GRAND GULF NUCLEAR STATION - UNIT NO. 1

Application for License
For
Storage Only of Unirradiated
Reactor Fuel and Associated Radioactive Material

Mississippi Power & Light Company for itself and on behalf of Middle South Energy, Inc., pursuant to Title 10, Code of Federal Regulations Part 70, hereby applies for a license to permit the receipt, possession, inspection and storage of special nuclear material in the form of unirradiated nuclear fuel bundles, for the packaging of such fuel bundles for delivery to a carrier, and for the receipt, possession, inspection and use of in-core detectors, and operational sources as herein described for the Grand Gulf Nuclear Station - Unit No. 1. The term of the license is requested to begin April 1, 1981 for the in-core detectors and April 1, 1981 for the operational source and the fuel bundles. It is requested that the license remain in effect until such time as it may be supplanted by a permanent operating license.

February 13, 1981
Amendment 2

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1.0 GENERAL INFORMATION

a. Name of Applicants / Address of Applicants

Name of Applicants	Address of Applicants
Mississippi Power & Light Company	P.O. Box 1640 Jackson, Mississippi 39205
Middle South Energy, Inc.	P.O. Box 61000 New Orleans, Louisiana 70161
South Mississippi Electric Power Association, Inc.	P.O. Box 1589 Hattiesburg, Mississippi 39401

b. Organization and Management of Applicants

Applicants are three corporations, MP&L, MSE, and SMEPA, organized and existing under the laws of the States of Mississippi, Arkansas, and Mississippi, respectively. MP&L's principal office is located in Jackson, Mississippi, MSE's principal office is located in New Orleans, Louisiana, and SMEPA's principal office is located in Hattiesburg, Mississippi, at the addresses stated previously.

Applicants are not owned, controlled or dominated by any alien, any foreign corporation, or any foreign government.

All of the Applicants' principal officers and directors are citizens of the United States. Their names and addresses are as follows:

MISSISSIPPI POWER & LIGHT COMPANY

DIRECTORS

Name	Address
Donald C. Lutken	Jackson, Mississippi
G. Lawrence Adams	Natchez, Mississippi
Norman B. Gillis, Jr.	McComb, Mississippi
Robert M. Hearin	Jackson, Mississippi
J. H. Johnston, Jr., M.D.	Jackson, Mississippi
Robert E. Kennington, II	Grenada, Mississippi
John P. Maloney	Jackson, Mississippi
Richard D. McRae	Jackson, Mississippi
Floyd W. Lewis	New Orleans, Louisiana
LeRoy P. Percy	Greenville, Mississippi
Robert M. Williams, Jr.	Southaven, Mississippi
Dr. Walter Washington	Alcorn, Mississippi

PRINCIPAL OFFICERS

Name	Address
Donald C. Lutken, President and Chief Executive Officer	Jackson, Mississippi
Norris L. Stampley, Senior Vice President of Production, Engineering and Construction	Jackson, Mississippi
John D. Holland, Vice President Area Affairs	Jackson, Mississippi
W. Donald Colmer, Vice President Public Affairs and Environmental Matters	Jackson, Mississippi
Donald E. Meiners, Vice President Customer Services	Jackson, Mississippi
Frank S. York, Vice President Controller and Secretary	Jackson, Mississippi
Thomas A. Dallas, Vice President and Chief Engineer	Jackson, Mississippi
J. Stewart Frame, Vice President Personnel and Administrative Services	Jackson, Mississippi
Walton T. Woods, Jr., Vice President General Property and Services	Jackson, Mississippi
Alex McKeigney, Vice President Informational Services	Jackson, Mississippi
James P. McGaughy, Jr., Assistant Vice President Nuclear Production	Jackson, Mississippi
James R. Martin, Treasurer and Assistant Secretary	Jackson, Mississippi
Allan H. Mapp, Assistant Treasurer and Assistant Secretary	Jackson, Mississippi

MIDDLE SOUTH ENERGY, INC.

DIRECTORS

Name	Address
F. W. Lewis	New Orleans, Louisiana
D. C. Lutken	Jackson, Mississippi
J. L. Maulden	Little Rock, Arkansas
J. M. Wyatt	New Orleans, Louisiana
J. M. Cain	New Orleans, Louisiana
F. G. Smith, Jr.	Blytheville, Arkansas

PRINCIPAL OFFICERS

Name	Address
F. W. Lewis, President	New Orleans, Louisiana
D. J. Winfield, Senior Vice President - Financial Consultant	New York, New York
Edwin A. Lupberger, Vice President - Chief Financial Officer, Assistant Secretary and Assistant Treasurer	New Orleans, Louisiana
John F. Vogt, Jr. Vice President	New Orleans, Louisiana
D. C. Lutken Vice President	Jackson, Mississippi
D. C. Gibbs Vice President	New Orleans, Louisiana
Rodney J. Estrada, Treasurer and Assistant Secretary	New Orleans, Louisiana
Dan E. Stapp, Secretary and Assistant Treasurer	New Orleans, Louisiana
Frank S. York, Jr., Assistant Secretary and Assistant Treasurer	Jackson, Mississippi
James R. Martin, Assistant Secretary and Assistant Treasurer	Jackson, Mississippi

SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION, INC.

DIRECTORS

Name	Address
Ates M. Little	Carpenter, Mississippi
W. T. Ruffin	Bay Springs, Mississippi
W. T. Shows	Columbia, Mississippi
Jack Ware	Lucedale, Mississippi
Robert L. Graham	Shubuta, Mississippi
Blaine H. Eaton	Taylorsville, Mississippi
E. C. Parker	McComb, Mississippi
Robert St. John	Lorman, Mississippi
Henry L. Thomas	Bay St. Louis, Mississippi
James A. Rester	Picayune, Mississippi
Giles Bounds	Lyon, Mississippi
Joe J. Stevens	Drew, Mississippi
L. C. Spencer	Greenwood, Mississippi
Henry C. Waterer, Jr.	Tchula, Mississippi
Floyd Lynk	Hollandale, Mississippi
W. C. McKany, Jr.	Chatham, Mississippi
L. R. Parker	Yazoo City, Mississippi
Louis M. Aden	Valley Park, Mississippi
W. W. Bond	Perkinston, Mississippi
C. C. Clark	Ruth, Mississippi
D. R. Ware	Neely, Mississippi
L. G. Pierce	Moselle, Mississippi

PRINCIPAL OFFICERS

Name	Address
W. W. Bond, President	Perkinston, Mississippi
C. C. Clark, Vice President	Ruth, Mississippi
D. R. Ware, Secretary/Treasurer	Neely, Mississippi
L. G. Pierce, Assistant Secretary	Moselle, Mississippi

1.1 REACTOR AND FUEL

1.1.1 Identification of Reactor, Geographic Location, Docket and Construction Permit

This application is submitted for Unit 1 of the Grand Gulf Nuclear Station. This unit is a BWR-6 boiling water reactor (251 inch vessel) designed and supplied by General Electric Company. The unit will have a rated core thermal power level of 3833 Mwt.

The station is located in Claiborne County, Mississippi on the east side of the Mississippi River. It is located approximately 25 miles south of Vicksburg, Mississippi and 37 miles north - northeast of Natchez, Mississippi.

The unit was docketed in November, 1972 on NRC Docket Number 50-416 and was issued Construction Permit Number CPPR-118 in September, 1974. The symbol XTC was assigned as the Reporting Identification Symbol (RIS) for Grand Gulf.

1.1.2 Fuel Assembly Description

Each fuel assembly consists of a fuel bundle and the channel which surrounds it (See Figure 1). The fuel bundle may or may not be channeled while in the storage racks.

The fuel channel enclosing the fuel bundle is fabricated from zircaloy-4. The channel provides rigidity for the fuel bundle. The channel is open at the bottom and makes a sliding seal fit against the finger springs that are attached to the lower tie plate. Two diagonally opposed gusset tabs are welded to the top of the channel. One of these tabs is fitted with a channel fastener assembly which attaches to a threaded hole on the upper tie plate casting to support the weight of the channel (See Figure 2).

The fuel bundle consists of sixty-two (62) fueled rods and two (2) water rods (See Figure 3). The rods are spaced and supported in a square 8x8 array by the upper and lower tie plates and by seven (7) fuel spacer grids of an egg crate design. Descriptions and dimensional data on the fuel bundle and lattice is as follows:

Fuel pellet diameter, in.	0.410
Cladding inner diameter, in	0.419
Cladding outer diameter, in.	0.483
Cladding thickness, in.	0.032
Pellet cladding diametrical gap, in.	0.009
Rod to rod spacing, in.	0.153
Rod to channel spacing, in.	0.140
Rod to rod pitch, in.	0.636
Water rod outer diameter, in.	0.591
Water rod inner diameter, in.	0.531
Water rod thickness, in.	0.030

The cladding and water rod material are zircaloy-2. The fuel spacers are zircaloy-4 with inconel X-springs. Both upper and lower tie plates are fabricated from type 304 stainless steel castings. The fuel stack density is specified 94.04% of theoretical.

A complete description of the fuel assemblies is contained in subsection 4.2.2 of the Grand Gulf Final Safety Analysis Report (FSAR) which is on file with the Commission.

1.1.3 Enrichment

There are three bundle types. They are composed of (1) natural enriched (0.711% average) U-235, (2) low enriched (1.538% average) U-235, and (3) medium enriched (2.004% average) U-235, respectively.

The highest enrichments contained in each bundle type are (1) natural enriched bundle - 0.711% U-235, (2) low enriched bundle - 1.70% U-235, and (3) medium enriched bundle - 2.60% U-235. There is no U-233, Pu, depleted uranium, or thorium in the assemblies. The average initial core enrichment is 1.708% U-235.

The nominal fuel data for the 800 initial core fuel bundles is as follows:

Number of Bundles	Enrichment (w/o U-235)	Uranium per Bundle (Kg)	U-235 per Bundle (Kg)	UO_2 per Bundle (Kg)
92	0.711	183.04	1.301	207.65
252	1.538	182.94	2.813	207.54
456	2.004	182.66	3.660	207.23

The total weight of an assembly is approximately 316 Kg. The weight of a fuel bundle is approximately 271 Kg.

1.1.4 Total Fissionable Material

License is requested for a maximum of 810 fuel bundles with a total contained U-235 content not to exceed 2550 Kg. The total weight of contained Uranium will not exceed 149,000 Kg. These totals consist of the 800 initial core fuel bundles plus an allowance for 10 spare bundles with enrichments no greater than 2.60% U-235.

There will be a total of 800 fuel bundles in the initial core. This total is composed of 92 natural enriched bundles, 252 low enriched bundles and 456 medium enriched bundles.

Natural uranium is contained in the 92 natural enriched bundles and also in the top 6" and bottom 6" of each rod in the low and medium enriched bundles. The total initial core weight of U-235 is ~ 2497 Kg. The total initial core weight of UO_2 is ~ 165900 Kg.

1.2 STORAGE CONDITIONS

The control and accounting for special nuclear materials is in accordance with ANSI N15.8-1974, "Nuclear Material Control Systems for Nuclear Power Plants."

1.2.1 Storage Locations

There are three principal locations where the fuel bundles or assemblies may be stored. These include (1) New Fuel Storage Vault, (2) Spent Fuel Pool - Auxiliary Building, and (3) Fuel Pool - Containment Building. Appropriate descriptions and drawings of these areas are provided in the FSAR as referenced in section 1.2.3 below. The relative location of these storage areas to each other is as shown in Figures 4, 5, and 6.

