

MEETING SUMMARY DISTRIBUTION

ORB#4

cc: Metropolitan Edison Company
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Vice President - Generation
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Reading, Pennsylvania 19603

Mr. Ed Goodwin
NUS Corporation
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Rockville, Maryland 20850

Docket File

NRC PDR
L PDR
ORB#4 Rdg
NRR Rdg
BRusche
ECase
VStello
KGoller
DEisenhut
TCarter
ASchwencer
DZiemann
GLear
RReid

LShao
RBAer
WButler
BGrimes
Project Manager
Attorney, OELD
OI&E (5)
RIngram
RFraley, ACRS (16)
TBAbernathy
JRBuchanan
DThompson, E/W 359
NRC Participant(s)
ELantz
KJabbour
JSiegel

JZudans
RLaGrange
MWohl
RJClark

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7910220 681

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 16, 1976

DOCKET NO.: 50-289

LICENSEE: METROPOLITAN EDISON COMPANY (MET ED)

FACILITY: THREE MILE ISLAND UNIT NO. 1 (TMI-1)

SUMMARY OF MEETING HELD ON NOVEMBER 5, 1976, TO DISCUSS INSTALLATION OF COMPACT SPENT FUEL STORAGE RACKS AT TMI-1

On November 5, 1976, representatives of MetEd, GPU Service Corporation, and NUS Corporation met with the staff to discuss their planned submission of documents in support of installation of compact spent fuel storage racks at TMI-1. A list of attendees and a copy of the set of vu-graphs presented at the meeting are attached (Attachment 1 and 2).

Introduction

The basic plan is to replace the present storage racks in spent fuel pool B at TMI-1, which have a capacity of 174 assemblies, with compact racks to provide a storage capacity of 496 assemblies. The center-to-center pitch would be reduced from 21 1/8 inches in the present racks to 13 5/8 inches in the compact racks. The compact racks would be fabricated from stainless steel and would not incorporate supplementary neutron poison material. The changeover to the new racks would be performed under clean, dry conditions (present spent fuel is stored in Pool A). The change is only intended to increase the storage capacity for TMI-1 spent fuel and does not contemplate storage of spent fuel from offsite facilities.

The licensee plans to submit a formal application for this modification in December 1976, and hopes to have NRC approval by March 1977.

Technical Discussion

A. Structural

The licensee opened the discussion by describing the structural aspects of the modification. In addition to describing the design of the new racks, the licensee identified his design criteria, the loads and load combinations and acceptance criteria used in his analysis and described his seismic analysis methods. The principal staff comments on this subject were:

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- 1) To facilitate review of the planned modification, the licensee should provide more detailed sketches of the racks and their vertical and horizontal restraints and interfaces with the pool walls and floor.
- 2) Also to facilitate review, the licensee should submit a more detailed description of the non-linear seismic analysis, including data on the natural frequencies of the fuel elements, the storage cans, the floor response spectra and time histories utilized in the analysis.
- 3) Any new pumps or other components added as part of this modification should be qualified per currently applicable codes and regulations.
- 4) The analysis should address any stresses arising as a result of liner buckling.
- 5) The analysis should demonstrate the adequacy of the pool floor design to accommodate the added load imposed by the new storage rack design.

B. Criticality and Cooling

The licensee next described his methods of criticality analysis. These appeared to conform to present staff requirements. In addition, however, the staff stated the licensee should supply:

- 1) Proposed technical specifications specifying the maximum mass of U235 permitted per centimeter length of any fuel assembly to be stored in the lattice.
- 2) The fuel enrichment and stainless steel thickness reactivity coefficients for the storage cell lattice.
- 3) Information showing that there is adequate water flow between assemblies to preclude void formation by boiling.
- 4) A calculation of the time required to achieve boiling if all cooling of the spent fuel pool were lost.

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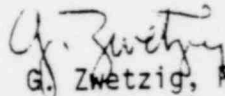
- 5) Confirmation that the outlet water temperature from pool under worst conditions with cooling system in normal operation will not exceed 140°F or the current FSAR values whichever is greater.

C. Environmental Assessment

The licensee stated he would submit the information required by present regulations. The staff supplied the licensee with hand-outs specifying the detailed information needed for environmental evaluation of this type of modification (Attachment 3).

D. Outstanding Issues

The licensee requested information on any outstanding issues which could impact approval of the planned modification. The project manager stated that the cask drop issue might impact the modification. He added that an effort was being made to expedite resolution of this issue.



