PACIFIC GAS AND ELECTRIC COMPANY

77 BEALE STREET • SAN FRANCISCO, CALIFORNIA [illegible] • (415) [illegible] • [illegible]

JAMES D. SHIFFER
VICE PRESIDENT
NUCLEAR POWER GENERATION

September 26, 1986

PGandE Letter No.: DCL-86-285

Mr. Steven A. Varga, Director
PWR Project Directorate No. 3
Division of PWR Licensing-A
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Spent Fuel Storage Racks

Dear Mr. Varga:

On September 25, 1986, the NRC Staff requested further information regarding welds on the original racks as reinstalled in the Diablo Canyon Unit 1 spent fuel pool. The information requested has been incorporated into the enclosure of PGandE letter DCL-86-273, as identified by revision bars in the margin and noted as Amendment 2.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. D. Shiffer

Enclosure

cc: L. J. Chandler
J. B. Martin
M. M. Mendonca
B. Norton
H. E. Schierling
CPUC
Diablo Distribution

1096S/0047K/TWL/1998

8610010206
4pp.

AMENDED ENCLOSURE

EVALUATION OF

REINSTALLATION OF

ORIGINAL SPENT FUEL RACKS

DIABLO CANYON POWER PLANT UNIT 1

September 17, 1986

PGandE Letter No. DCL-86-273

AMENDED September 23, 1986

PGandE Letter No: DCL-86-279

AMENDMENT 2

September 26, 1986 2

1096S/0047K

ENCLOSURE

1.0 INTRODUCTION

PGandE has revised certain structural details of the low density spent fuel storage racks (original racks) described in Chapter 9 of the FSAR Update. PGandE reviewed this revision in accordance with 10 CFR 50.59, and determined that the change does not involve an unreviewed safety question. This report provides a complete and detailed description of the revision and the analysis performed, and provides additional information regarding the previously performed safety evaluation of the reinstallation of the original racks.

2.0 BACKGROUND

The original racks were designed by PGandE using a standard Westinghouse design during the period of 1970-1974. The original racks were fabricated by Lamco Industries Inc., and installed by PGandE in 1974. The NRC's review and acceptance of the original racks are documented in the Safety Evaluation Report, October 1974 (Ref. 1). These original racks were verified to meet licensing criteria for the Hosgri earthquake in 1978. In October 1985, PGandE requested a License Amendment (DCL-85-333) to allow use of high density spent fuel racks (high density racks) for Diablo Canyon Units 1 and 2 (Ref. 2). The NRC issued license amendments approving PGandE's request on May 30, 1986 (Ref. 3).

Following receipt of approval from the NRC and to support the scheduled refueling outage of Diablo Canyon Unit 1, PGandE immediately proceeded to install the high density racks. As part of this effort, the original racks were removed from the spent fuel pool and stored at the plant site with a protective covering. Some of the bolts used to anchor the original racks were ground off flush with the fuel pool floor to permit the installation of the high density racks. High density rack installation was completed in August 1986.

On July 2, 1986, the U.S. Court of Appeals for the Ninth Circuit, issued a stay pending review which stayed the NRC license amendments permitting the use of the high-density racks. Since a possibility of a delayed decision from the Court existed, PGandE prepared for reinstallation of the original racks. Reinstallation of the original racks began on September 5, 1986. On September 11, 1986 the Court issued an opinion setting aside the NRC's issuance of license amendments authorizing PGandE to rerack the Units 1 and 2 spent fuel pools pending completion of licensing hearings. As a result of this decision, PGandE proceeded to complete the reinstallation of the original racks.

Rack 1 will be changed to have an anchorage configuration like racks 2 through 8. This change will enhance rack removal if the racks are required to be removed with water in the pool.

This report also contains answers to questions posed by the NRC and discussed in the meeting of September 10, 1986 between PGandE and the NRC Staff. A list of the questions, with reference to locations in this report where the responses appear, is contained in Attachment 1.

3.0 SYSTEM DESCRIPTION

The original fuel storage system consisted of eight racks located in the spent fuel pool as shown in Figure 1. These racks are framed structures which hold fuel assemblies in a vertical array, each containing either 30 or 35 fuel storage cells. The smaller rack module consists of a 5 by 6 array and the larger a 5 by 7 array. The fuel cells in each rack are formed by four corner angles tied together by lacing bars. The racks are constructed of ASTM A240 Type 304 stainless steel. The original design for the attachment of these racks to the floor utilized bolts which were fillet welded to embedded plates (embeds) in the floor of the spent fuel pool (Figure 18). The details of the racks are shown in Figure 2 through 6.

Minor changes have been made to the original racks to correct a lacing bar damaged in rack removal, and also to provide a rack design which meets the original design acceptance criteria when using a more conservative model to determine rack stiffness than was used in the original analysis. These changes are:

A. The racks were attached to the plate embedded in the bottom of the spent fuel pool by bolts which were fillet welded to the embedded plate. All forces were transferred to the embed through these fillet welds (Figure 18). Refer to Figures 8 and 9 for details of the revised welded connections.

B. In lieu of adding weld metal to increase the strength of the connection of diagonal bracing, a 2" x 1-1/4" x 16" bar was welded to the bracing. Refer to Figure 10 for the details of this bar and its attachment to the bracing.

C. Weld material was added at one gusset plate location on Rack 8 to restore the rack to the original design. Refer to Figure 11 for details.

D. One cell lacing bar was added on Rack No. 1 to repair damage which occurred during removal of the rack. Refer to Figure 12 for details.

The lighting and tool bracket installations do not require relocation due to reinstallation of the original racks.

In summary, the rack and cell configuration remain unchanged. Detailed discussion of the changes identified above are provided in the following sections.

4.0 DESIGN AND ANALYSIS

4.1 Design Calculations

The design calculations for the original racks are based on criteria provided in Section 9.1 of the FSAR Update (Ref. 4). These criteria are as follows:

> "The spent fuel storage racks are designed in accordance with Safety Guide 13 and the American Institute of Steel Construction Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings. The ASME Boiler and Pressure Vessel Code is used to determine allowable limits for materials not addressed by the AISC Specification."

FSAR Sections 3.7, "Seismic Design," and 3.8, "Design of Structures," are applicable to the design of the original racks.

In addition, the racks are designed to withstand a vertical (uplift) force of 4,000 pounds in the unlikely event that an assembly would bind in the rack while being lifted by the spent fuel bridge crane.

The original calculations for seismic qualification utilized a model in which the individual cells contributed to the composite rack stiffness used to determine inertia loads. This modeling technique resulted in a stiff rack structure, with the fundamental frequency close to the rigid range.

The original rack seismic displacements were significantly less than the clearances both between the racks and the racks and fuel pool structure. Therefore, no interaction will occur.

Based on a review of the calculations for the original racks, PGandE concluded that the model used in the analysis to determine stiffness might not yield conservative inertia loads. Therefore, a new calculation was performed to reflect a range of stiffness properties, giving more conservative inertia loads.

4.2 Analysis Methodology

The original racks were reanalyzed using the same criteria and methodology as was used in the original analysis. However, a more conservative model for determination of stiffness was used.