Circumstances may arise which could briefly interrupt offloading and receipt of fuel in the Auxiliary Building Fuel Handling Area. For example, maintenance or malfunction of the fuel handling cranes or test or construction activities which conflict with fuel receipt could disrupt fuel receiving activities. As a contingency for such a disruption, a temporary storage area will be provided where crated fuel may be stored in its wooden shipping crate. This area will be a secure, limited access area controlled in accordance with the interim security plan (Section 1.2.5). Further information on temporary storage is given in Section 1.2.3.3.

In addition, while awaiting unpacking for inspection, channeling, and storage, fuel may be stored in its metal shipping containers in the fuel handling area (Auxiliary Building, Elevation 208'-10", Figure 6). This is a limited access area controlled in accordance with the interim security plan. Criticality control is discussed in Section 2.2.3.

1.2.2 Adjacent Area Activities

To the extent practical, no operations other than fuel and component inspection, handling, and storage will be performed in the fuel storage areas. Crane operations will be restricted such that no more than one channeled fuel assembly or equivalent weight per crane will be allowed over storage areas containing fuel. Loaded fuel shipping containers or properly designed overload test weights may be handled in these areas provided they are at no time suspended over the fuel arrays in storage. Any non-fuel related activities which must be conducted in the fuel handling area will be reviewed and approved by the Technical Superintendent, or his designee.

Activities in the fuel handling area on Elevation 208'-10" of the Auxiliary Building will be restricted as follows during fuel handling:

a) No painting, grinding, sandblasting, or similar activites are allowed.

b) No overhead work is allowed.

c) No crane operations other than those required for fuel handling and inspection are allowed.

d) No construction or test activities which may adversely affect fire protection in the fuel handling area are allowed.

When fuel handling activities are not in progress, selected activities such as those above may be performed provided the fuel is protected and the activities are reviewed and approved by the Technical Superintendent, or his designee.

Activities in other areas of the Auxiliary Building and containment need not be restricted during this period. Such activities include construction and testing associated with completion of the plant.

1.2.3 Fuel Storage and Handling

1.2.3.1 New Fuel Storage Vault

The new fuel storage vault contains storage space for a maximum of 300 fuel assemblies. The vault contains thirty (30) sets of castings, each capable of holding up to ten (10) fuel assemblies. Each set of castings is made up of three tiers which are positioned by fixed box beams (See Figure 7A). This arrangement maintains the fuel assemblies in a vertical position supported at lower and upper tie plates with added lateral support at the center of gravity of the fuel assembly.

The new fuel storage racks are made from aluminum. Materials used for construction are specified in accordance with the latest issue of applicable ASTM specifications. The material choice is based on a consideration of the susceptibility of various metal combinations to electrochemical reaction. When considering the susceptibility of metals to galvanic corrosion, aluminum and stainless steel are relatively close together insofar as their coupled potential is concerned. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion is a recommended practice and has been used successfully for many years by the aluminum industry.

The rack is designed to withstand an impact force of 4,000 ft.-lbs. while maintaining the safety design basis. This impact force could be generated by the vertical free fall of a fuel assembly from a height of six feet.

The storage rack is designed to withstand a pull-up force of 4,000 pounds and a horizontal force of 1,000 pounds. The racks are designed with lead outs to prevent sticking. However, in the event of a stuck fuel assembly, the lifting bail will yield at a pull-up force less than 1,000 pounds.

The storage rack is designed to withstand horizontal combined loads up to 222,000 pounds.

The fuel storage rack is designed to handle non-irradiated, low emission radioactive fuel assemblies. The expected radiation levels are well below the design levels.

The fuel storage rack is designed using non-combustible materials. Plant procedures and inspections assure that combustible materials are restricted from this area. Fire prevention by elimination of combustible materials and fluids is regarded as the prudent approach rather than fire accommodation and the need for fire suppressant materials which could inhibit or negate criticality control assurances. Therefore, fire accommodation is not considered a problem.

The new fuel storage vault is provided with a removable metal cover to ensure a watertight facility. When the vault is
filled, the metal covers will be secured. 2
While fuel is being inserted or removed at the new fuel storage vault, the fuel will be protected by a fire retardant covering to prevent the entry of debris or fire

suppressant materials. A person will be stationed on the racks to lead-in and maintain coverage of the fuel with the 2
fire retardant covering during fuel transfers.

A complete description of the New Fuel Storage Vault including design criteria is contained in subsection 9.1.1 of the Grand Gulf FSAR.

1.2.3.2 Spent Fuel Pool Storage - Auxiliary Building and Fuel Pool - Containment Building

The spent fuel storage racks in the auxiliary building and containment contain a storage space sufficient for 158 percent and 21 percent, respectively, of one full core of fuel assemblies and are designed to withstand all credible static and dynamic loadings to prevent damage to the structure of the racks, and therefore the contained fuel, and to minimize distortion of the racks arrangement.

The racks are designed to protect the fuel assemblies from excessive physical damage under normal or abnormal conditions.

The racks are constructed in accordance with the Quality Assurance Requirements of 10 CFR 50, Appendix B.

The rack arrangement is designed to prevent accidental insertion of fuel bundles between adjacent racks. The storage rack structure is so designed that the upper tie plate casting cannot be lowered below the top of the upper rack. This prevents any tendency of the fuel bundle jamming on insertion or removal from the rack.

The spent fuel storage racks are categorized as safety Class 2 and seismic Category I.

The spent fuel storage facility is housed within a seismic Category I structure and is designed to Regulatory Guides 1.13 and 1.29 which precludes any deleterious effects on spent fuel rack integrity due to natural phenomena such as earthquakes, tornadoes, hurricanes, tornado missiles, and floods. The spent fuel storage facility is designed in accordance with General Design Criteria 61, 62, and 63.

There are three tiers of castings which are positioned by fixed-box beams and cruciforms (see Figure 7B). These hold the fuel assemblies in a vertical position and are supported at the lower and upper tie plate with additional lateral support at the center of gravity of the fuel assembly.

The lower casting supports the weight of the fuel assembly and restricts the lateral movement; the center and top casting restricts lateral movement only of the fuel assembly.

The spent fuel storage racks are made from aluminum. Materials used for construction are specified in accordance with the latest issue of applicable ASTM specifications. The material choice is based on a consideration of the susceptibility of various metal combinations to electrochemical reaction. When considering the susceptibility of metals to galvanic corrosion, aluminum and stainless steel are relatively close together insofar as their coupled potential is concerned. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion is a recommended practice and has been used successfully for many years by the aluminum industry.

The minimum center-to-center spacing for the fuel assembly between rows is 11.875 inches. The minimum center-to-center spacing within the rows is 6.535 inches. Fuel assembly placement between rows is not possible.

Lead-in and lead-out of the castings provide guidance of the fuel assembly during insertion or withdrawal

The rack is designed to withstand the impact force of 4,000 ft.-lbs. while maintaining the safety design basis. This impact force could be generated by the vertical free-fall of a fuel assembly from the height of six feet.

The storage rack is designed to withstand the pull-up force of 4,000 pounds and a horizontal force of 1,000 pounds. There are no readily available forces in excess of 1,000 pounds. The racks are designed with lead-outs to prevent sticking. However, in the event of a stuck fuel assembly, the lifting bail will yield at a pull-up force less than 1,000 pounds.

The storage rack is designed to withstand horizontal combined loads up to 220,000 pounds, well in excess of expected loads.

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

If the spent fuel storage pool or containment building fuel pool are not flooded, a fire retardant covering will be placed over fuel stored in the racks to prevent the entry of debris or fire suppressant materials. A person will be stationed on the racks to lead-in and to maintain, to the maximum extent practicable, coverage of the fuel with the fire retardant covering. 2

A complete description of the fuel storage racks in the containment and auxiliary buildings is contained in subsection 9.1.2 of the Grand Gulf FSAR.

1.2.3.3 Temporary Storage

As discussed in Section 1.2.1, a temporary outdoor storage area is provided in case unforeseen events briefly interrupt fuel receipt and offloading. This area is located in the southwest corner of the switchyard (see Figures 8A and 8B). This area is located within the fenced site boundary. The temporary storage area will be a securely fenced, limited access area which will be guarded continually when fuel is present in accordance with the Interim Security Plan. Fuel stored in this area will remain on the trailers used for shipment. No more than three (3) trailers holding a maximum of ninety-six

(96) fuel bundles in their shipping crates will be allowed in the temporary storage area. As soon as fuel receiving can be resumed, the fuel will be removed from temporary storage and moved to the Auxiliary Building.

1.2.3.4 Fuel Handling System - Auxiliary and Containment Buildings

All fuel handling equipment will be preoperationally tested for safe operation prior to the receipt of unirradiated fuel. The fuel handling equipment and fuel bundles and assemblies are specifically designed for all fuel handling activities described in this application.

A complete description of the Fuel Handling System is contained in subsection 9.1.4 of the Grand Gulf FSAR.

1.2.3.5 Fuel Handling Activities

Upon arrival of a shipment of fuel from the Wilmington facility the following will normally take place:

1. Health Physics will perform a preliminary survey on the truck. The Reactor Engineering Department will be notified of any unsatisfactory results identifed by the survey.

2. The shipment is then directed from the gate to the railroad bay in the Auxiliary Building at Elevation 133'-0".

3. The Maintenance Supervisor will locate the truck and direct the removal of tarps and chains.

4. Health Physics will survey the wooden crates.

5. The shipment and shipping containers will be verified to comply with shipping papers presented by the carrier. Reactor Engineering is responsible for evaluation and resolution of discrepancies.

6. Upon proper acceptance of shipping papers and radiation surveys, the truck may be unloaded.

After removal of the metal shipping containers from the wooden shipping crates, the containers will be hoisted to the Fuel Handling Area, 208'-10" elevation, of the Auxiliary Building using either the new fuel bridge crane or the spent fuel cask cranes. The fuel may now be readied for inspection, channeling, and storage or inspection and storage. All personnel involved in the inspection operation will be familiar with and adhere to all criticality rules. Inspection, channeling, and storage will proceed in accordance with written procedures as follows:

1. Unpack fuel bundles from the metal shipping containers. Remove the polyethylene sleeves from the fuel bundles prior to inspection. The sleeves will then be permanently discarded. 2

2. Move one bundle to the new fuel inspection stand and secure in place on the inspection stand. Move second bundle from the shipping container and secure in place on the inspection stand. Two bundles may be secured on the inspection stand concurrently. Bundle movements will generally be made using the new fuel bridge crane.

3. The inspection will encompass the following categories:

   a. Visual examination.
   b. Removal of packing spacers.
   c. Dimensional check.
   d. Pin enrichment and location check (also gadolinia fuel pins).
   e. Clean all outside surfaces and verify cleanliness of all surfaces.

4. The inspected bundles may now be channeled and transported to the

new fuel vault or the spent fuel storage pool. The inspected bundles may also be transported to the new fuel vault for storage prior to being channeled.

5. Two independent observers will verify the coordinates of the stored fuel in the new fuel vault or in the spent fuel storage pool.

6. The stored fuel in either the new fuel vault when the permanent covers are not in place or the spent fuel storage pool when not flooded will be covered by a fire retardant material to prevent possible inundation by low density fire extinguisher foam or water mist.

Should a defective new fuel bundle be found, the bundle will be clearly marked and segregated from all non-defective fuel bundles in the new fuel vault or the spent fuel storage pool.

Should a condition arise that would preclude the inspection and subsequent storage of new fuel in the new fuel vault or the spent fuel storage pool, the crated fuel may be diverted, as allowed in 1.2.1, "Storage Locations," to the temporary storage area located within the site boundary. Such temporary storage area will be a fenced, limited access area with security supervision and protection against theft, vandalism, and fire hazard (see Figures 8A and 8B). A maximum of forty-eight (48) crates of fuel will be allowed in the temporary storage area. This temporary storage area will be used, in accordance with the Interim Security Plan, as a surge area in unforseeable events such as the following:

a. Unavailability of new fuel bridge crane and spent fuel cask crane.

b. Necessary construction or test activities affecting fuel handling operations.