G. Zwetzig, Project Manager
Operating Reactors Branch #4
Division of Operating Reactors

Attachments:

1. List of Attendees
2. Vu-graphs
3. Environmental and Cost/Benefit Assessment

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ATTACHMENT 1

MEETING WITH METROPOLITAN EDISON COMPANY

COMPACT FUEL STORAGE RACKS

LIST OF ATTENDEES

NOVEMBER 5, 1976

NRC

G. Zwetzig R. J. Clark
E. Lantz
K. Jabbour
J. Siegel
J. Zudans
R. LaGrange
M. Wohl

Met Ed

J. Moran

NUS Corporation

D. Hill
E. Goodwin
E. Wiot
B. Reckman

GPU Service Corporation

C. Montgomery
R. McGoey
D. Reppert

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THREE MILE ISLAND FUEL POOL
MODIFICATIONS

AGENDA

1. OPENING REMARKS
 - a. NEED
 - b. SCHEDULE

2. DESCRIPTION OF MODIFICATION
 - a. RACKS
 - b. SEISMIC RESTRAINTS AND ANALYSIS
 - c. INSTALLATION

3. OPEN LICENSING ITEMS
 - a. CASK DROP
 - b. OTHERS (IF ANY)

4. DESCRIPTION OF SUBMITTAL
 - a. SUBMITTAL DOCUMENTS – SAR & EI
 - b. DEPTH OF COVERAGE

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THREE MILE ISLAND

SPENT FUEL STORAGE MODIFICATION SCHEDULE

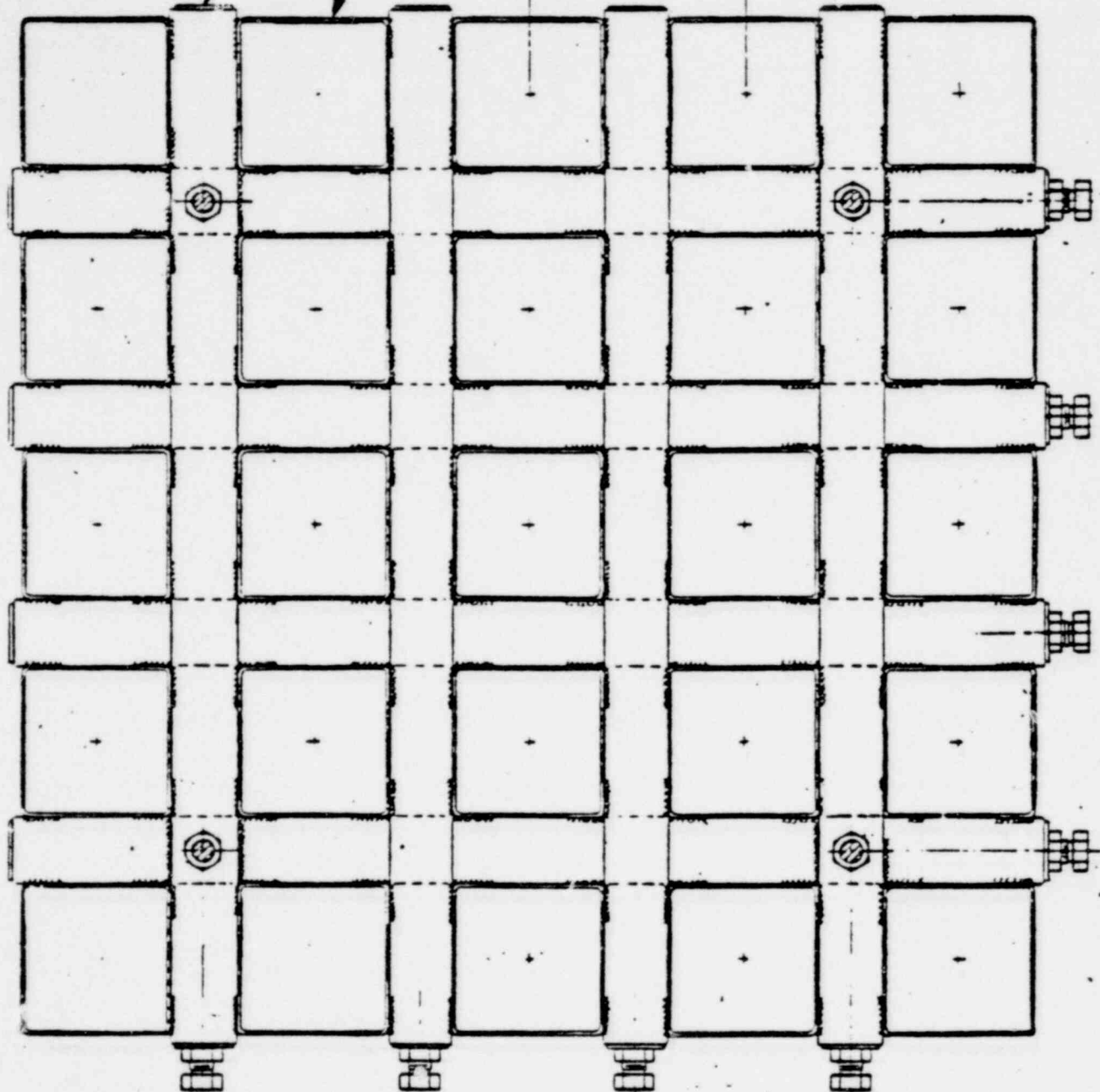
- MODIFICATION PLAN SUBMITTED TO NRC OCTOBER, 1976
- REVIEW MODIFICATION PLAN WITH NRC NOVEMBER 5, 1976
- FORMAL APPLICATION TO NRC FOR SPENT FUEL STORAGE MODIFICATION APPROVAL DECEMBER, 1976
- NRC APPROVAL RECEIVED MARCH, 1977
- FABRICATION AND DELIVERY OF NEW RACKS MARCH-JULY, 1977

