN TO ELEC
	EQUIP AREA DIV C
1959	CONTINUOUS H2 AND O2
	SAMPLE PANEL
1953	ROUGHING FILTER FOR
	EL EQUIP AREA DIV A
1954	AFTER FILTER FOR
	ELEC EQUIP DIV A
1955	ROUGHING FILTER FOR
	EL EQUIP AREA DIV
1956	AFTER FILTER FOR
	EL EQUIP AREA DIV B
1957	ROUGHING FILTER FOR
	EL EQUIP AREA DIV C
1958	AFTER FILTER FOR
	EL EQUIP AREA DIV C

EQUIPMENT IDENTIFICATION AND LOCATION LIST	
REF NO	DESCRIPTION
166	SKIMMER SURGE TANK A
	FUEL POOL OVERFLOW
167	SKIMMER SURGE TANK B
	FUEL POOL OVERFLOW
682	RAPI AUX PANEL A
683	RAPI AUX PANEL B
684	EMERGENCY ROD INSERTION PANEL
685	EMERGENCY ROD INSERTION PANEL
783	CRD REMOTE COMMUNICATION CAB
784	CRD REMOTE COMMUNICATION CAB
785	CRD REMOTE COMMUNICATION CAB
786	CRD REMOTE COMMUNICATION CAB
787	CRD REMOTE COMMUNICATION CAB
788	CRD REMOTE COMMUNICATION CAB
789	CRD REMOTE COMMUNICATION CAB
790	CRD REMOTE COMMUNICATION CAB
791	CRD REMOTE COMMUNICATION CAB
792	CRD REMOTE COMMUNICATION CAB
793	CRD REMOTE COMMUNICATION CAB
794	CRD REMOTE COMMUNICATION CAB
795	CRD REMOTE COMMUNICATION CAB
796	CRD REMOTE COMMUNICATION CAB
797	CRD REMOTE COMMUNICATION CAB
798	CRD REMOTE COMMUNICATION CAB
799	CRD REMOTE COMMUNICATION CAB
800	CRD REMOTE COMMUNICATION CAB
801	CRD REMOTE COMMUNICATION CAB
802	CRD REMOTE COMMUNICATION CAB
803	CRD REMOTE COMMUNICATION CAB
804	CRD REMOTE COMMUNICATION CAB
805	CRD REMOTE COMMUNICATION CAB
806	CRD REMOTE COMMUNICATION CAB
807	CRD BRAKE CONTROLLER CABINET
808	CRD BRAKE CONTROLLER CABINET
809	CRD BRAKE CONTROLLER CABINET
810	CRD BRAKE CONTROLLER CABINET
811	CRD BRAKE CONTROLLER CABINET
812	CRD BRAKE CONTROLLER CABINET
813	FM DRIVE CABINET CR GRP 1
814	FM DRIVE CABINET CR GRP 1
815	FM DRIVE CABINET CR GRP 1
816	FM DRIVE CABINET CR GRP 1
817	FM DRIVE CABINET CR GRP 1
818	FM DRIVE CABINET CR GRP 1
819	FM DRIVE CABINET CR GRP 1
820	FM DRIVE CABINET CR GRP 2
821	FM DRIVE CABINET CR GRP 2
822	FM DRIVE CABINET CR GRP 2
823	FM DRIVE CABINET CR GRP 2
824	FM DRIVE CABINET CR GRP 2
825	FM DRIVE CABINET CR GRP 2
826	FM DRIVE CABINET CR GRP 2
827	FM DRIVE CABINET CR GRP 3
828	FM DRIVE CABINET CR GRP 3
829	FM DRIVE CABINET CR GRP 3
830	FM DRIVE CABINET CR GRP 3
831	FM DRIVE CABINET CR GRP 3
832	FM DRIVE CABINET CR GRP 3
833	FM DRIVE CABINET CR GRP 3
834	FM DRIVE CABINET CR GRP 1
835	FM DRIVE CABINET CR GRP 1
836	FM DRIVE CABINET CR GRP 1
837	FM DRIVE CABINET CR GRP 1
838	FM DRIVE CABINET CR GRP 1
839	FM DRIVE CABINET CR GRP 1
840	FM DRIVE CABINET CR GRP 1
841	FM DRIVE CABINET CR GRP 2
842	FM DRIVE CABINET CR GRP 2
843	FM DRIVE CABINET CR GRP 2
844	FM DRIVE CABINET CR GRP 2
845	FM DRIVE CABINET CR GRP 2
846	FM DRIVE CABINET CR GRP 2
847	FM DRIVE CABINET CR GRP 2
848	FM DRIVE CABINET CR GRP 3
849	FM DRIVE CABINET CR GRP 3
850	FM DRIVE CABINET CR GRP 3
851	FM DRIVE CABINET CR GRP 3
852	FM DRIVE CABINET CR GRP 3
853	FM DRIVE CABINET CR GRP 3
854	FM DRIVE CABINET CR GRP 3
855	FMCRD POWER DISTB
	PANEL (CR GRP 1)
856	FMCRD POWER DISTB
	PANEL (CR GRP 1)
857	FMCRD POWER DISTB
	PANEL (CR GRP 1)
858	FMCRD POWER DISTB
	PANEL (CR GRP 1)
859	FMCRD POWER DISTB
	PANEL (CR GRP 2)
860	FMCRD POWER DISTB
	PANEL (CR GRP 2)
861	FMCRD POWER DISTB
	PANEL (CR GRP 2)
862	FMCRD POWER DISTB
	PANEL (CR GRP 2)
863	FMCRD POWER DISTB
	PANEL (CR GRP 3)