Transfer of new fuel stored in the temporary storage area to the fuel handling area of the Auxiliary Building at elevation 208'-10" will be made as soon as possible. Every effort will be made to minimize the time of storage of new fuel in the temporary storage area.

1.2.3.6 Administrative Controls

The Plant Manager has overall responsibility for special nuclear materials on the Grand Gulf site. He approves all transfers of SNM within the site and plant boundaries. The Technical Superintendent is responsible for establishing the onsite fuel management program and ensuring that proper controls are applied to all SNM. Individual section supervisors and superintendents will ensure that written procedures are developed and approved for all fuel handling activities for which they are responsible. Further, they are charged to ensure those activities are performed in accordance with those procedures.

Safety related procedures and instructions are also reviewed and approved by the Plant Safety Review Committee (PSRC). The permanent PSRC members are:

a. Assistant Plant Manager
b. Nuclear Support Manager
c. Nuclear Plant Quality Superintendent
d. Operations Superintendent 2
e. Chemistry and Radiation Control Superintendent
f. Technical Superintendent
g. Maintenance Superintendent

Specific responsibilities are as follows:

1. Approval of fuel movement plans -
   a. Plant Manager
   b. Technical Superintendent
   c. Reactor Engineer

2. Authorize and direct unloading, movement, storage, and shipping of SNM -
   a. Reactor Engineering
   b. Shift Superintendent
   c. Maintenance Supervisor

3. Approve radiation survey results -

    a. Health Physics
    b. Reactor Engineering

4. Direct and authorize use of fuel handling equipment -

    a. Shift Superintendent

5. Authorize entry into limited access areas -

    a. Security
    b. Reactor Engineering
    c. Health Physics

6. Approve fuel inspection results -

    a. Maintenance Supervisor
    b. Reactor Engineering

7. SNM accountability -

    a. Technical Superintendent
    b. Reactor Engineer
    c. Manager of Nuclear Fuels

1.2.4 <u>Fire Protection System</u>

1.2.4.1 General Description - Auxiliary and Containment Buildings

The materials used in construction of the fuel storage area are concrete and steel. The fuel assemblies themselves and fuel racks are also constructed of non-flammable materials. Fire protection is provided by a hose connection and hose in the fuel area.

The fire protection system consists of two 300,000 gallon nominal capacity water storage tanks at atmospheric pressure, one electrically driven 1,500 gpm at 125 psig fire pump, two diesel-driven 1,500 gpm at 125 psig fire pumps, one 30 gpm at 125 psig jockey fire pump, fire water yard mains, hydrants, standpipes, hose stations, sprinklers, deluge spray systems, automatic Halon 1301 systems, automatic carbon dioxide systems, hydrogen detectors, smoke detectors, alarms, fire barriers, fire stops, fire breaks, portable fire extinguishers, portable breathing apparatus, smoke and heat ventilation systems, and associated controls and appurtenances.

The fire-fighting water is taken from the two water storage tanks, which are capable of being filled by the plant service water system in less than four hours. The plant service water system supplies water directly to the jockey fire pump. The fire pump suction piping is arranged so that any pump can take suction from either water storage tank. An outside hose header test manifold equipped with six hose valves is provided for annual tests.

The fire protection system is designed to operate and/or fail without inducing failure of engineered safety features. No electrically conductive fire extinguishing agent is automatically released on relays, switchgear, motor control center, or other critical safeguard equipment.

Ventilation systems, including smoke and heat removal systems, are discussed in further detail in Table 1.0, Section D.4, of Appendix 9A of the Grand Gulf FSAR and the individual system description in Sections 6.4 and 9.4 of the Grand Gulf FSAR. Appendix 9A contains the reference drawings of the Fire Protection Program Review. Figures 9 and 10 show the relative location of fire protection apparatus (i.e., hose stations, extinguishers, etc.) on the refueling floor in the auxiliary and containment buildings.

Construction of the Fire Protection System serving the fuel handling and storage areas will be completed prior to the receipt of unirradiated fuel. The Fire Protection System in these areas will also have successfully completed preoperational testing. No activities which may adversely affect the Fire Protection System in the fuel handling area will be allowed.
During fuel handling and storage operations, the Shift Superintendent acting as Shift Fire Chief is responsible for all activities regarding the Fire Protection System and implementation of the Station Fire Plan.

A complete description of the Fire Protection System is contained in subsection 9.5.1 and Appendices 9A and 9B of the Grand Gulf FSAR.

1.2.4.2 Fire Protection - Temporary Storage

Non-flammable or fire retardant materials will be utilized where possible.

The following protection and precautions will be taken for storage in the Temporary Storage area:

1. There will be a security guard stationed in the area of the fuel with communications to the control room and the security office.

2. The crated fuel will be inspected for fire hazard once every eight hour shift.

3. Portable fire extinguishers will be located near the stored fuel.

1.2.5 Control of Access to Areas Where Special Nuclear Material is Stored

A description of the controls for prevention of unauthorized access to the fuel storage area is contained in the Interim Security Plan and is considered security confidential. This plan is submitted under separate cover.

Control of access to temporary storage areas, as discussed in Section 1.2.3.3, is also covered under this plan.

1.3 PHYSICAL PROTECTION

The quantity of U-235 (contained in uranium enriched to 20% or more in the U-235 isotope), or plutonium to be possessed under this license is less than the quantity specified in 10 CFR 73.1(b) of 10 CFR 73. Therefore, the physical protection requirements specified therein do not apply. Physical protection is, however, addressed in the Interim Security Plan for protection of the received, unirradiated fuel bundles. As noted in 1.1.3 of this application, the average initial core enrichment is 1.708% U-235. The highest enrichment contained in any bundle is 2.60% U-235.

1.4 TRANSFER OF SPECIAL NUCLEAR MATERIALS

1.4.1 Fuel Shipments

General Electric Company will be responsible for the shipment of fuel to the plant site from their Wilmington, N.C. facility. The fuel will be shipped in approved shipping containers. If for any reason fuel would have to be shipped back to the Wilmington facility from the plant, MP&L will be responsible for the shipment.

1.4.2 Packaging of Fuel for Transportation

General Electric Company will be responsible for the packaging of fuel for shipment from the Wilmington facility to Grand Gulf. MP&L will be responsible for the packaging of any fuel which is required to be returned to the GE Wilmington facility.

1.5 FINANCIAL PROTECTION AND INDEMNITY

Proof of financial protection in the amount of $1,000,000 is provided as Attachment A as required by 10 CFR 140.13.

2.0 HEALTH AND SAFETY

2.1 RADIATION CONTROL

2.1.1 Training and Experience

The technical qualifications for personnel with Radiation Protection responsibilities are described in Section 13.1.3 of the FSAR.

Qualifications of the Radiation Protection personnel are specified in Regulatory Guide 1.8. MP&L's commitment to Regulatory Guide 1.8 is found in FSAR Appendix 3A. 2

2.1.2 Contamination Monitoring

Administrative controls will be covered under the sections of the Plant Operations Manual which govern the plant Health Physics Program. These procedures include receipt surveys on new fuel, fuel inspection surveys, storage and handling of radioactive material, personnel monitoring, establishing and posting controlled areas, operation of portable survey instruments, Radiation Work Permits, and others.

Contamination controls as described in the above will be provided by requiring Radiation Work Permits to control work and access to the fuel handling and storage area.

Monitoring stations for radioactive contamination are to be on the "clean" side of the control point(s) that are to be established at the exit(s) to the fuel handling and storage area of the fuel handling building and at the exit from the radiologically controlled areas.

Procedures for Radiation Protection are discussed in Section 12.5.3 of the FSAR. Health Physics equipment is described in Section 12.5.2.2 of the FSAR.

Radiation survey inspections of the loaded shipping crates will be performed upon receipt.

2.1.3 Portable survey instrumentation will be calibrated at six (6) month intervals using either approved plant procedures and National Bureau of Standards (NBS) traceable calibration sources or a contracted calibration service which has been evaluated and placed on the Qualified Suppliers List for safety related services.

Laboratory instrumentation will be calibrated at twelve (12) month intervals using NBS traceable calibration sources. Functional checks will be performed daily or prior to use to ensure that the instrument is operating properly and remains in calibration.

Additional detail on the frequencies and methods for calibration of instruments is discussed in Section 12.5.2.2 of the FSAR.

2.2 NUCLEAR CRITICALITY SAFETY

2.2.1 Personnel and Training

Reactor engineering personnel are responsible for criticality safety related to fuel handling and storage operations. Safety is ensured through a combination of engineered safeguards and written procedures. Training is conducted to ensure that reactor engineering personnel are thoroughly familiar with these design features and procedures. Qualifications of Reactor Engineering personnel are contained in Regulatory Guide 1.8 (FSAR Appendix 3A). 2
The reactor engineer and the training superintendent are responsible for developing and implementing the criticality training program.

2.2.2 Storage of Loaded Shipping Containers

The fuel bundles may be stored in shipping containers. If they are stored in this way, the shipping containers will be stored in no more active array than they were during shipping. The shipping containers will be located in limited access areas according to the Interim Security Plan submitted under separate cover.

The fuel bundles are shipped in a steel container (182 7/8" x 20 5/8" x 11 1/4") encased in a wooden shipping crate (206 3/4" x 29 3/4" x 31"). One (1) steel container is contained in each wooden shipping crate. Two (2) fuel bundles are contained in each steel container. The container and crate are described in General Electric Company drawing numbers 731E674 and 829E209, respectively. They are licensed with the NRC under Certificate of Compliance 4986.

2.2.3 Nuclear Safety of Storage Location

2.2.3.1 Criticality Control New Fuel Vault

The calculations of k_{eff} are based upon the geometrical arrangements of the fuel array and subcriticality does not depend upon the presence of neutron absorbing materials. The arrangement of fuel assemblies in the fuel storage racks results in k_{eff} below 0.95 in a dry condition or completely flooded with water which has a density of 1 g per cc. To meet the requirements of General Design Criterion 62, geometrically-safe configurations of fuel stored in the new fuel array are employed to assure that k_{eff} will not exceed 0.95 if fuel is stored in the dry condition or if the abnormal condition of flooding (water with a density of 1 g/cc) occurs. In the dry condition, k_{eff} is maintained ≤ 0.95 due to under moderation. In the flooded condition, the geometry of the fuel storage array assures the k_{eff} will remain ≤ 0.95 due to overmoderation. The floor of the vault is sloped to a drain at the low point to drain any water that may be introduced. The design of the fuel, racks, and vault ensures that water will not be retained in or around a channeled or unchanneled fuel bundle should the vault be flooded and drained. 2

Analysis shows that the possibility exists that under optimum conditions of fuel geometry and moderation, a critical assembly may result. Such optimum moderation conditions could conceivably result from water mists from fire fogging nozzles, fire sprinkers, or from fire suppression foams. Fire fogging nozzles, sprinklers, and foams are excluded from the fuel handling area. As further protection while fuel is being inserted or removed at the new fuel vault, the fuel will be protected with a fire retardant covering. When the new fuel vault is loaded, the permanent water tight covers will be secured.

No limitation is placed on the size of the new fuel storage array from a criticality standpoint since all calculations are performed on an infinite basis. The new fuel storage area therefore accommodates fuel from a multi-unit facility with no safety implications. All handling conditions remain the same and there is no compromise of any safety considerations.

No credit is taken for burnable poisons which may be contained in any fuel bundle.

The minimum center-to-center spacing for the fuel assembly between rows is 11.875 inches. The minimum center-to-center spacing with the rows is 6.535 inches. Fuel assembly placement between rows is not possible.