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SUPPORT CHANNEL

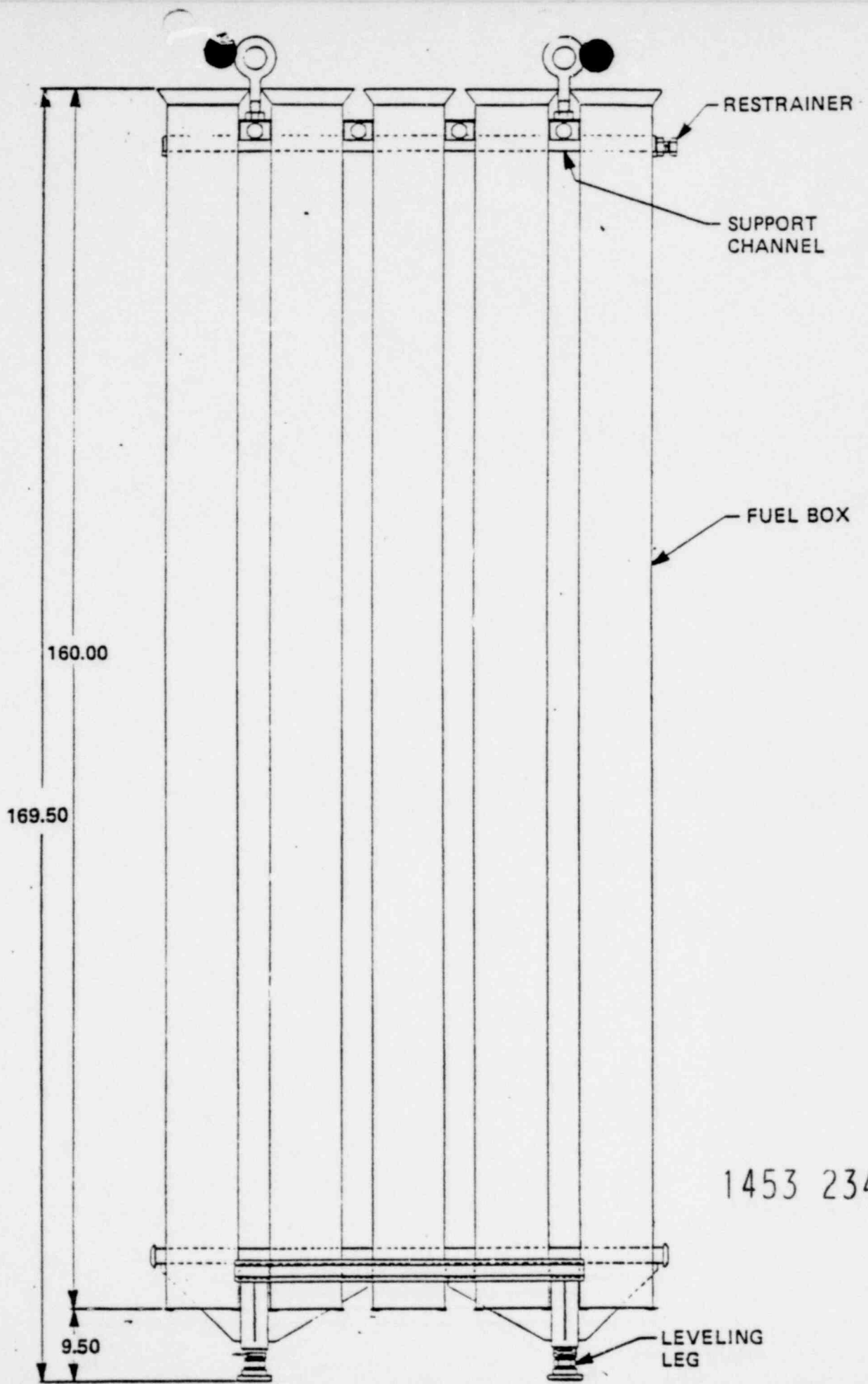
FUEL BOX (9.125 INSIDE SQUARE)