4.2.1 Global Load Path

Lateral seismic forces on the original racks result mainly from the fuel assembly, structure, and effective water masses. Since the fuel assemblies are contained by the individual cells, a distributed load is imposed along the length of each cell structure. These loads are transferred to the top and bottom grid diaphragms which support each of the cells (see Figures 5 and 6).

At the top of the rack, forces are transferred to the lateral bracing system, which provides a load path to the base anchorage. For conservatism, only bracing in tension is considered to be effective in resisting lateral loads.

Forces imposed on the bottom grid diaphragm are distributed directly to the anchorage. The load paths are described in Figure 13.

Anchor bolt bearing plates (anchor brackets), located at the corners of each rack, are welded to embedded plates to anchor the racks to the spent fuel pool floor. Changes to the anchor brackets were made to facilitate the welded design (see Figure 9). The embedded plates are attached to the spent fuel pool reinforced concrete using welded, headed studs.

The revised anchorage from a bolted to welded configuration does not change the global load path for the racks. However, the welded anchorage does change the local load path to the embedded plate. The effects of these local changes have been evaluated and found to be acceptable. This load path is identical to that used in the original calculations with the exception of the local load path to the embedded plate.

4.3 Mathematical Modeling

For seismic inertia load evaluation of the changed racks, two basic mathematical models were developed to analyze the structural system of the racks:

- Global rack model (Refer to Figure 17).
- Individual cell model (Refer to Figure 16).

The global rack model is a three dimensional, beam and truss model representing the lateral force-resisting system of a fuel rack. In contrast to the original rack stiffness model, the individual cells were considered not to contribute to the stiffness of the rack lateral force-resisting system.

The individual cell model is a three-dimensional, finite element, beam-type model in which the corner members and lacing bars of a typical cell are modeled with support at the top and bottom of the cell.

This modeling yielded system frequencies of 6 to 10 Hertz. These frequencies result in conservative spectral accelerations since they are near the peak of the applicable seismic spectra. For additional conservatism, the peak spectral acceleration was used in the new analysis, which resulted in greater loads than in the original analysis.

For member evaluation, equivalent static analysis was performed using the mathematical models described above. Equivalent static analysis methodology was used in the original analysis.

4.4 Structural Design Review

Members, connections, anchorages, and embedments were evaluated using the results of the equivalent static analyses and the acceptance criteria described in Section 4.1.

The original racks had been previously accepted with some local weld size deviations from design requirements. The deviations were found acceptable based on the relatively low loads determined by the original analysis. Prior to reinstallation of the original racks, inspections of the racks were performed by PGandE's engineering and quality control personnel to establish the as-built configuration. The scope of inspection consisted of visual inspection of all racks and structural welds, and included documented measurements of all bracing connections. The as-built configuration was documented and served as the basis for review and evaluation of loads associated with the more conservative modeling technique. The evaluations for increased loads resulted in minor changes which are described as follows: 2

A. The racks were anchored using welded connections instead of bolted connections because of the increased seismic loading resulting from using the more conservative model used to determine rack stiffness (described in Section 4.3). To facilitate installation of the welded connection, all remaining bolts were ground off, and the embed cavity around each bolt was filled with weld metal and ground flush to achieve an uniform bearing surface (Refer to Figure 9). The load paths due to the revised configuration of the anchorage were evaluated and the results of this evaluation are as follows:

- The welded connection does not change the global load path, since the behavior of the rack module as a truss remains unchanged.

- The welded anchorage changes the local load path on the embeds. The effects of the revised load path were evaluated for 1) the anchor brackets at the corner of each rack, 2) the embedded plates at the pool floor, and 3) the headed studs which anchor the plate to the concrete floor.

In all cases, the anchorage components meet the acceptance criteria.

B. The intersecting connection of the diagonal cross-bracing was reinforced by adding a welded connecting bar (Refer to Figure 10). The change resulted from an as-built review which found that a portion of the weld on the diagonal bracing intersection required by design was not adequate. A calculation was performed to demonstrate that the as-installed welds met acceptance criteria based on loads determined by the original calculation but not the new more conservative calculation. This bar was installed to provide the strength equivalent to that provided in the original design. This change was chosen for ease of construction and to minimize potential for distortion.

C. An additional weld was specified at one gusset plate on Rack No. 8 (Refer to Figure 11) for reasons similar to the discussion in Paragraph B. The as-built review found that a portion of the weld required by design had not been provided. A calculation was performed to demonstrate that the as-installed weld met acceptance criteria based on loads generated by the original calculation but not the new more conservative calculation.

D. One cell lacing bar was added to Rack No. 1 to repair damage to a lacing bar which was damaged during removal of the racks (Refer to Figure 12). The effects of the revised location of the lacing bar on the cell (local buckling) have been evaluated and found to be acceptable as indicated in Table 1.

Table 1 provides a design summary of changed original racks including information on stresses and interaction stress ratios for key rack elements. This table shows that the reinstalled racks meet the acceptance criteria described in Section 4.1.

The changed rack seismic displacements were significantly less than the clearances between racks and the structure. Therefore, no interaction will occur.

5.0 REINSTALLATION AND INSPECTION

Reinstallation and inspection of the original racks were performed as required by approved procedures, appropriate codes, Westinghouse fuel interface specification requirements, and the PGandE Quality Assurance Manual for Nuclear Power Plants. The quality assurance program was reviewed and accepted by the NRC. In a letter dated August 21, 1985, the NRC found that the program continues to satisfy the requirements of 10 CFR 50, Appendix B.

The materials used for rack reinstallation are identical to those used in the original fabrication and installation. The bar stock is A304 stainless steel and the weld filler metal is E308-16 (stainless steel). These materials are used extensively in spent fuel rack installations and they have been demonstrated to be compatible with spent fuel pool environments.

To ensure rack cleanliness prior to reinstallation, iron-free sand blasting and steam cleaning were performed. Cleanliness was verified by swab testing for chlorides and fluorides. To preclude iron contamination during reinstallation, only tools designated for use with stainless steel were used. Following reinstallation, the original racks were washed down with demineralized water and again swab tested to verify compliance to ANSI N45.2.1 (FSAR Section 17.2, Table 17.2), level C, and surface contamination acceptance criteria of less than 150 ug/dm^2 Cl and 15 ug/dm^2 F.

Welding and inspection were performed in accordance with the 1983 ASME Boiler and Pressure Vessel Code, Section III and Subsection NF, rather than the 1968 version of ASME Code, Section IX and the inspection requirements contained in PGandE Fabrication and Installation Specification 8795. This selection was made to allow implementation of current welding and inspection requirements and controls as allowed by ASME Code, Section III. Use of the 1983 code provides clarification and improved inspection acceptance criteria.

Section III invokes Section IX for weld procedure and welder qualification. The 1983 version of Section IX is more stringent than the 1968 version. The 1983 version requires the weld procedure to address essential, non-essential, and where applicable supplementary essential variables, whereas the 1968 version required only essential variables to be addressed. The visual inspection requirements of ASME Section III, Subsection NF, Class 3 component supports are the same as the requirements of the specification for rack fabrication and installation except for undercut requirements. The code allows 1/32" undercut and the original specification did not allow undercut. The allowable 1/32" undercut is compatible with the design and analysis. Rejection of minor undercut can lead to unnecessary repairs and excessive heat input. Therefore, the current welding and inspection requirements are equal to and in most cases they are an improvement from previous requirements.