A safety evaluation of the New Fuel Vault storage area is provided in subsection 9.1.1.3 of the Grand Gulf FSAR.

2.2.3.2 Criticality Control Spent Fuel Pool and Containment Pool

The design of the spent fuel storage racks provides for a subcritical multiplication factor (k_{eff}) for both normal and abnormal storage conditions. For normal and abnormal conditions, k_{eff} is equal to or less than 0.95. Normal conditions exist when the fuel storage racks are located in the pool and are covered with a normal depth of water (about 25 feet above the stored fuel) for radiation shielding and with the maximum number of fuel assemblies or bundles in their design storage position. An abnormal condition may result from accidental dropping of equipment or damage caused by the horizontal movement of fuel handling equipment without first disengaging the fuel from the hoisting equipment. To meet the requirements of General Design Criterion 62, geometrically safe configurations of fuel stored in the spent fuel array are employed to assure that k_{eff} does not exceed 0.95 under all normal and abnormal storage conditions. The geometry of the spent fuel storage array is such that k_{eff} is 0.95 due to overmoderation. The design of the fuel, racks, and pools ensures that water will not be retained around an assembly when the pools are flooded and drained.

Analysis shows that the possibility exists that under optimum conditions of fuel geometry and moderation a critical assembly could conceivably result from water mists from fire fogging nozzles, fire sprinkers, or from fire suppression foams. Fire fogging nozzles, sprinklers, and foams are excluded from the fuel handling areas in the Auxiliary Building and Containment. As further protection, if the spent fuel storage pool or containment building fuel pool are not flooded, a fire retardant covering will protect the fuel.

The rack holddown bolt spacing is such as to maintain minimum spacing of adjacent racks for geometric reactivity control. The racks are designed to maintain a minimum fuel spacing of 6.535 inches (center to center) within a rack and 11.875 inches (center to center) from rack to rack.

No neutron poison is used in the spent fuel pool or racks. No credit is taken for burnable poisons which may be contained in any fuel bundles.

A safety evaluation of the Spent Fuel Pool and Containment Pool storage areas is provided in subsection 9.1.2.3 of the Grand Gulf FSAR.

Each fuel movement is required by procedure to be confirmed by an independent observer before the movement is considered complete.

2.2.3.3 Criticality Control Temporary Storage

Fuel bundles in Temporary Storage will be stored in no more active an array than they were during shipping. Each trailer carries a maximum of sixteen (16) crates. Each crate shall contain a maximum of two (2) fuel bundles. No more than three (3) trailers having a combined maximum of ninety-six (96) fuel bundles will be permitted in the temporary storage area.

2.2.4 Moderation Control

Analyses of the storage areas take into account the effects of full and no moderation. Results show that flooding or lack of moderation produces no adverse effect on nuclear safety. The effects of optimum interspersed moderation and the protective actions taken considering it were discussed in Section 2.2.3.

The storage of fuel in the new fuel vault, auxi` ary building pool, or containment building pool is such that if the array were flooded and drained, the fuel packaging would not retain water around or within the assemblies.

2.2.5 Maximum Number of Fuel Assemblies Out of Authorized Locations

The maximum number of fuel bundles that will be allowed outside a normal, approved storage location or normal shipping container is three (3). Fuel bundles outside approved storage locations or shipping containers must maintain an edge-to-edge spacing of 12 inches or more from all other fuel. A fuel array of four or more bundles outside approved fuel storage locations or shipping containers is prohibited.

No more than one metal shipping container may be opened at any one time and this container must be closed if all fuel is not immediately removed. Removal of the wooden crates is done only in the enclosed railroad bay at elevation 133'-0". The metal shipping container will be opened only in the fuel handling area at elevation 208'-10". Fuel shipping containers will not be opened in the temporary storage area.

2.2.6 Criticality Accident Requirements - Auxiliary and Containment Buildings

Emergency procedures and drills in conjunction with detectors and instrumentation for a criticality accident will be in place prior to fuel arrival on-site. Area Radiation Monitoring in the area of fuel movement and storage for criticality monitoring will be operable. Additionally, a criticality accident is not credible under the storage and handling conditions previously described. An exemption is requested from the requirements of 10 CFR 70.24(b) as provided in 70.24(c).

The area radiation monitoring system is provided to supplement the personnel and area radiation survey provisions of the plant health physics program described in FSAR Section 12.5 to ensure compliance with the personnel radiation protection guidelines of 10 CFR 20, 10 CFR 50, 10 CFR 70, and Regulatory Guides 8.2, 8.8, and 8.12.

The following design criteria are applicable to the area radiation monitoring system.

RANGEABILITY - Five decade range indication appropriate for the detector location. The lower range limit is selected as the lower of the following: 2

1. The radiation level existing with the plant shutdown (i.e., natural background).

2. One decade lower than the radiation level existing with the plant in operation (i.e., normal background). 2

The alarm setpoint will be in the second decade of reading or higher.

SENSITIVITY - Gamma sensitive to photon energies of 100 keV and above.

RESPONSE - In any range, the readout indicates at least 90 percent of its end point reading within 5 seconds after step change in radiation level at the detector.

ENERGY DEPENDENCE - The dose rate (mrem/hr) readout is within 15 percent of the actual dose rate in each detected area from photon energies between 100 keV and 1.5 MeV.

ENVIRONMENTAL DEPENDENCE - The system meets the above requirements for all variations of temperature, pressure, and relative humidity within each area monitored which includes 95 percent relative humidity and temperatures between $32^{\circ}F$ and $120^{\circ}F$.

EXPOSURE LIFE - Each detector maintains its characteristics up to an integrated dose of 10^5 rads.

Airborne radioactivity monitoring is provided in compliance with 10 CFR 20 and Regulatory Guides 8.2 and 8.8. The purpose of the airborne radioactivity monitoring system is to monitor the air within an enclosure by either direct measurement of the enclosure atmosphere or the exhaust air from this enclosure. The system indicates and records the levels of airborne radioactivity, and, if abnormal levels occur, actuates alarms. Alarms are provided to alert personnel that airborne radioactivity is at or above the selected setpoint level to ensure that personnel are not subjected to airborne radioactivity above limits in 10 CFR 20. The system provides a continuous record of airborne radioactivity levels which will aid operating personnel in maintaining airborne radioactivity at the lowest practicable level.

The in-plant airborne radiological monitoring and sampling systems are provided to allow determination of the content of radioactive material in various rooms throughout the plant. The design objectives and criteria are primarily determined by the system safety functions.

The criteria for determining the type of airborne radioactivity monitoring system are based upon the nature and type of radioactive releases expected, and the location being monitored.

Where ingestion of radioactive airborne materials by plant personnel is a possibility, monitors are used to analyze, record and alarm should the radioactivity approach the limits established by 10 CFR 20.

A complete description of the Radiation Protection design features is contained in subsection 12.3 of the Grand Gulf FSAR.

2.2.7 Criticality Accident Requirements - Temporary Storage

A criticality accident is not credible under these conditions of storage. Exemption is requested from 10 CFR 70.24(b) as provided in 10 CFR 70.24(c).

2.3 ACCIDENT ANALYSES

2.3.1 Auxiliary and Containment Buildings

Accident Analyses for fuel handling equipment and storage areas are provided throughout Sections 9.1.1, 9.1.2, and 9.1.4 of the FSAR. The potential for accidents affecting the safety of fuel in the storage areas is limited to the dropping of fuel assemblies over the storage area. No overhead load greater than one fuel assembly will be allowed in or over the fuel storage array. This requirement is contained in procedure No. 07-S-01-13 (Control of Crane Operation). The seismic design of the containment and the auxiliary building, and of cranes, racks, and pools precludes the credibility of more severe accidents. In the unlikely event of a dropped fuel assembly in the storage areas, the consequences affecting safety would be minimal. Due to the spacing of the storage arrays, a criticality condition would not be possible under these accident conditions. The consequences of the accident would be limited to the minimal effect of possible rupture of fuel rods and subsequent release of unirradiated uranium dioxide fuel.

3.0 OTHER MATERIALS REQUIRING NRC LICENSE

3.1 TYPE, AMOUNT, AND CONDITIONS OF STORAGE

Authorization is requested to receive, possess, inspect and use seven (7) antimony-beryllium (SbBe) neutron sources and other special nuclear material as outlined below. This is in addition to the fuel bundles previously described in this application for license.

Special Nuclear Material (In-core Detectors)

Quantity	Description (See Note Below	Grams U-235 Per Detector	Grams U-235 Total	Activity (microcuries) Per Detector	Activity (microcuries) Total
12	SRM Detectors	.0027	.0324	5.85×10^{-6}	7.02×10^{-5}
16	IRM Detectors	.00074	.01184	1.62×10^{-6}	2.592×10^{-5}
352	LPRM Detectors	.00022	.07744	5.1×10^{-3}	1.7952
10	TIP Detectors	.000744	.00744	1.62×10^{-6}	1.62×10^{-5}

NOTE: All of the above devices are sealed sources.

Neutron detectors may be temporarily stored in the MP&L warehouse under the auspices of the Interim Security Plan.

Radioactive Sources

Description	Quantity	Isotope	Est. Activity Each
Operational Source	14	Sb124	1400 Curies

(Seven (7) operational sources with two (2) 1400 Curie pins each)

The operational sources will be shipped in lead filled drums approximately 47" tall and 31" in diameter, which meet DOT package specifications. The source is positioned within a 7" diameter x 25" long cavity which is centered in the drum and surrounded by lead shielding. The cavity is sealed with a lead plug. This shipping container is a General Electric Model 1500 Shielded Container, licensed with the DOT under S.P. No. 5939.

Consistent with recommendations of Regulatory Guide 8.8, MP&L has committed to establish a health physics program to maintain occupational and general public exposure to radiation "As Low As Reasonably Achievable" (ALARA). The ALARA program is contained in Administrative Procedure No. 01-S-08-2. 2

The operational neutron sources will be stored in the shielded container in the containment building fuel pool. This pool is within a limited access area. The area containing the sources will be designated and posted as either a Radiation Area or High Radiation Area, if required, depending on the dose rate. The area will also be designated as a Radioactive Material Area. These areas will be established and controlled in accordance with plant administrative procedures. Periodic radiological surveys will be performed to ensure personnel safety.

Shortly before fuel loading commences the containment fuel pool will be flooded and the shielded shipping container containing the sources unbolted. The operational neutron sources will be removed from the shipping container and installed in the source holders. They will then be transferred under water to their permanent locations in the reactor vessel. These activities are required prior to fuel load so that source range monitors (SRM) can be calibrated and tested. All of these activities will be performed in accordance with written procedures under strict operations and health physics supervision.

The storage area will be posted in accordance with 10 CFR 20.203 and positive key control will be utilized to preclude unauthorized entry. Thermoluminescent detectors and self reading dosimeters will be used to monitor personnel for exposure. Exposure limits will be in accordance with 10 CFR 20.101.

3.2 SHIPPING AUTHORIZATION

In addition to storage, authorization is requested for provisions to cover return shipping of the sources in their shipping containers to the supplier in case of damage to the sources or excessive decay of sources due to startup delays. Appropriate procedures and precautions will be utilized should this need arise.

3.3 RADIATION PROTECTION

In addition to the shielding provided for the operational sources, radiation protection provisions will include: 1) proper labeling of storage location, 2) radiation surveys of the area, and 3) personnel radiation monitoring for individuals in the area.