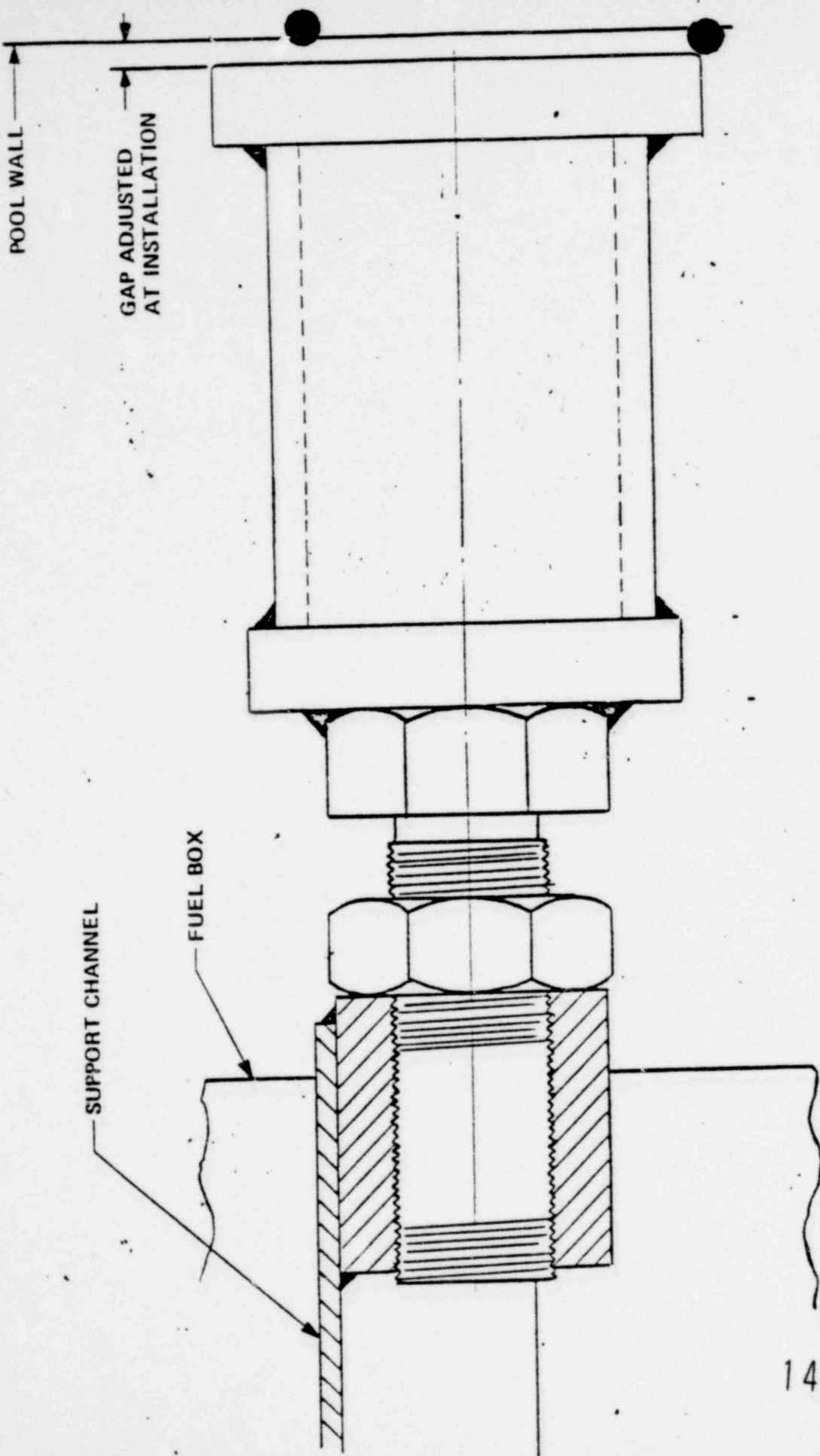
13.625 PITCH



RACK PLAN VIEW

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TYPICAL SEISMIC RESTRAINER

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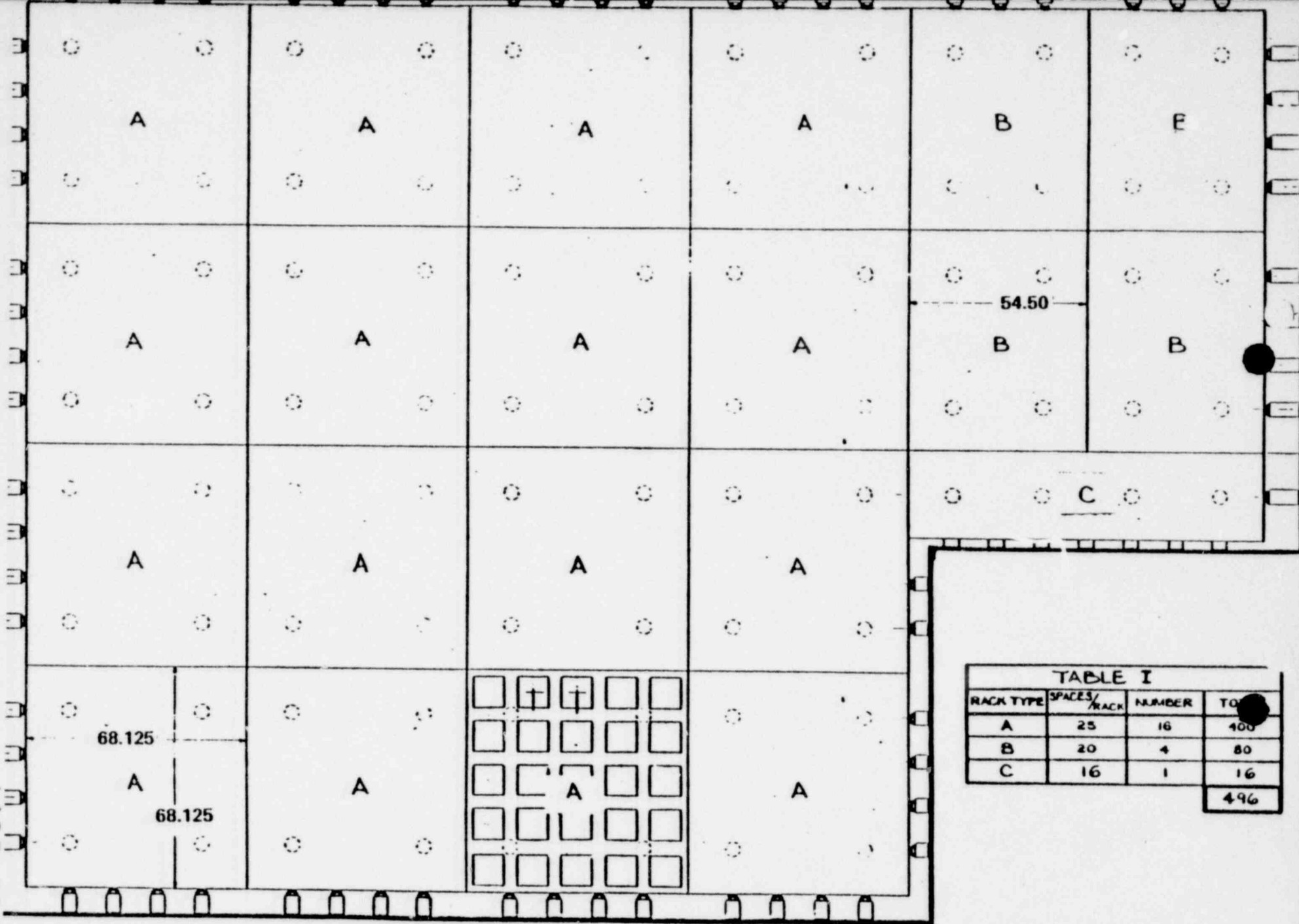


TABLE I

RACK TYPE	SPACES/RACK	NUMBER	TOTAL
A	25	16	400
B	20	4	80
C	16	1	16
			496

POOL ARRANGEMENT

FUEL RACK STRUCTURAL ANALYSIS

- CRITERIA FOR ANALYSIS
- LOADS
- LOAD COMBINATIONS AND ACCEPTANCE CRITERIA
- SEISMIC ANALYSIS METHODS

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CRITERIA FOR ANALYSIS

- USNRC STANDARD REVIEW PLAN SECTION 3.8.4
- AISC SPECIFICATION FOR THE DESIGN, FABRICATION,
AND ERECTION OF STEEL FOR BUILDINGS
- ASME BOILER AND PRESSURE VESSEL CODE, SECTION III

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LOADS

- NORMAL LOADS - DEAD LOADS
 - LIVE LOADS
 - THERMAL LOADS
- SEVERE ENVIRONMENTAL LOAD - OBE
- EXTREME ENVIRONMENTAL LOAD - SSE
- ABNORMAL LOADS - ACCIDENTAL DROP OF A FUEL ASSEMBLY
 - POSTULATED STUCK FUEL ASSEMBLY