To assure access to welds and to minimize distortion from the welding process, the rack installation and welding sequences were established and controlled by procedure . Mockups were used to establish the rack installation sequence, and the welding sequence was established after consultation with welding engineers. Weld interpass temperatures were controlled to minimize heat input. A straight edge was used on the embed plates before and after welding the rack anchor brackets to the embed to verify that distortion had not occurred. Welding during installation has not caused any discernible distortion which assures that no additional loads have been applied to the liner and liner integrity is assured.

All fuel cells were tested using a dummy fuel assembly to assure that drag on insertion and removal did not exceed the 50 lb. limit established by the fuel manufacturer, Westinghouse (Ref. 5).

All welding and testing activities were inspected and acceptance was documented by an engineer or a quality control inspector as required by approved procedures. The use of the methods described above ensured the quality of rack fabrication and installation.

PGandE, in conjunction with the NRC, has reviewed the dimensions of approximately 170 welds on the spent fuel racks. The welds reviewed were randomly selected by the NRC and evaluated to the as-built documentation. Only three minor differences were identified. PGandE has completed an assessment of the as-built documentation of the welds using statistical techniques and concluded, with a 95% confidence level, that the as-built program for documentation of welds is adequate for all spent fuel pool welds. Additionally, PGandE evaluated the three welds where minor differences were identified. These welds are:

1. The diagonal to gusset plate weld identified as "X" in Figure 10 for Rack No. 2. Since the calculations for the connection conservatively neglected the strength contribution of this weld, the connection capacity remains unchanged. 2

2. The midheight gusset plate weld to corner cell angle for Rack No. 5. This weld is identified as "X" in Figure 3. This connection weld continues to have very large margin.

3. The welds connecting the lower diagonal brace to the gusset plate at the bottom left corner of Rack No. 6. This weld is identified as "X" in Figure 11. Since a more limiting dimension for this weld was used for analysis purposes, this connection continues to have ample margin.

The capacities of the connections and the corresponding loads are included in Table 1 (Item I.8).

6.0 FSAR CHANGES

The changes to the FSAR resulting from the revised calculations and as-builts are minor. Figure 9.1-2 of the FSAR will be changed by revising the note to indicate attachment by welding instead of bolting. In the next FSAR Update in accordance with 10 CFR 50.71(e), the note making reference to a one-inch diameter bolt will be revised to reflect the welded anchorage. Figures 14 and 15 show the proposed change.

7.0 SAFETY EVALUATION

The changes described above do not involve any revisions to the existing Technical Specifications of the Unit 1 operating license, and do not involve any unreviewed safety question as defined in 10 CFR 50.59. Therefore, no prior NRC approval was needed to implement these changes. In particular, PGandE performed a safety evaluation of the rack reinstallation design change focusing on the three standards set forth in 10 CFR 50.59 as quoted below:

> "A proposed change, test, or experiment shall be deemed to involve an unreviewed safety question (i) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (ii) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (iii) if the margin of safety as defined in the basis for any technical specification is reduced."

The following evaluation is provided for the standards related to an unreviewed safety question.

A. Does the change increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the FSAR?

   The reinstalled rack and cell configuration is the same as that in the original FSAR analyses. The minor changes to the structural details described do not increase the probability or consequences of accidents previously evaluated in the FSAR for the following reasons:

1. The strengthened rack bracing cross-connections and gusset weld and lacing bar repair ensure that the racks meet the criteria for the DE, DDE, and Hosgri seismic loadings.

2. Similarly, the change in method of anchorage to the floor (welding vs. bolting) has been evaluated using original acceptance criteria, and the change is shown to meet the criteria for the DE, DDE, and Hosgri seismic loadings, and to maintain the integrity of the floor embedments and pool liner under all loading conditions.

3. FSAR accident analyses have been reviewed with regard to the changes in the rack bracing and anchorage system. The analyses are not affected by the changes because the FSAR accident analyses are not based on any specific anchorage or bracing methodology.

B. Does the change create a possibility for an accident or malfunction of a different type than any evaluated previously in the FSAR?

Since these analyses show the racks meet FSAR criteria, these changes do not create accidents or malfunctions different from those previously evaluated in the FSAR. The addition of the bar and welds to selected portions of the rack bracing, and the repair of the damaged lacing bar on Rack 1 ensure that the reinstalled racks meet original acceptance criteria. Utilizing original analysis criteria and methodology, the racks have been shown to meet the FSAR design criteria for the original racks, including DE, DDE, and Hosgri seismic loading conditions.

Similarly, the change in rack anchorage to the floor has been analyzed. These analyses show that the welded attachment meets the criteria for the DE, DDE, and Hosgri loadings. The welded attachment was analyzed for its effect on the embedments in the floor and the liner plate. These analyses show that the use of welded attachments would not degrade the integrity of the liner or embedments in the floor.

The welded attachments have been shown to provide anchorage properties equivalent to or better than the original bolting arrangement which depended upon a fillet weld to the embed for load transfer; therefore they would create no accidents or malfunctions different from those previously evaluated in the FSAR.

C. Does the change reduce the margin of safety as defined in the basis for any technical specification?

The reinstalled spent fuel racks are the same racks that were originally installed in the spent fuel pool structure, with some minor changes described in Section 3.0 of this report. The reinstallation of the racks with the minor changes described above in Section 3.0, including the anchorage from a bolted to a welded configuration, assure that the racks are qualified to the criteria for the DE, DDE, and Hosgri seismic loading conditions. Therefore, the change does not reduce the margin of safety as defined in the basis for any technical specification.

8.0 REFERENCES

1. "Safety Evaluation by the Directorate of Licensing, USAEC, Diablo Canyon Nuclear Power Station, Units 1 and 2", October 16, 1974.

2. PGandE letter DCL-85-333 from Mr. D. A. Brand to Mr. H. R. Denton October 30, 1985.

3. NRC letter from Mr. S. A. Varga to Mr. J. D. Shiffer dated May 30, 1986.

4. "Final Safety Analysis Report Update, Diablo Canyon Power Plant Units 1 and 2," Pacific Gas and Electric Company (1985).