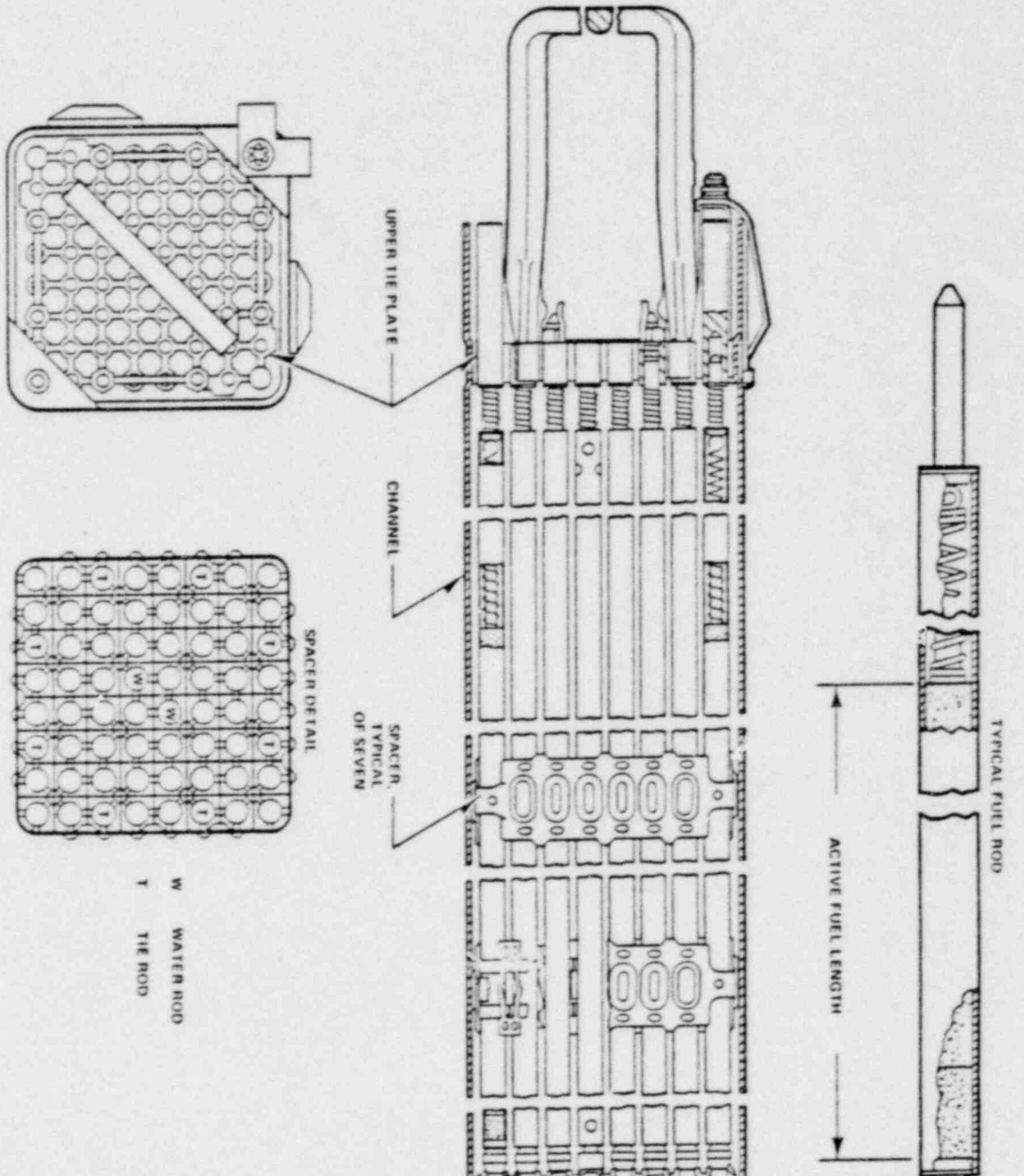


Figure 1
Fuel Assembly Outline Drawing

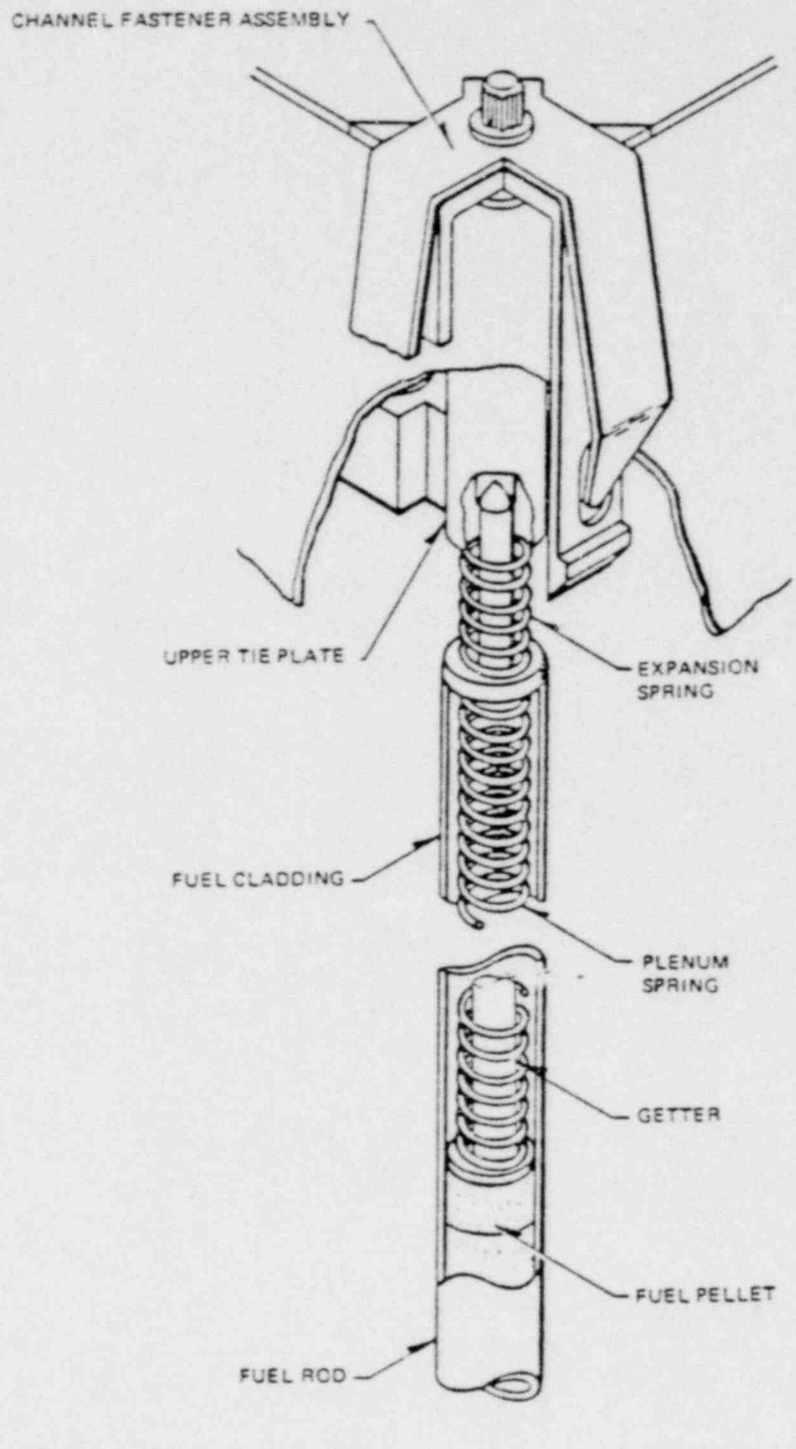
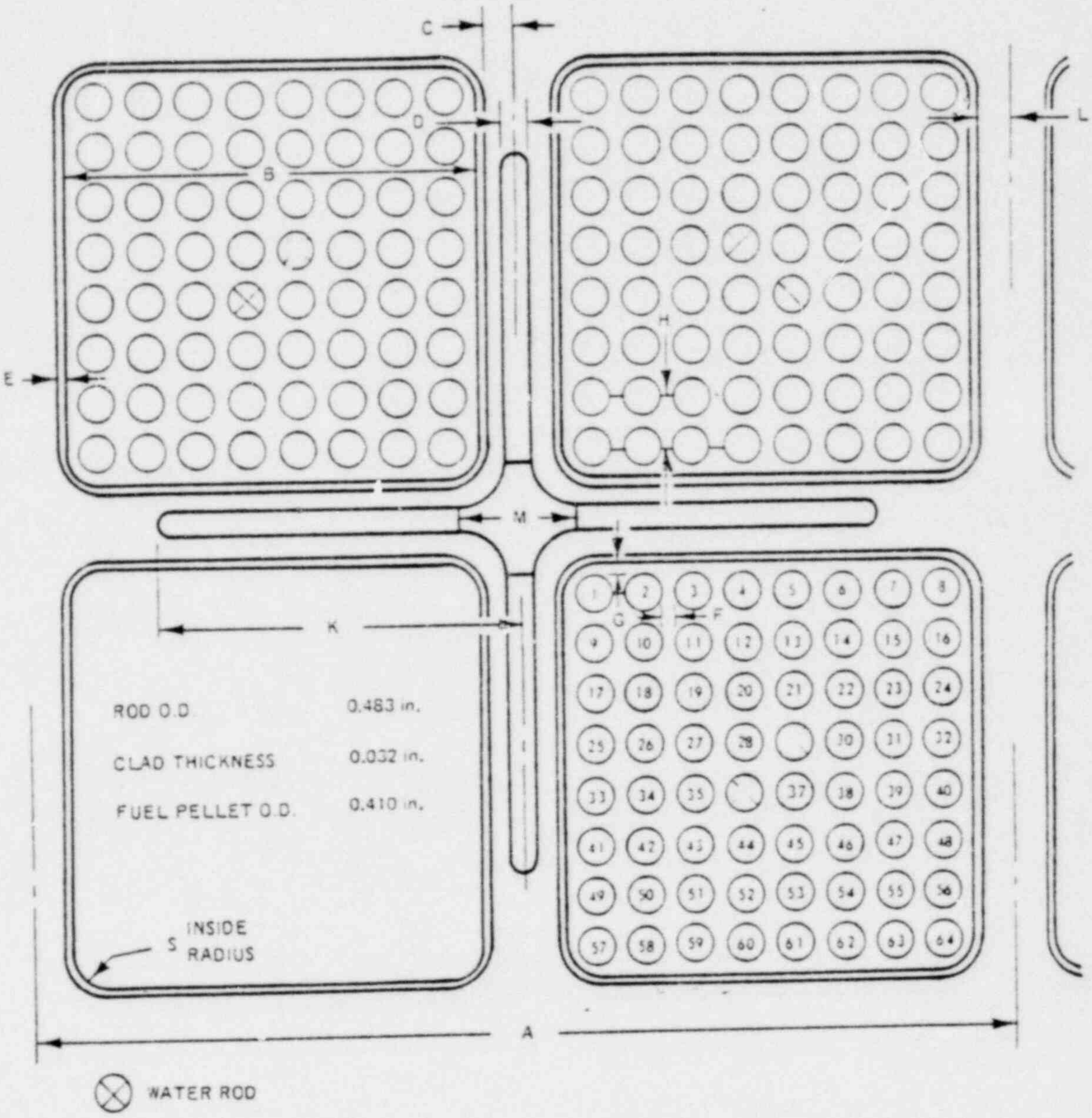