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LOAD COMBINATIONS AND ACCEPTANCE CRITERIA

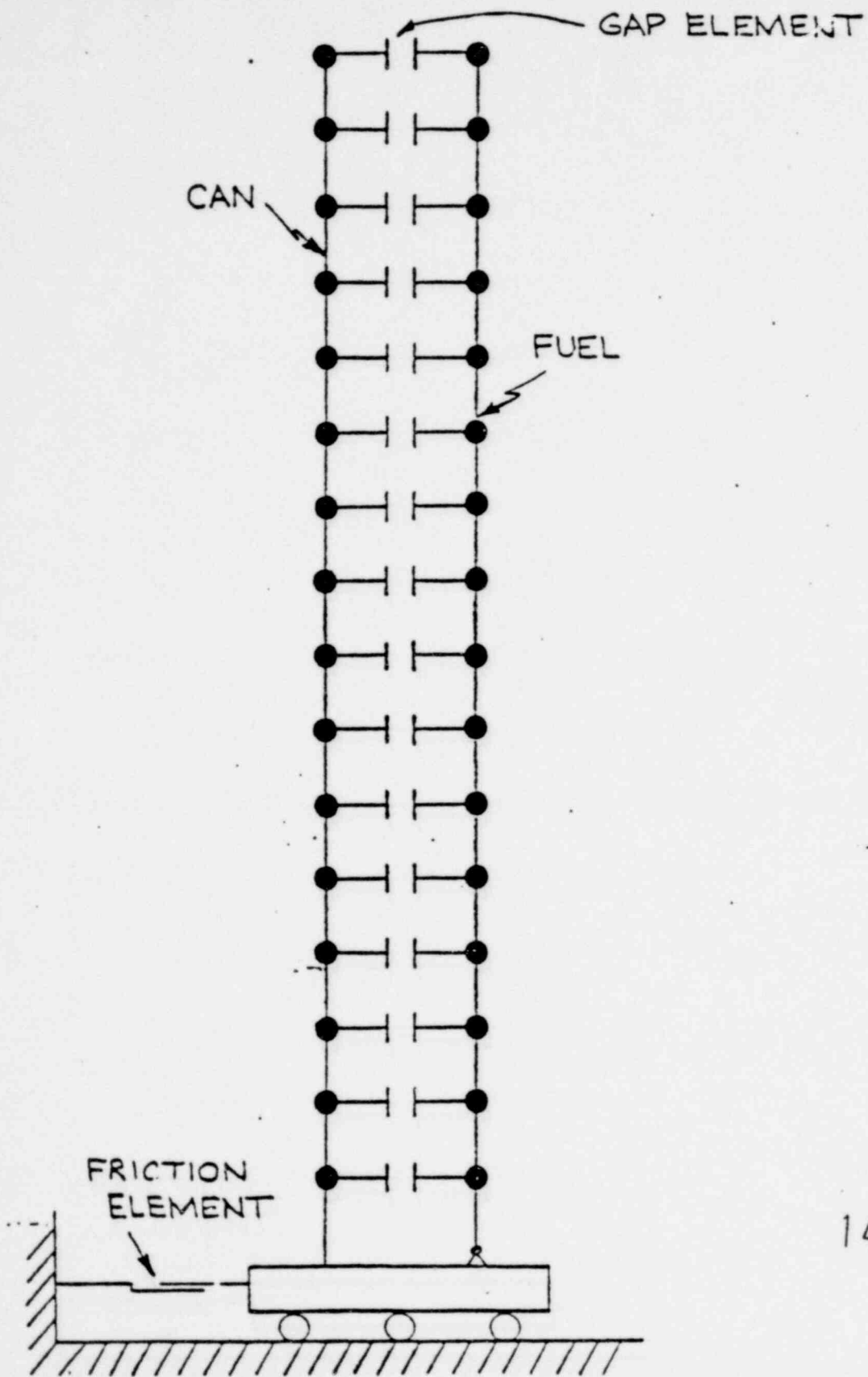
1. D + L ----- S
2. D + OBE ----- S
3. D + T + OBE ----- 1.5S
4. D + SSE + T ----- 1.6S
5. D + STUCK FUEL ASSEMBLY ----- 1.6S
6. D + FUEL ASSEMBLY DROP ----- NO LOSS OF FUNCTION

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SEISMIC ANALYSIS METHODS

- RESPONSE SPECTRUM MODAL DYNAMIC ANALYSIS
- RESPONSE SPECTRA
- FINITE ELEMENT MODEL
- COMPUTER PROGRAM
- COMBINATION OF MODES AND SPATIAL COMPONENTS
- STRESS CALCULATIONS
- SLOSHING
- IMPACT

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NONLINEAR FINITE ELEMENT MODEL