5. Westinghouse Fuel Assembly, Storage and Refueling Equipment Design Interface Specification No. F-8, Rev. 8.

TABLE 1

DESIGN SUMMARY OF CHANGED RACKS[1]

Description	Calculated Stresses or Interaction Stress Ratios	FSAR Criteria Allowables	Are Criteria Met
I. Rack Components			
1. Bracing			
1.1 Diagonal	16 ksi	28.3 ksi	Yes
1.2 Horizontal	0.88	1.0	Yes
2. Cell System			
2.1 Lacing	23.4 ksi	28.3 ksi	Yes
2.2 Corner angle	0.9	1.0	Yes
2.3 Interior angle	23.3 ksi	28.3 ksi	Yes
3. Diaphragm	0.9	1.0	Yes
4. Anchor Bracket			
4.1 Bending	22 ksi	28.3 ksi	Yes
4.2 Shear	9 ksi	16.3 ksi	Yes
5. Weld Stresses			
5.1 Anchor Brackets			
a. To embed	31.6 ksi	40.8 ksi	Yes
b. To rack	35.1 ksi	40.8 ksi	Yes
5.2 Intersecting diagonal	20.9 ksi	40.8 ksi	Yes

DESIGN SUMMARY OF CHANGED RACKS

(Continued)

Description	Calculated Stresses or Interaction Stress Ratios	FSAR Criteria Allowables	Are Criteria Met
5.3 Modified diagonal connection at base of Rack 8	14.8 ksi	40.8 ksi	Yes
5.4 Repaired lacing in Rack 1	16.8 ksi	40.8 ksi	Yes
6. Strain in Liner at Embeds			
6.1 Membrane	.00021	.003	Yes
6.2 Membrane and bending	.00075	.010	Yes
7. Embeds			
7.1 Single (8"x8")			
a. Plate bending	0.85	1.0	Yes
b. Stud	0.61	1.0	Yes
c. Concrete bearing	3.5 ksi	9.6 ksi	Yes
7.2 Single (8"x13-1/2")			
a. Plate bending	0.85	1.0	Yes
b. Stud	0.85	1.0	Yes
c. Concrete bearing	3.5 ksi	9.6 ksi	Yes

	Connection Load	Connection Capacity	Are Criteria Met
8. As-Built Welds			
a. Rack 2 2/	37 kips	64 kips	Yes
b. Rack 5	3.2 kips	45 kips	Yes
c. Rack 6 3/	37 kips	78 kips	Yes

2

DESIGN SUMMARY OF CHANGED RACKS

(Continued)

Description	Calculated Stresses or Interaction Stress Ratios	Criteria Allowables	Are Criteria Met	Remarks
II. Global Displacements - Relative to Pool Base				
1. Top Corner	0.38 inch	2.0 inch	Yes	
2. Top Corner	0.50 inch	4.1 inch	Yes	

Description	Comments	FSAR Criteria Allowables	Are Criteria Met
III. Analysis			
1. Global Rack Model	216 nodes, 6 degrees of freedom each (1296) 411 beam elements 32 truss elements 17 to 19 boundary elements	None	N/A
2. Individual Cell Model	37 nodes, 6 degrees of freedom except at the boundary (210) 69 beam elements	None	N/A
3. Diaphragm			
3.1 Top	140 nodes, 5 degrees of freedom each (700) 256 beam elements 4 truss elements 4 boundary elements	None	N/A

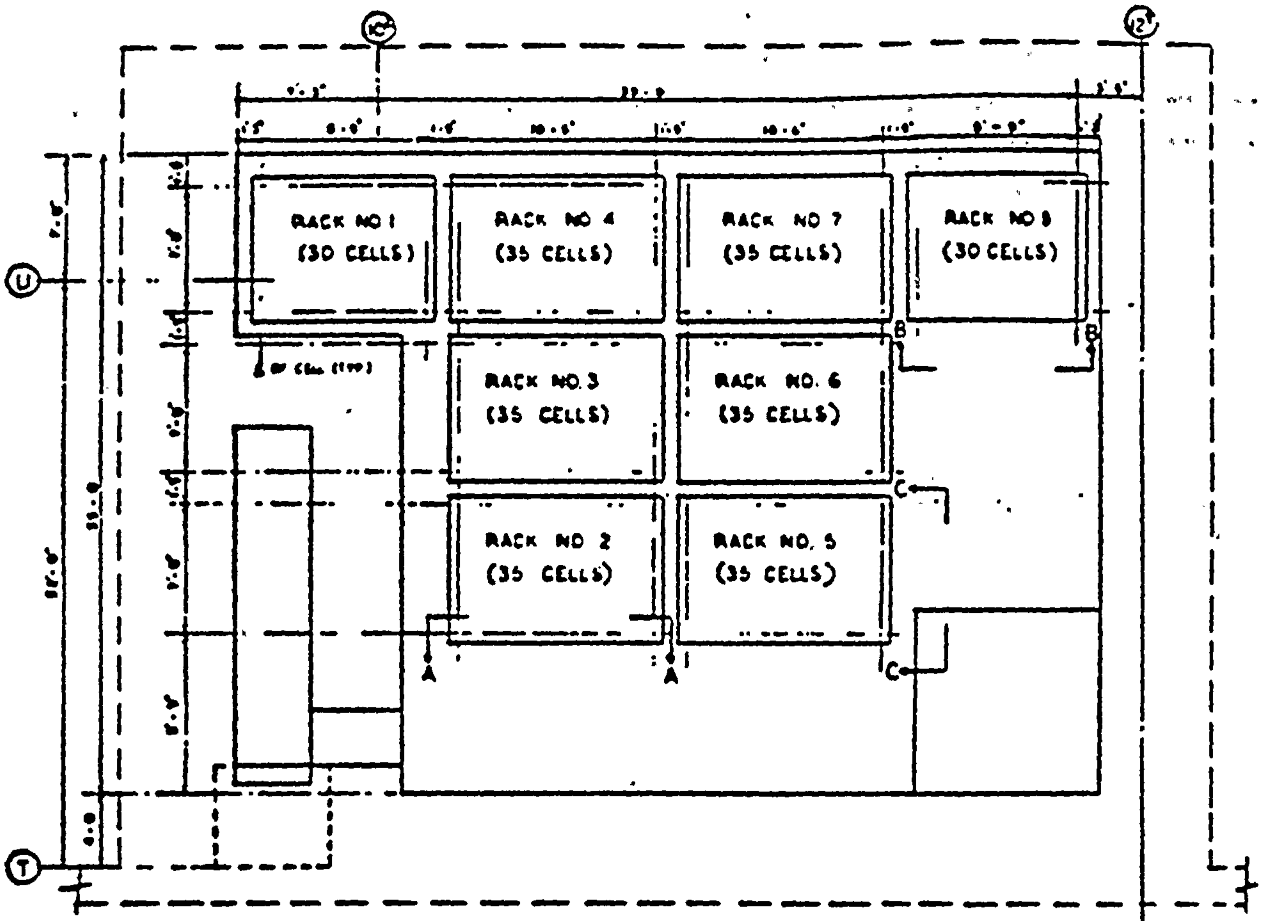
DESIGN SUMMARY OF CHANGED RACKS

(Continued)

Description	Calculated Stresses or Interaction Stress Ratios	Criteria Allowables	Are Criteria Met
III. Analysis			
3. Diaphragm (Continued)			
3.2 Bottom	140 nodes, 5 degrees of freedom each (700) 256 beam elements 4 truss elements 8 boundary elements	None	N/A
4. Stiffness			
4.1 Diaphragm (in plane bending)	530 kips/inch (EW) 700 kips/inch (NS)	None	N/A
4.2 Fuel Cell Stiffness	13 kips/inch	None	N/A
4.3 Rotational Stiffness of Anchor Bracket	54,000 kip-inch/ radian (Accounting for the flexibility of the embed)	None	N/A

NOTES:

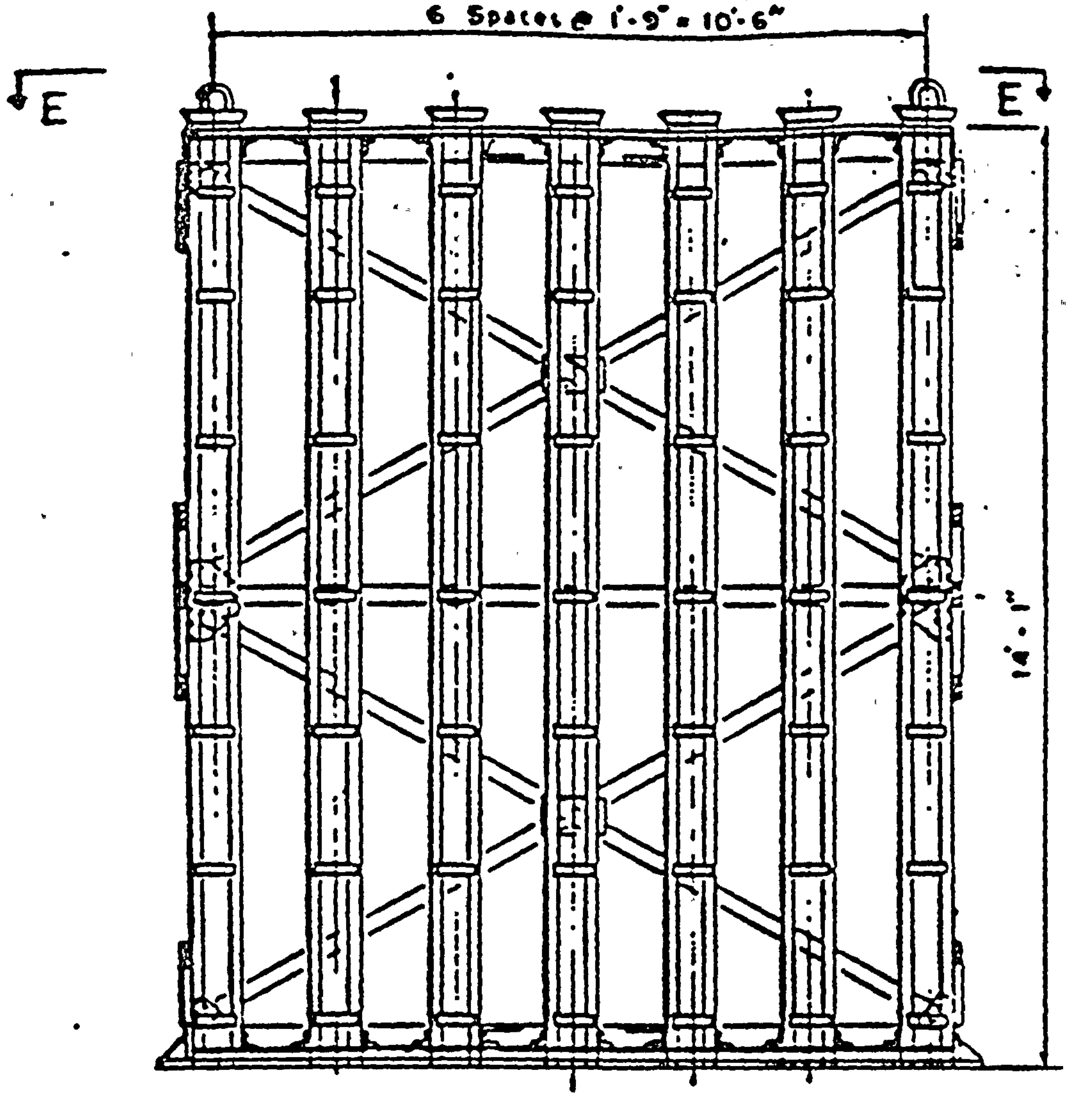
1. The stresses/ratios are based on the Hosgri earthquake; the DE and DDE do not govern the design.
2. Strength contribution of existing welds was neglected; qualification of this connection was based on welds for an added bar.
3. Weld is one of several welds contributing to connection capacity of 78 kips. 2