Figure 2
Channel Fastener Assembly

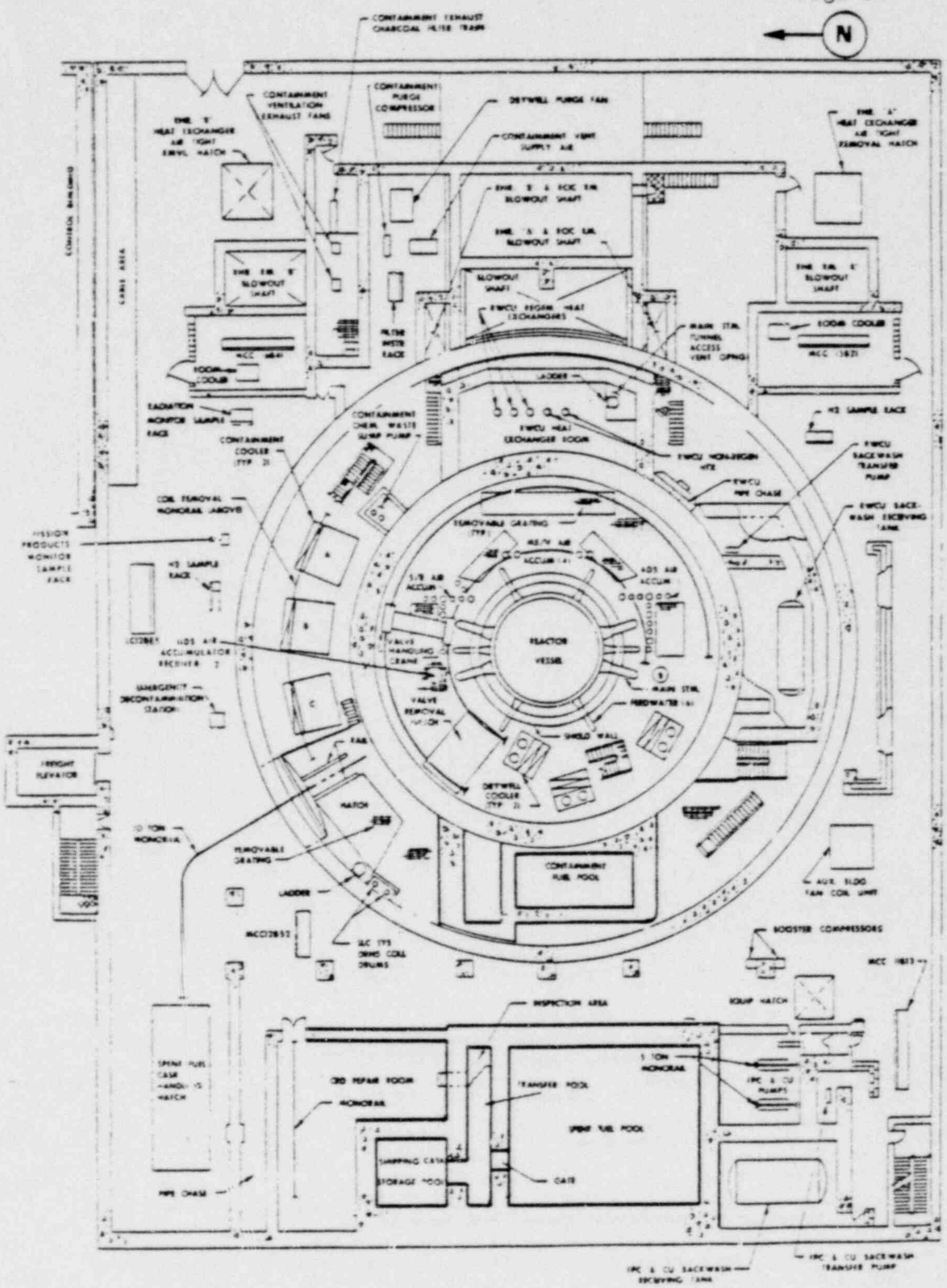


DIM. IDENTIFICATION	A	B	C	D	E	F	G	H	I	J
DIM. INCHES	12.0	5.215	0.2725	0.328	0.120	0.153	0.140	0.636		

DIM. IDENTIFICATION	K	L	M	N	O	P	Q	R	S	
DIM. INCHES	4.375	0.2725	1.562						0.330	

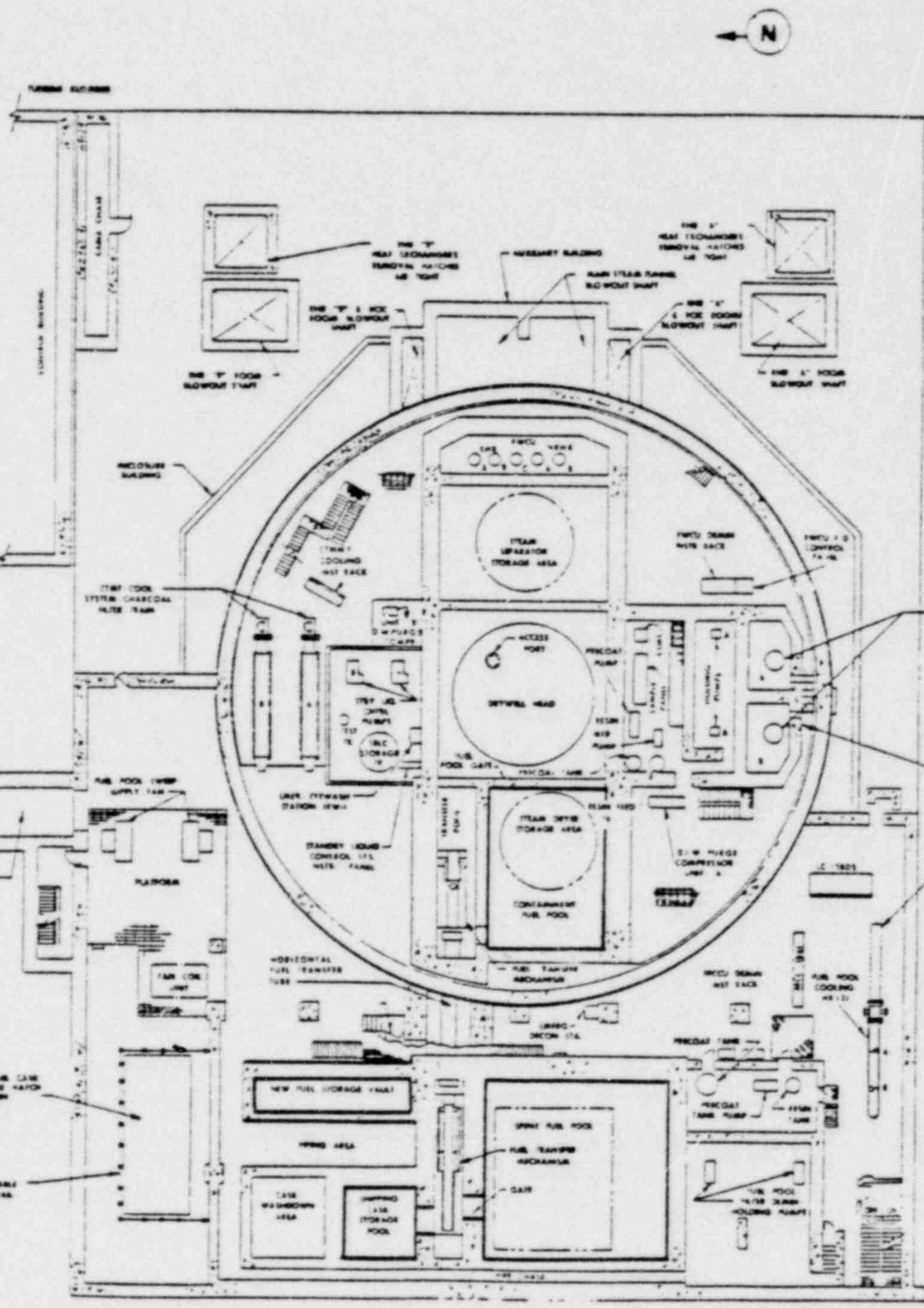
Figure 3
Typical Lattice Dimensions

POOR ORIGINAL



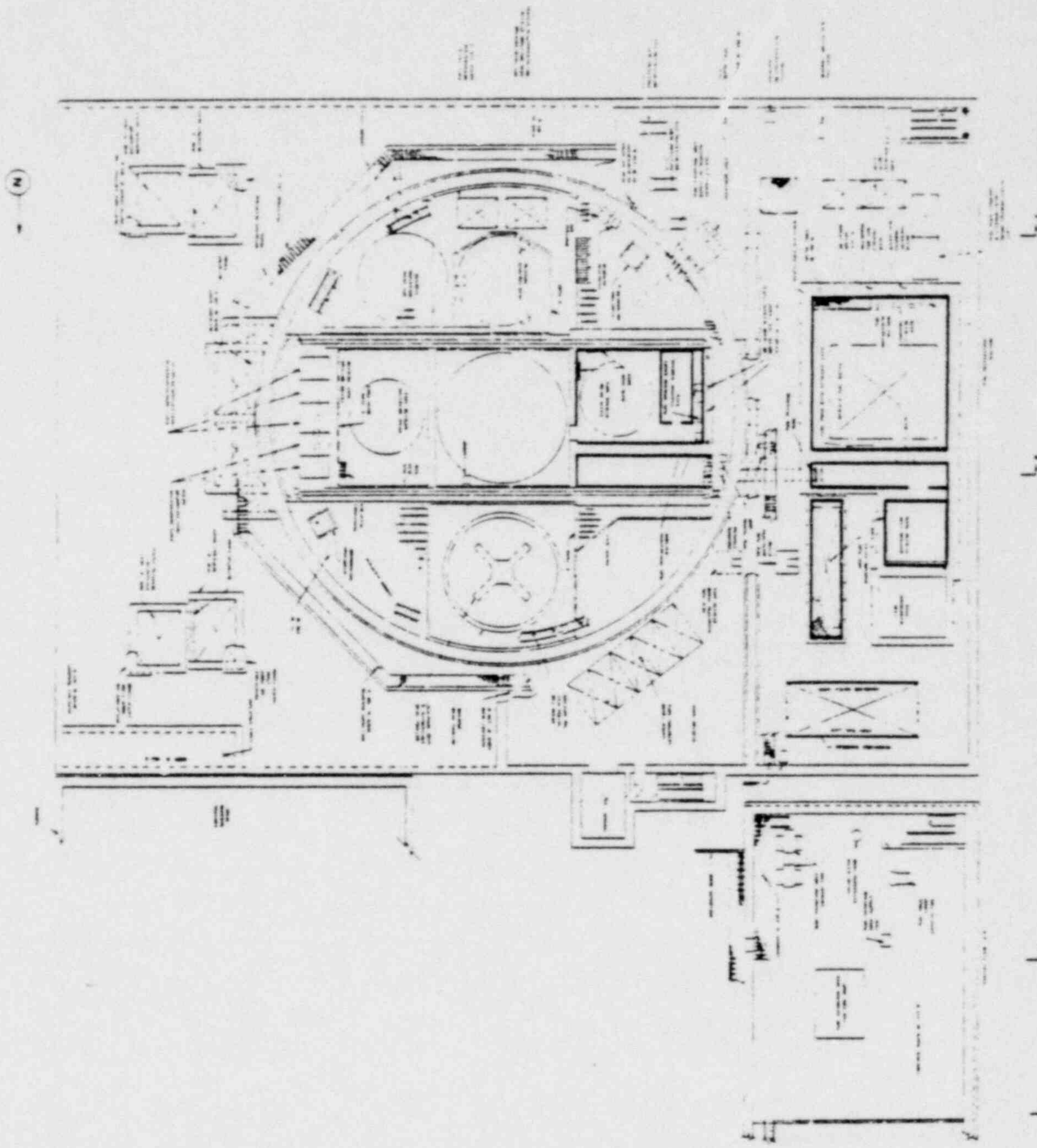
Aux Bldg/Containment Elevation , Elevation 161'10" & 166'0"

Figure 4



Bldg/Containment. Elevation 184'6" & 185'0"