POOR ORIGINAL

TIME →

Figure 3

FUEL-CAN Intergrction

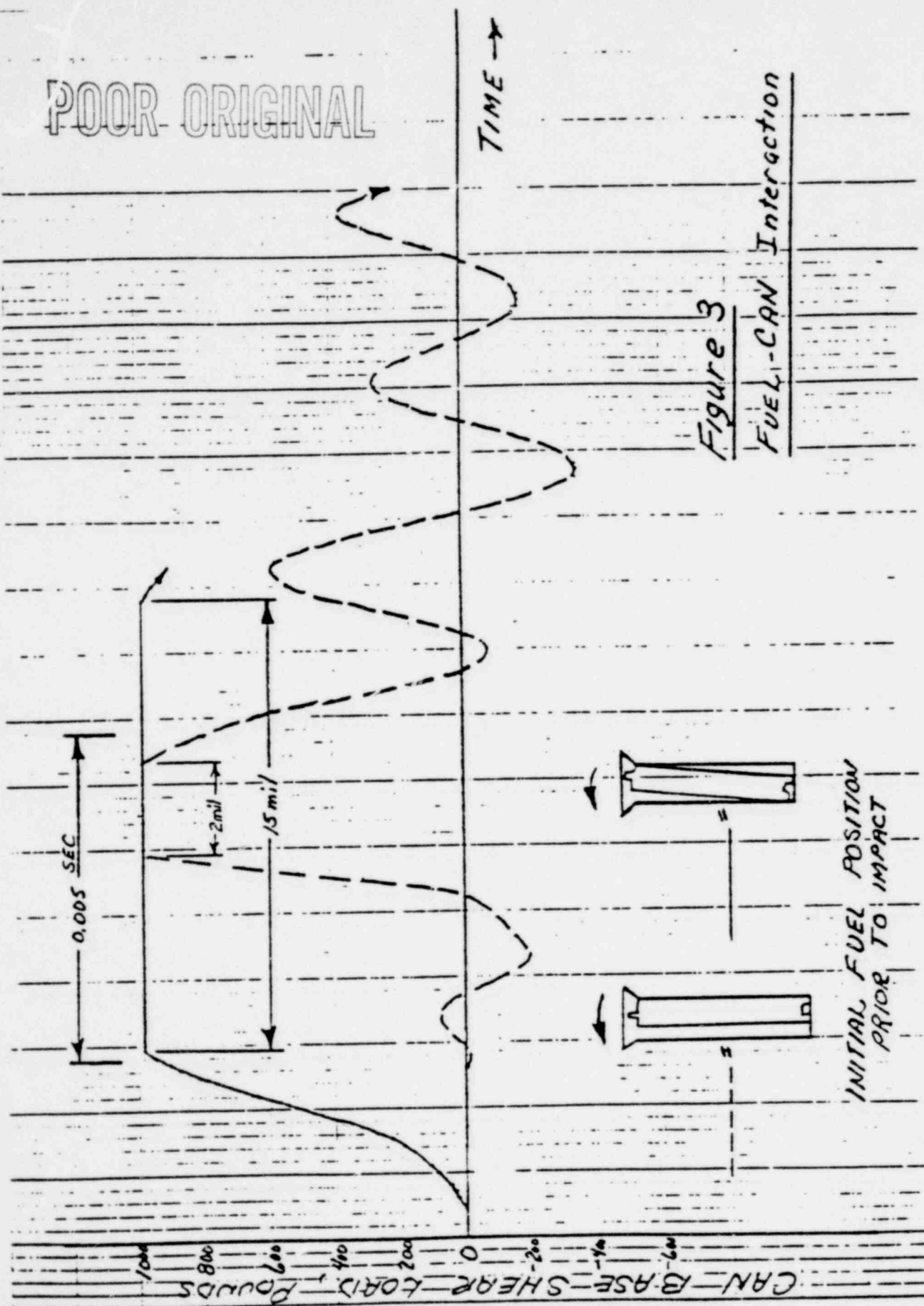
0.005 SEC

2 mil

15 mil

CAN-BASE-SHEAR-LOAD, POUNDS

INITIAL FUEL POSITION PRIOR TO IMPACT



LICENSING DOCUMENTS

1. LETTER OF INTENT
2. SAFETY EVALUATION
 - INTRODUCTION
 - GENERAL DESCRIPTION
 - MECHANICAL DESIGN
 - CRITICALITY CONSIDERATIONS
 - STRUCTURAL ANALYSIS
 - COOLING CONSIDERATIONS
 - RADIOLOGICAL CONSIDERATIONS
3. ENVIRONMENTAL IMPACT ASSESSMENT
 - INTRODUCTION
 - DESCRIPTION OF MODIFICATION
 - ENVIRONMENTAL EFFECTS – NORMAL OPERATION
 - ENVIRONMENTAL EFFECTS – ACCIDENTS
 - ALTERNATIVE ACTIONS
 - SUMMARY OF COST BENEFIT ANALYSES
4. FSAR SECTION PREPARATION

EVALUATION OF k_{∞}

k_{∞} , NOMINAL (68⁰F)