PLAN

FIGURE 1

GENERAL ARRANGEMENT



SECTION A - A

FIGURE 2

ELEVATION OF RACK

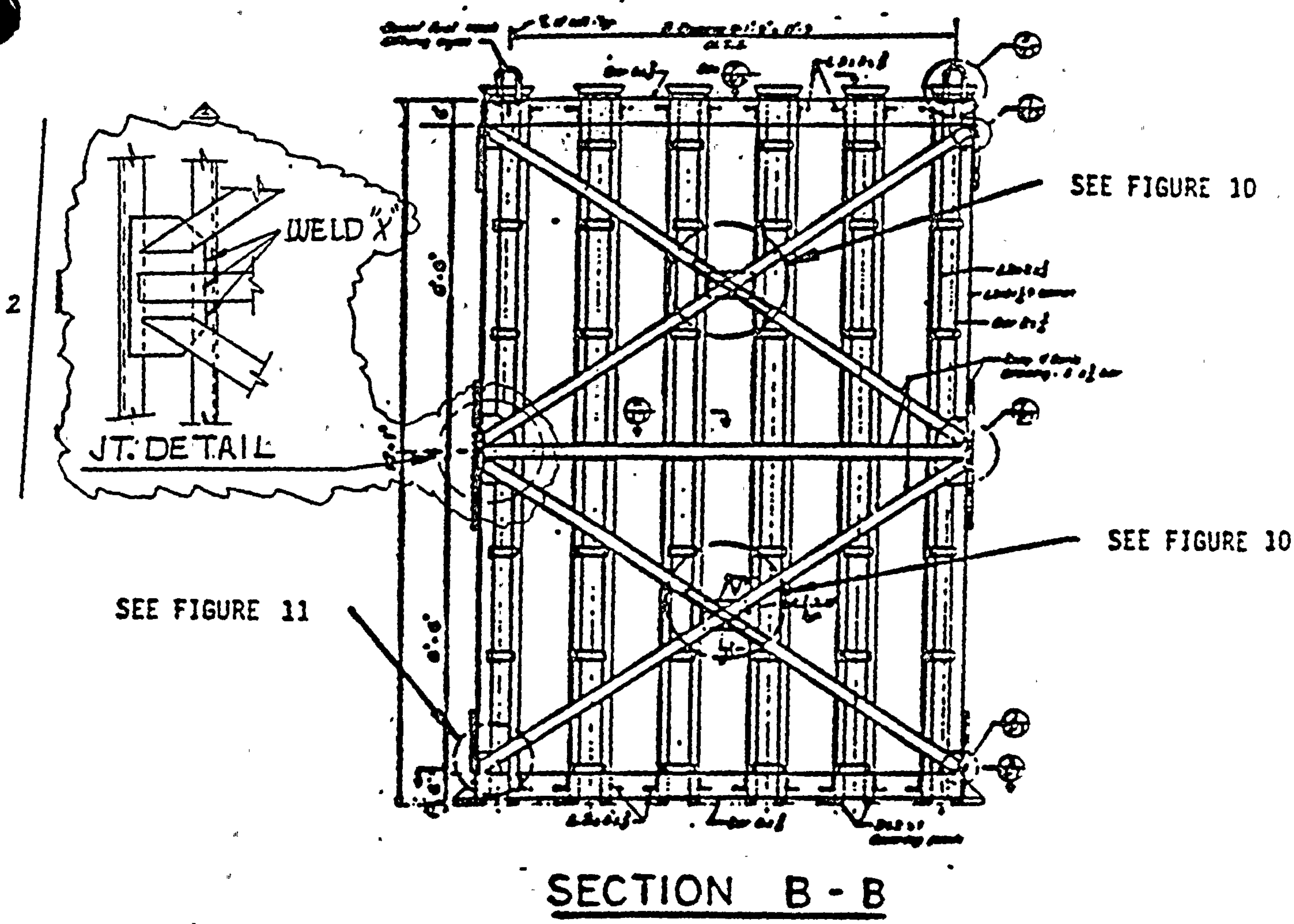
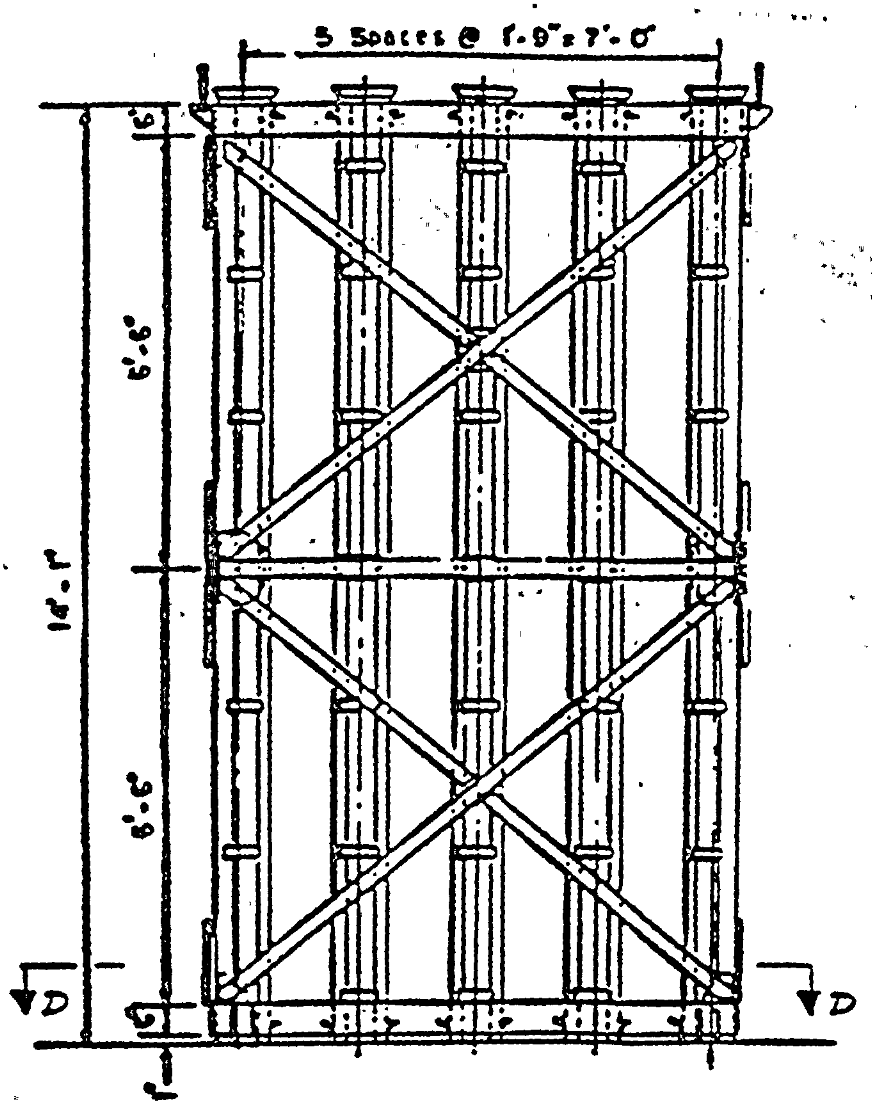