Figure 5



Aux Bldg/Containment, Elevation 208'-10''

Figure 6

POOR ORIGINAL

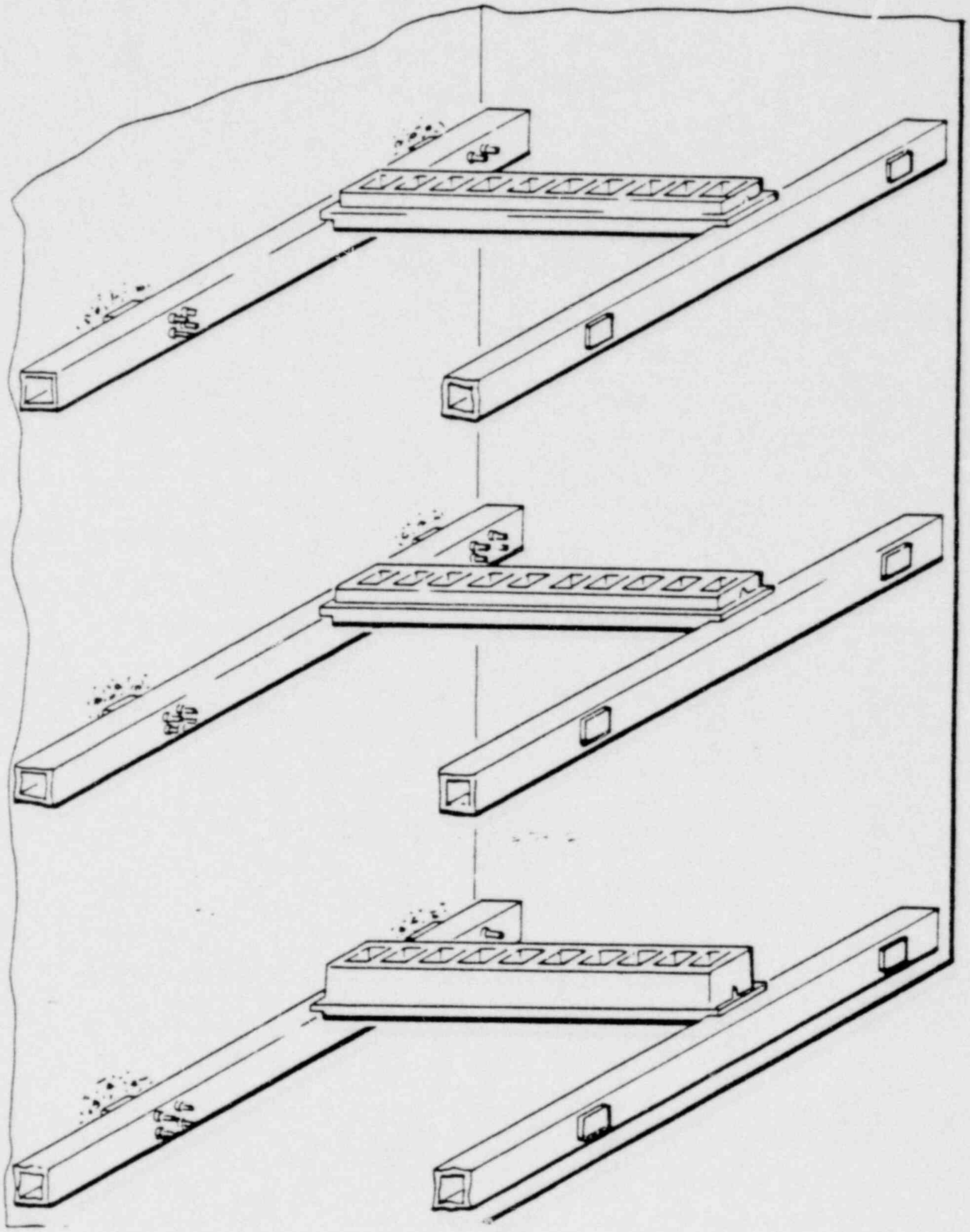
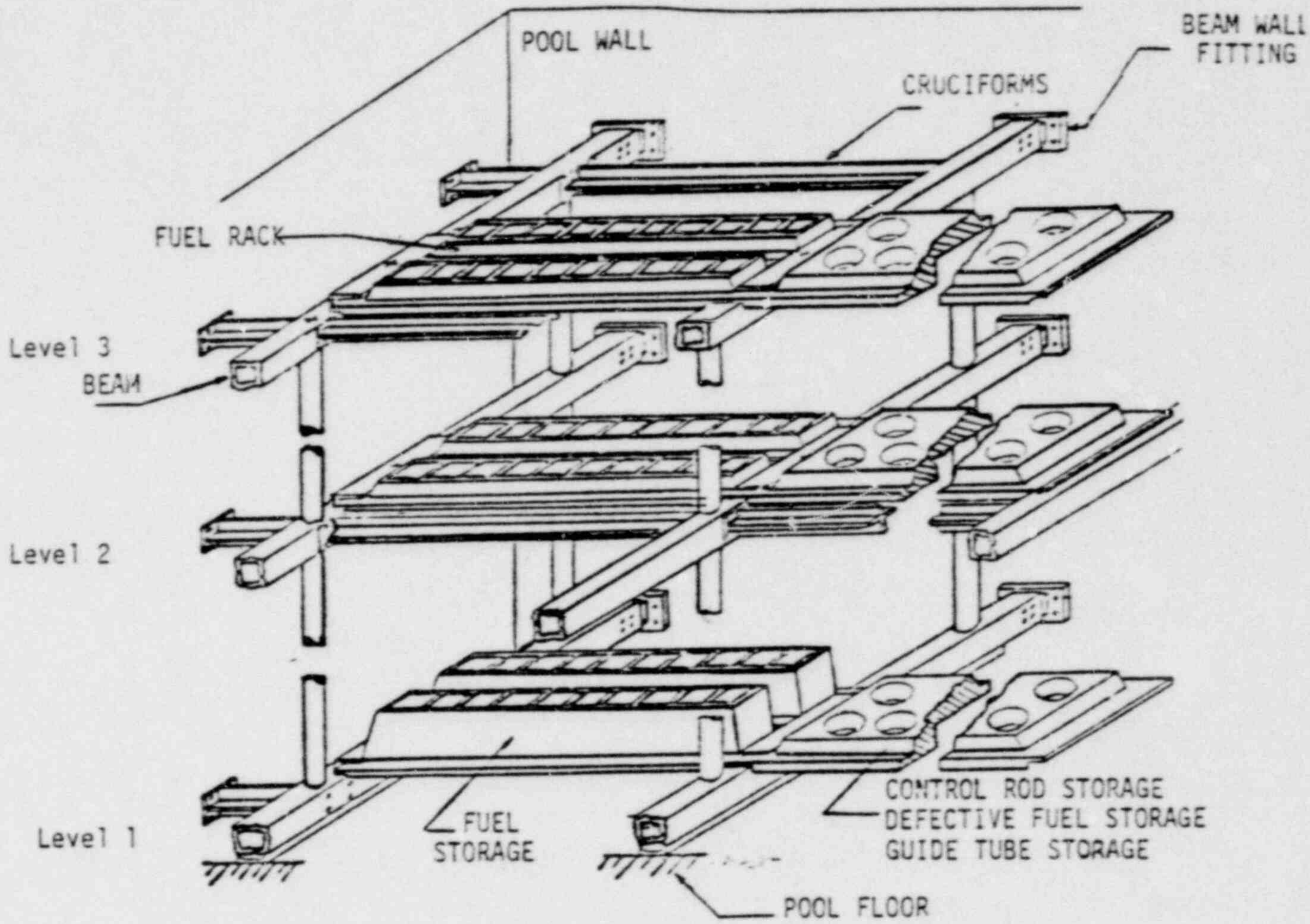


Figure 7A
Racks- New Fuel Storage Vault

POOR ORIGINAL



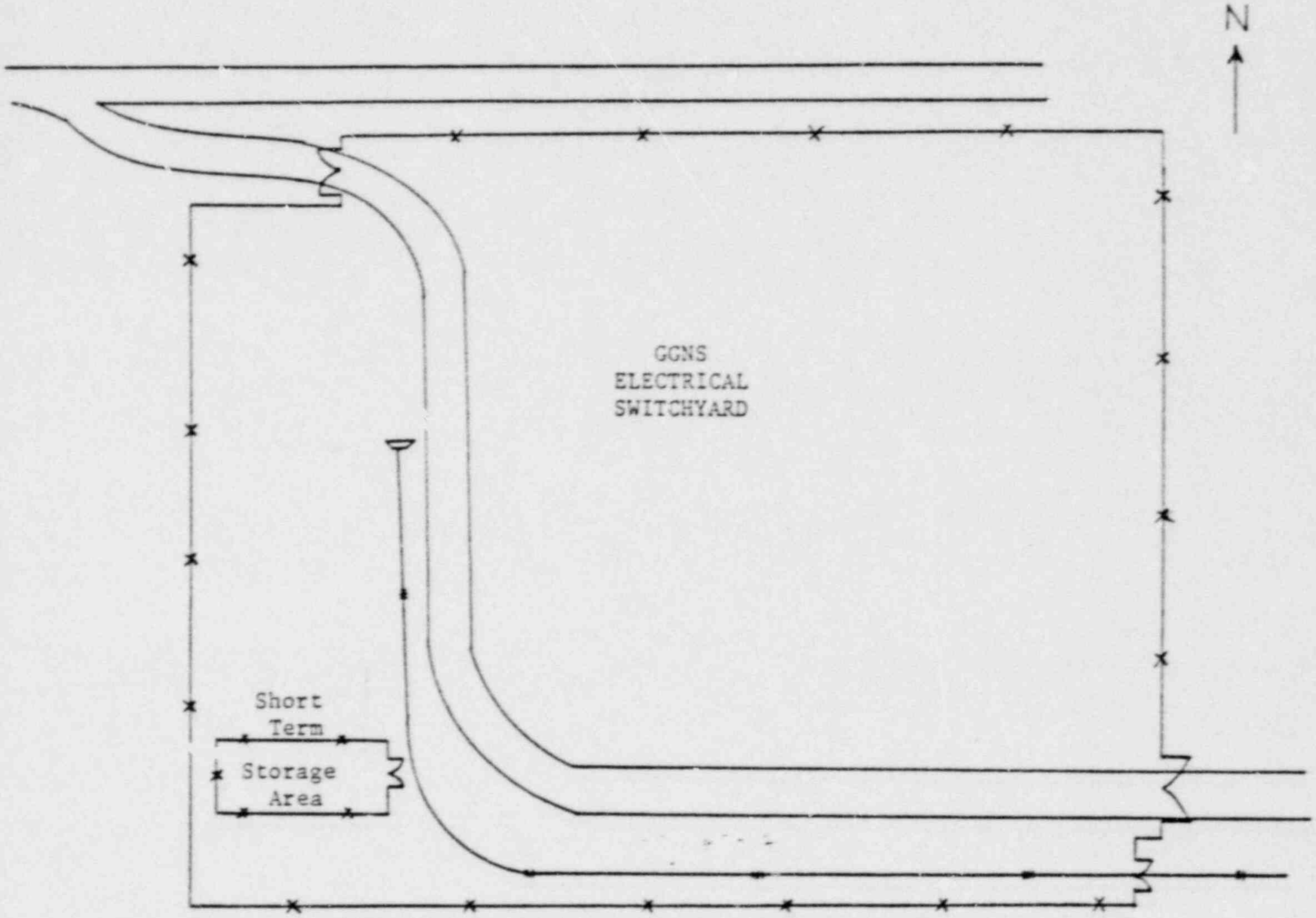
NOTE:

This sketch illustrates concept only.