CALCULATIONAL UNCERTAINTIES

$\Delta k_{\infty} = .0086$

- o KENO vs CRITICALS,
- o 95% C. L. STATISTICS,

Δk_{∞}

Δk_{∞}

MOST REACTIVE WATER TEMP,

Δk_{∞}

TOLERANCES

- o CENTER-TO-CENTER SPACING,
- o CAN DIMENSIONS,
- o ECCENTRIC LOADING,
- o SS COMPOSITION,

Δk_{∞}

Δk_{∞}

Δk_{∞}

Δk_{∞}

WORST POSSIBLE k

ACCIDENTS

- o ASSEMBLY ON RACK TOP,
- o ASSEMBLY ON SIDE OF RACK,

k_{∞}

k_{∞}

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ENVIRONMENTAL and COST/BENEFIT ASSESSMENT

1. What are the specific needs that require increased storage capacity in the spent fuel pool (SFP)? Include in the response:
 - (a) status of contractual arrangements, if any, with fuel-storage or fuel-reprocessing facilities,
 - (b) proposed refueling schedule, including the expected number of fuel assemblies that will be transferred into the SFP at each refueling,
 - (c) number of spent fuel assemblies presently stored in the SFP,
 - (d) control rod assemblies or other components stored in the SFP, and
 - (e) the additional time period that spent fuel assemblies would be stored on-site as a result of the proposed expansion.
2. Discuss the total construction cost associated with the proposed modification, including engineering, capital costs (direct and indirect) and allowance for funds used during construction.
3. Discuss the alternatives to increasing the storage capacity of the SFP? The alternatives considered should include:
 - (a) shipment to a fuel reprocessing facility,
 - (b) shipment to another reactor site,
 - (c) shutting down the reactor.

The discussion of options (a) and (b) should include a cost comparison in terms of dollars per KgU stored or cost per assembly. The discussion of (c) should include the cost for providing replacement power either from within or outside the licensee's generating system.

4. Discuss whether the commitment of material resources (e.g., stainless steel, boral, B₄C, etc.) would tend to significantly foreclose the alternatives available with respect to any other licensing actions designed to ameliorate a possible shortage of spent fuel storage capacity. Describe the material resources that would be consumed by the proposed modification.
5. Discuss the additional heat load and the anticipated maximum temperature of water in the SFP which would result from the proposed expansion, the resulting increase in evaporation rates, the additional heat load on component and/or plant cooling water systems and whether there will be any significant increase in the amount of heat released to the environment.

RADIOLOGICAL EVALUATION

1. Please provide the following information related to the water purification system:
 - (a) What is the average volume of water in the SFP?
 - (b) What is the present equipment in the purification system, and what additional equipment will be added due to the expansion of the capacity of the SFP? State the size of the equipment and the criteria for the replacement of the demineralizer and filter.
 - (c) What is the purification flow rates for the present and for the new purification system? What is the frequency of operation of the present purification system equipment, and what frequency of operation is expected for the new equipment?
 - (d) What is the present annual quantity of solid radioactive wastes generated by the SFP purification system? What is the expected increase in solid wastes which will result from the expansion of the capacity of the SFP?
2. Please provide data regarding krypton-85 measured from the fuel building ventilation system by year for the last two years. If data are not available from the fuel building ventilation system, provide this data for the ventilation release which includes this system.
3. What is the design burnup of the fuel in MWD/MT?
4. Describe the ventilation filter assemblies for the fuel storage building and discuss the effect, if any, of the SFP modification on the efficiency of these assemblies. Provide an analysis of the ESF filter assemblies, for the fuel handling and spent fuel cask drop accidents, with respect to the positions in Section C of Regulatory Guide 1.52. References to FSAR Sections are acceptable.

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5. Provide a discussion of the increases in the doses to personnel from radionuclide concentrations in the SFP due to the expansion of the capacity of the SFP, including the following:
- (a) Provide a table showing the most recent gamma isotopic analysis of SFP water identifying the principal radionuclides and their respective concentrations.
 - (b) Please provide the models and calculations used to determine the external dose equivalent rate from these radionuclides. Consider the dose equivalent rate at some distance above the center and edge of the pool respectively. (Use relevant experience if necessary).
 - (c) Provide a table of recent analysis performed to determine the principal airborne radionuclides and their respective concentrations in the SFP area.
 - (d) Provide the model and calculations used to determine the increase in dose rate from the radionuclides identified in (c) above in the SFP area and at the site boundary.
 - (e) Provide an estimate of the increase in the annual man-rem burden from more frequent changing of the demineralizer resin and filter cartridges.
 - (f) Discuss the buildup of crud (e.g., ^{58}Co , ^{60}Co) along the sides of the pool and the removal methods that will be used to reduce radiation levels at the pool edge to as low as reasonably achievable.
 - (g) Specify the expected total man-rem to be received by personnel occupying the fuel pool area based on all operations in that area including the doses resulting from (e) and (f) above.

Include a discussion of your radiation protection program, as it affects (a) through (g) above, in your response.

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