FIGURE 3

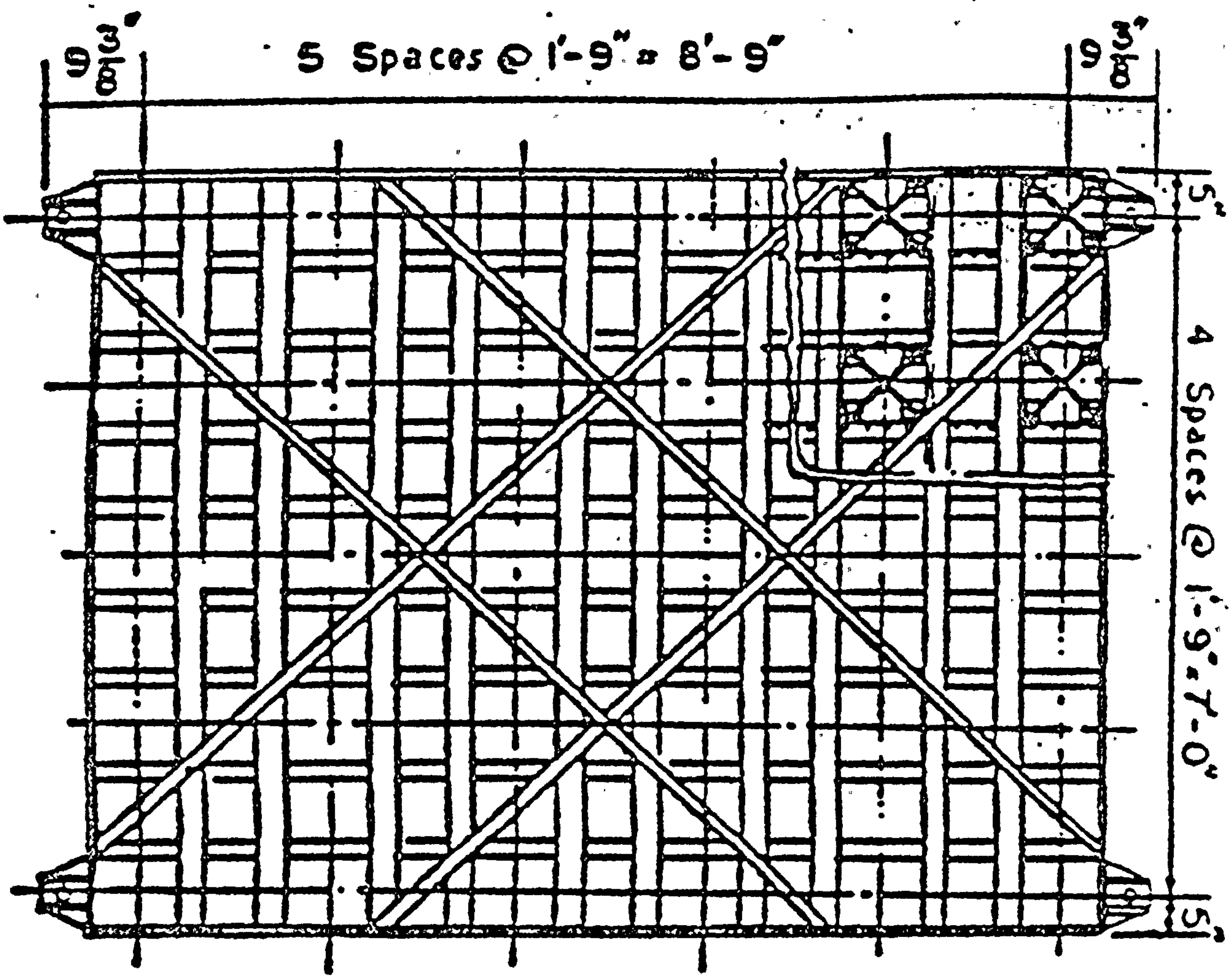
ELEVATION OF RACK



SECTION C - C

FIGURE 4

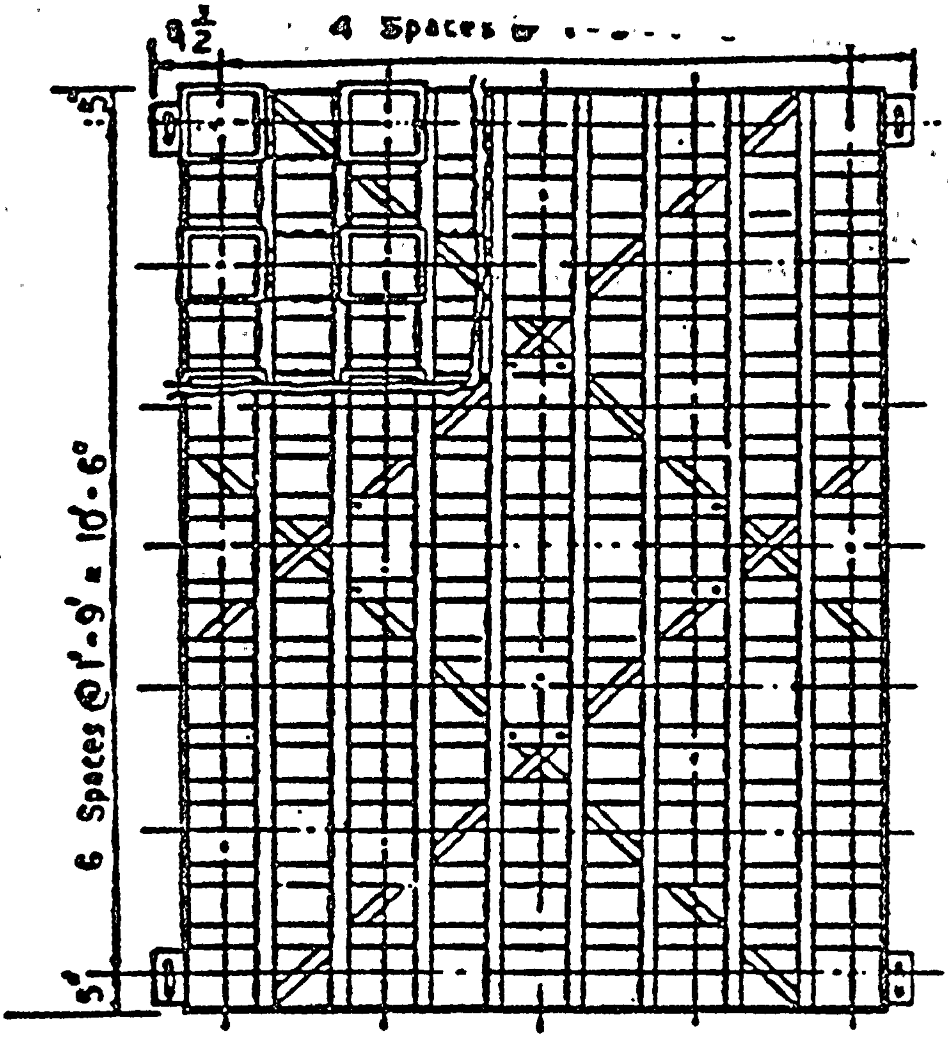
ELEVATION OF RACK



SECTION D-D

FIGURE 5

PLAN OF RACK-BOTTOM



SECTION E - E

FIGURE 6