Figure 7B

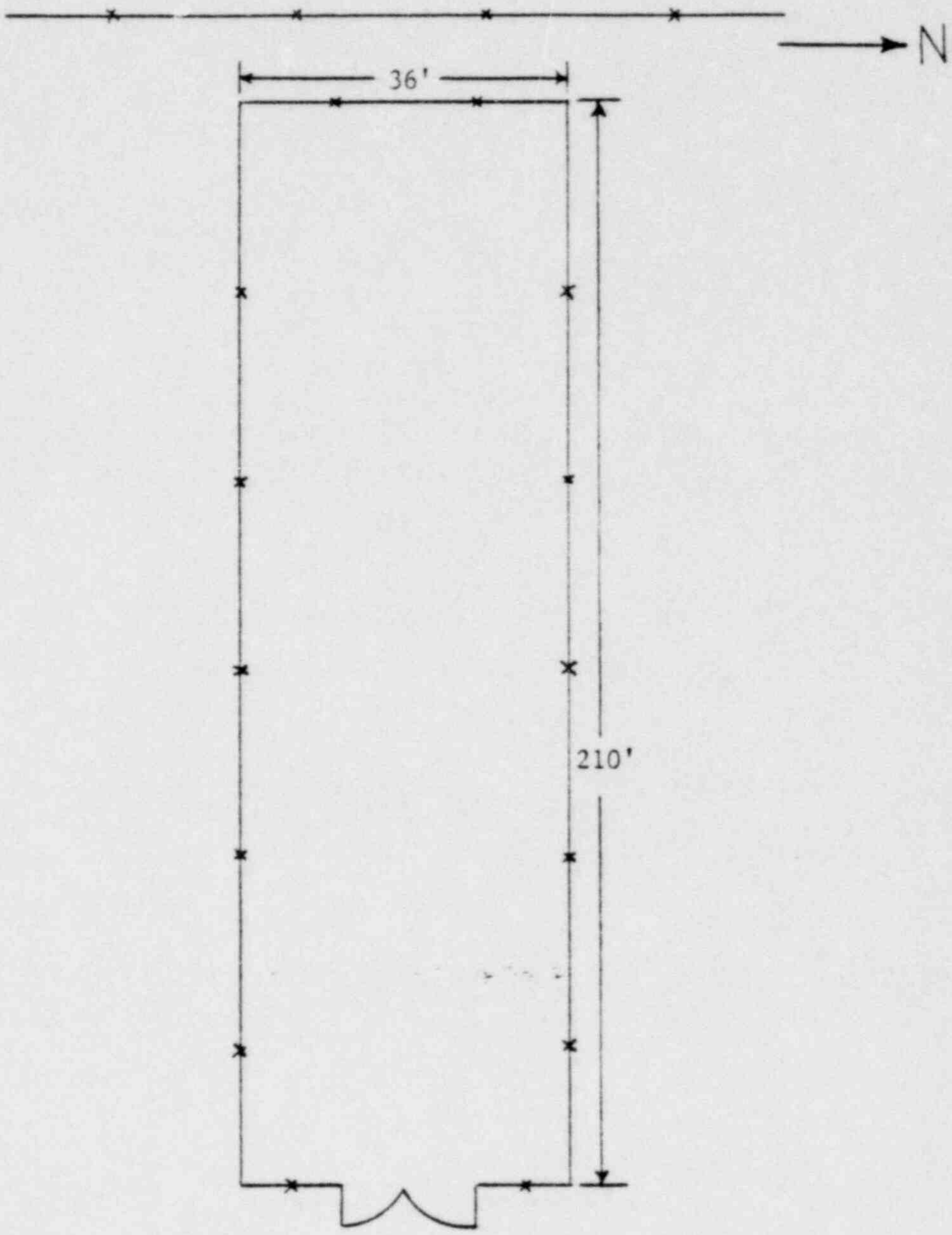
Racks- Spent Fuel Pool

POOR ORIGINAL



(not to scale)

Short Term Storage Area
Figure 8A



Short Term Storage Area - Detail
Figure 8B

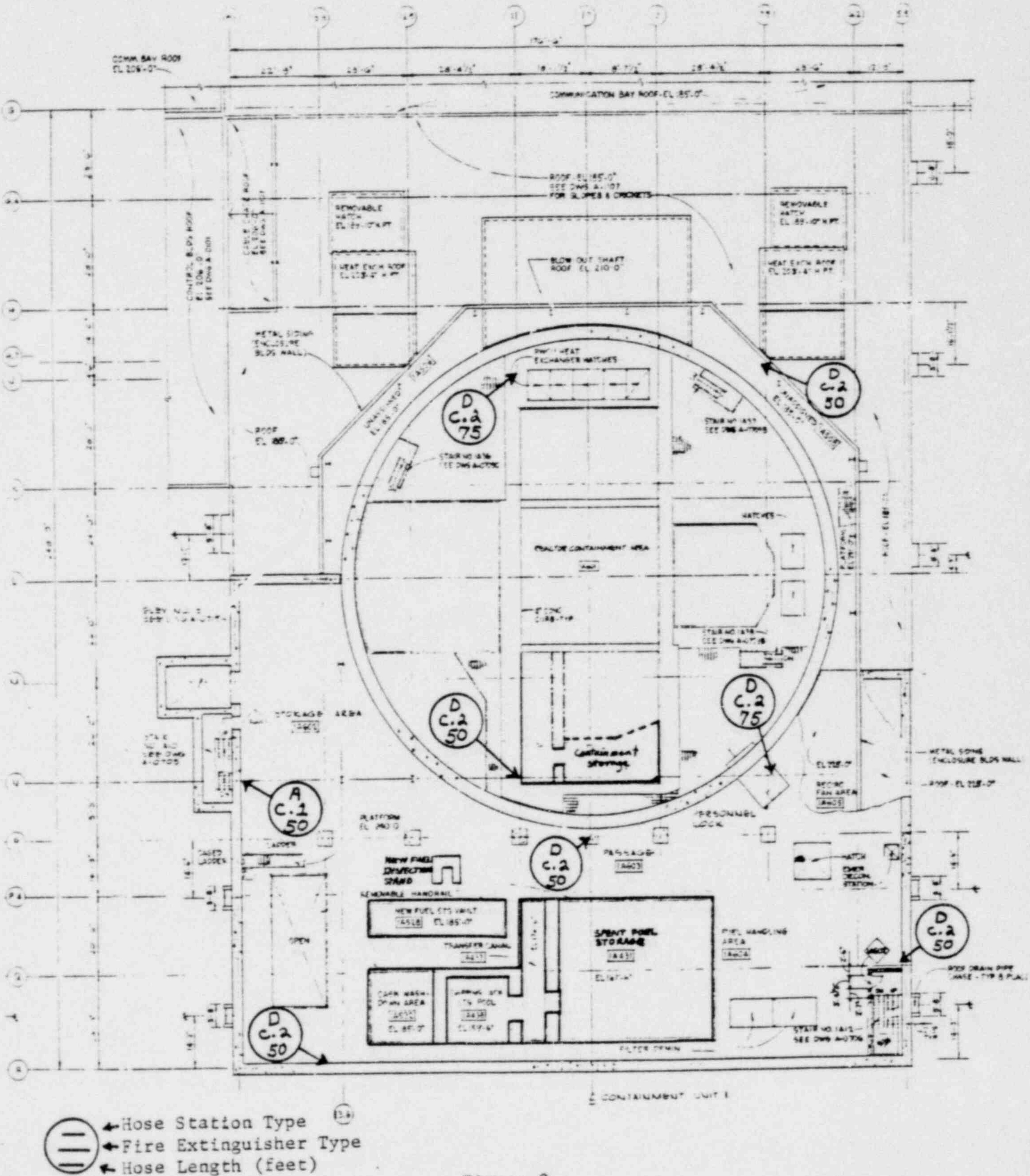


Figure 9
Hose Station Locations - El 208' 10"

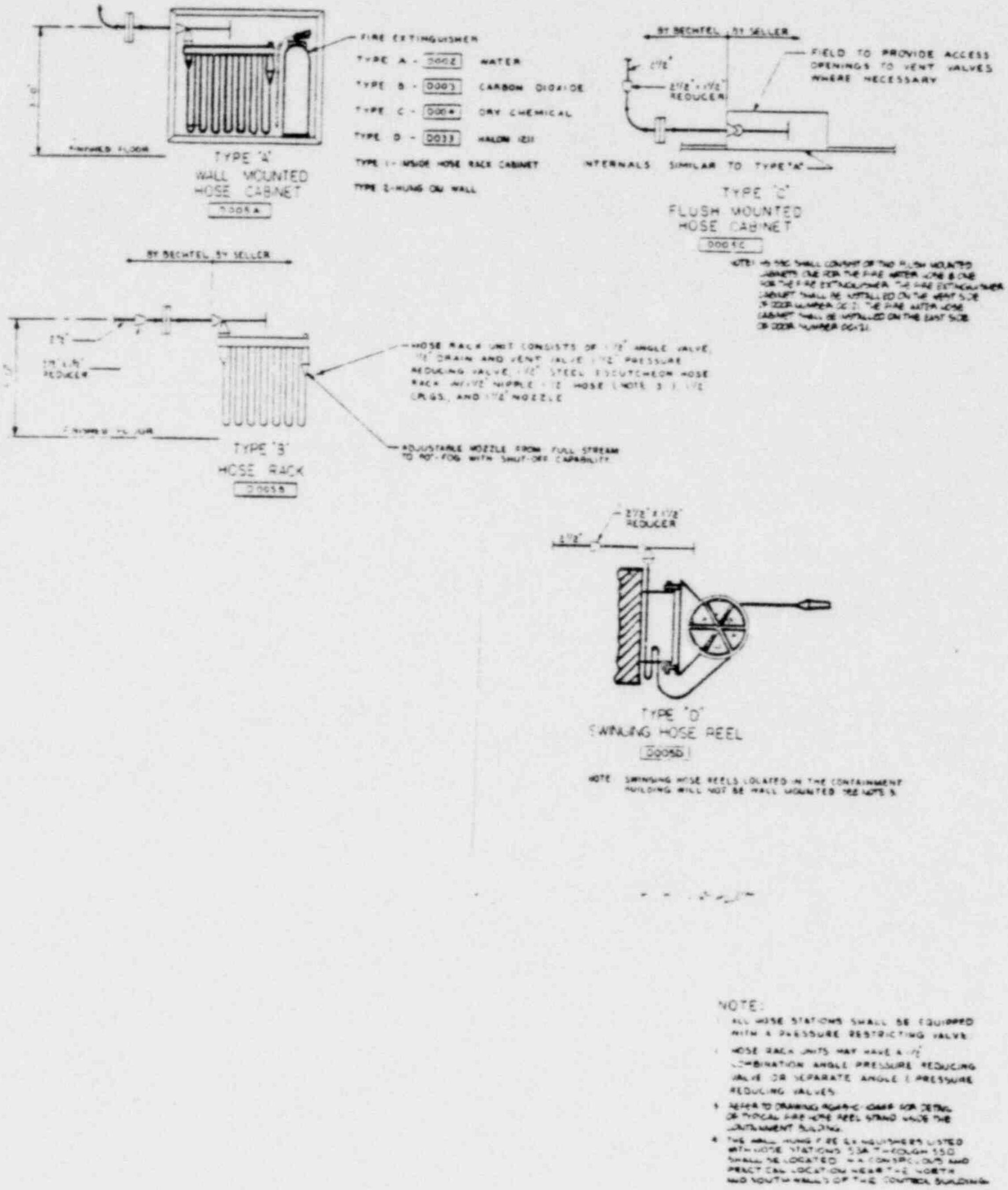


Figure 10
Hose Station Details