NOTES:

1. THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING;

   D.S. – DUCT SPACE
   EL – ELEVATION
   ELEV – ELEVATOR
   P.S. – PIPE SPACE
   T.S. – CABLE TRAY SPACE

2. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING;

   XXX – ROOM NUMBER
   RAMP
   GRATING
   CHECKER PLATE
   CONCRETE BLOCK
   EARTH
   AREA RADIATION MONITOR
   n= MONITOR ASSIGNED NUMBER

4. ALL UNITS ARE IN MM UNLESS NOTED.

FIGURE 12.3-61 REACTOR BUILDING AREA RADIATION MONITORS AT ELEVATION 27200 mm

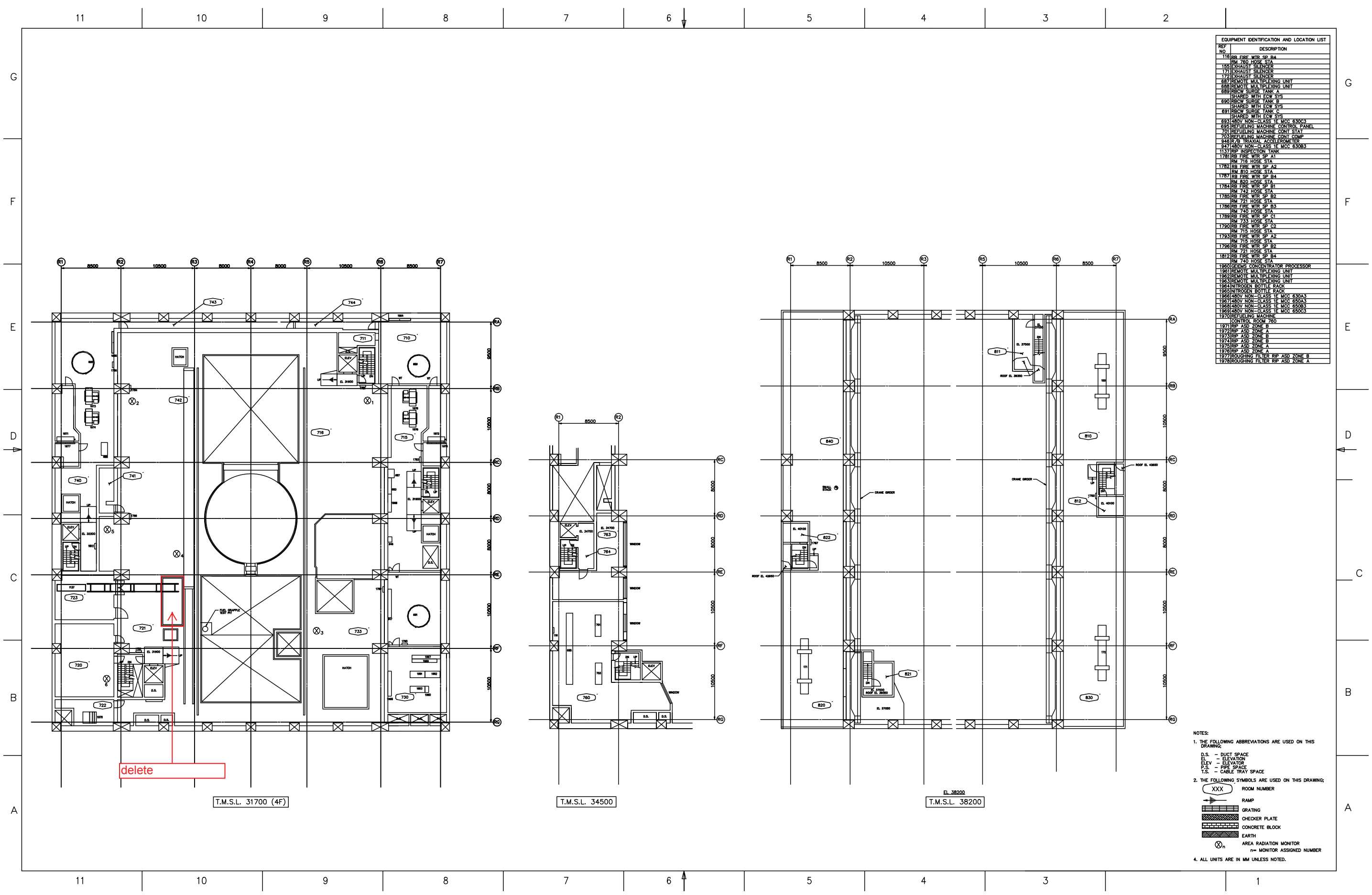


FIGURE 12.3–62 REACTOR BUILDING AREA RADIATION MONITORS AT ELEVATION 31700/38200 mm