PLAN OF RACK-TOP

FIGURE 7

INTENTIONALLY LEFT BLANK

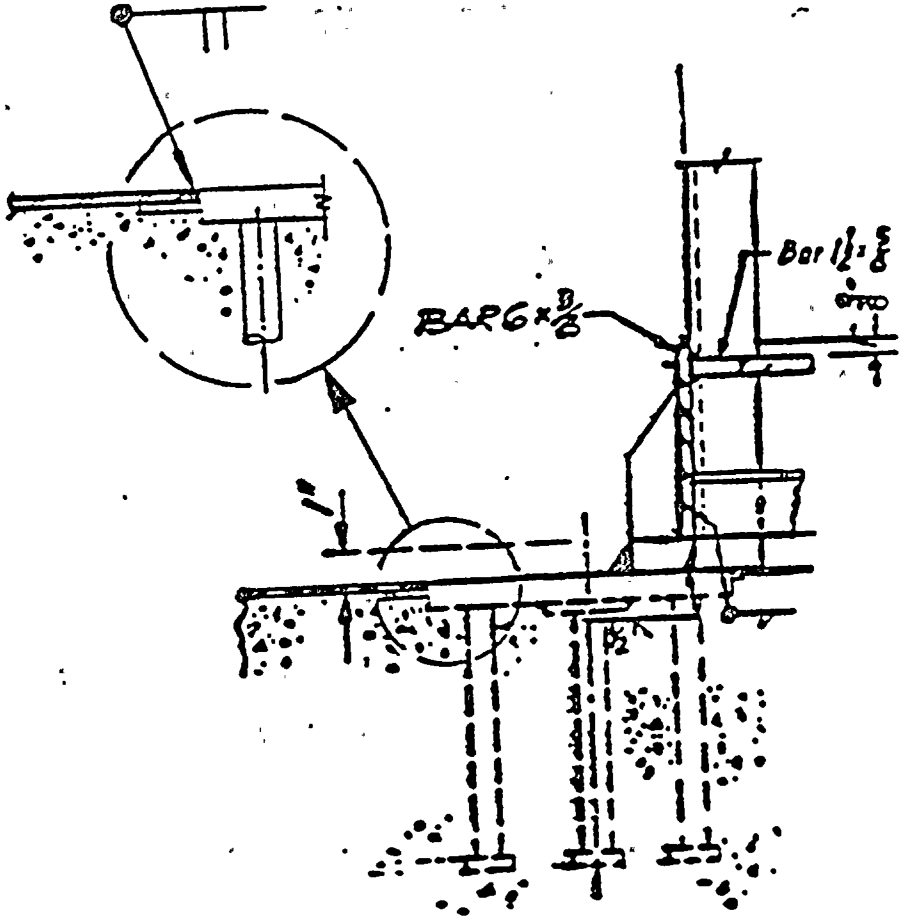


FIGURE 8

SECTION THROUGH ANCHORAGE

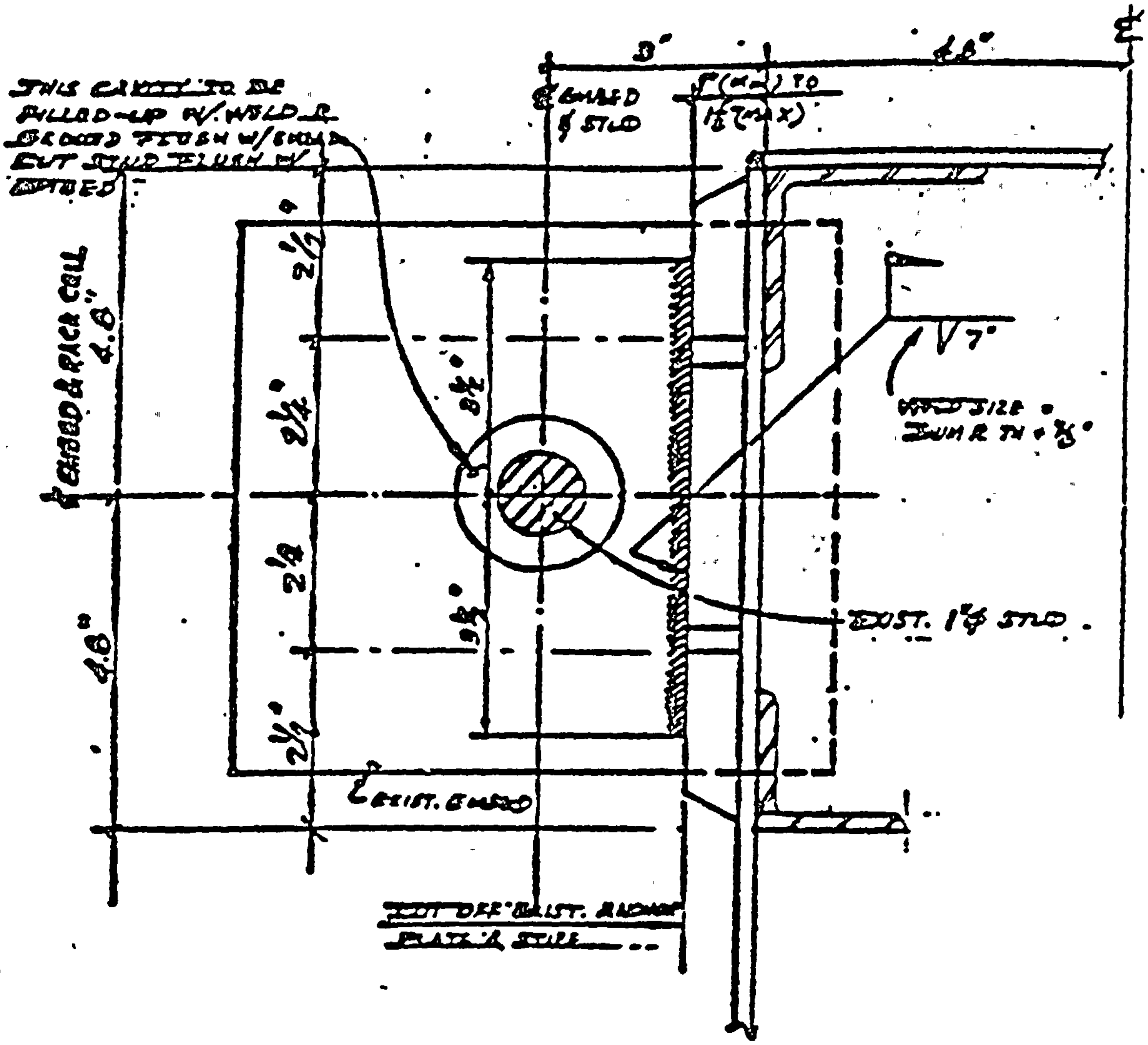
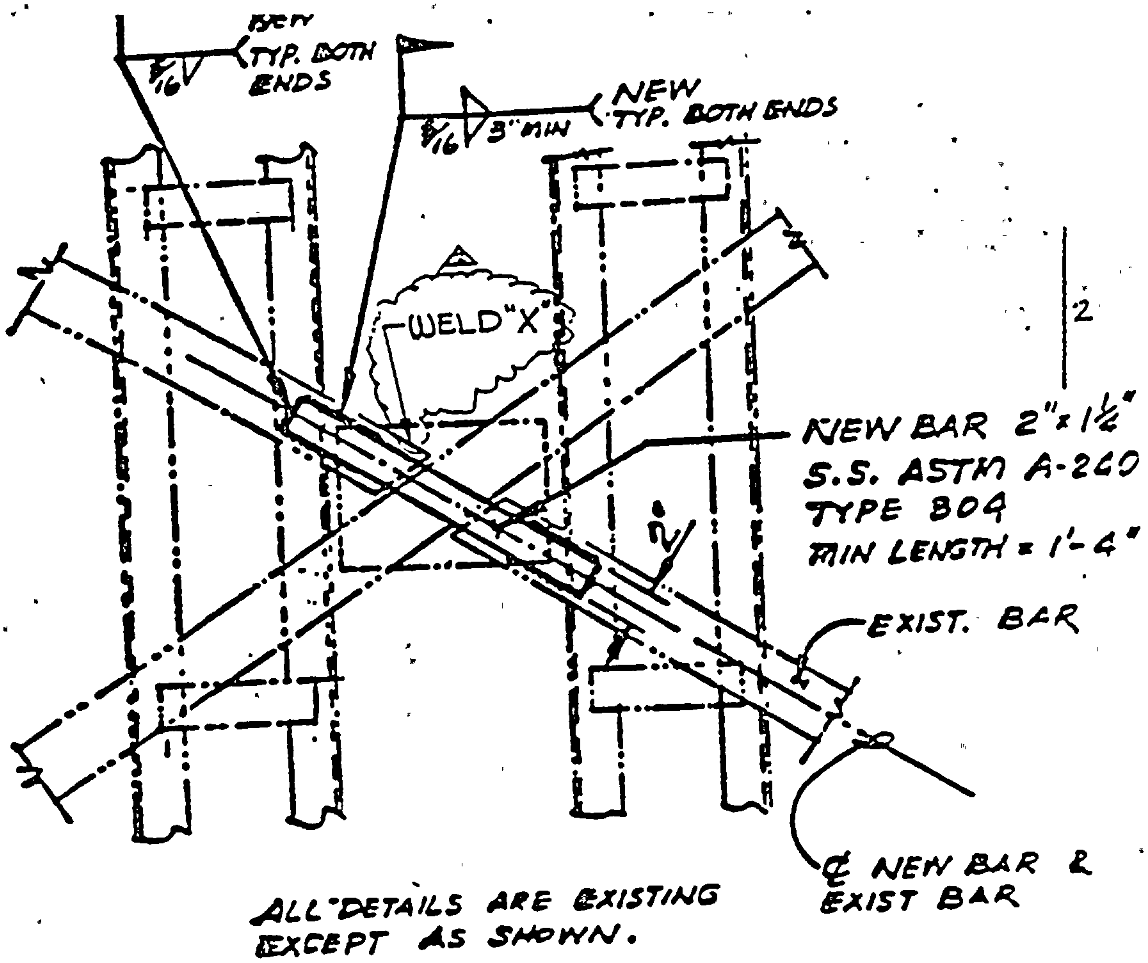


FIGURE 9

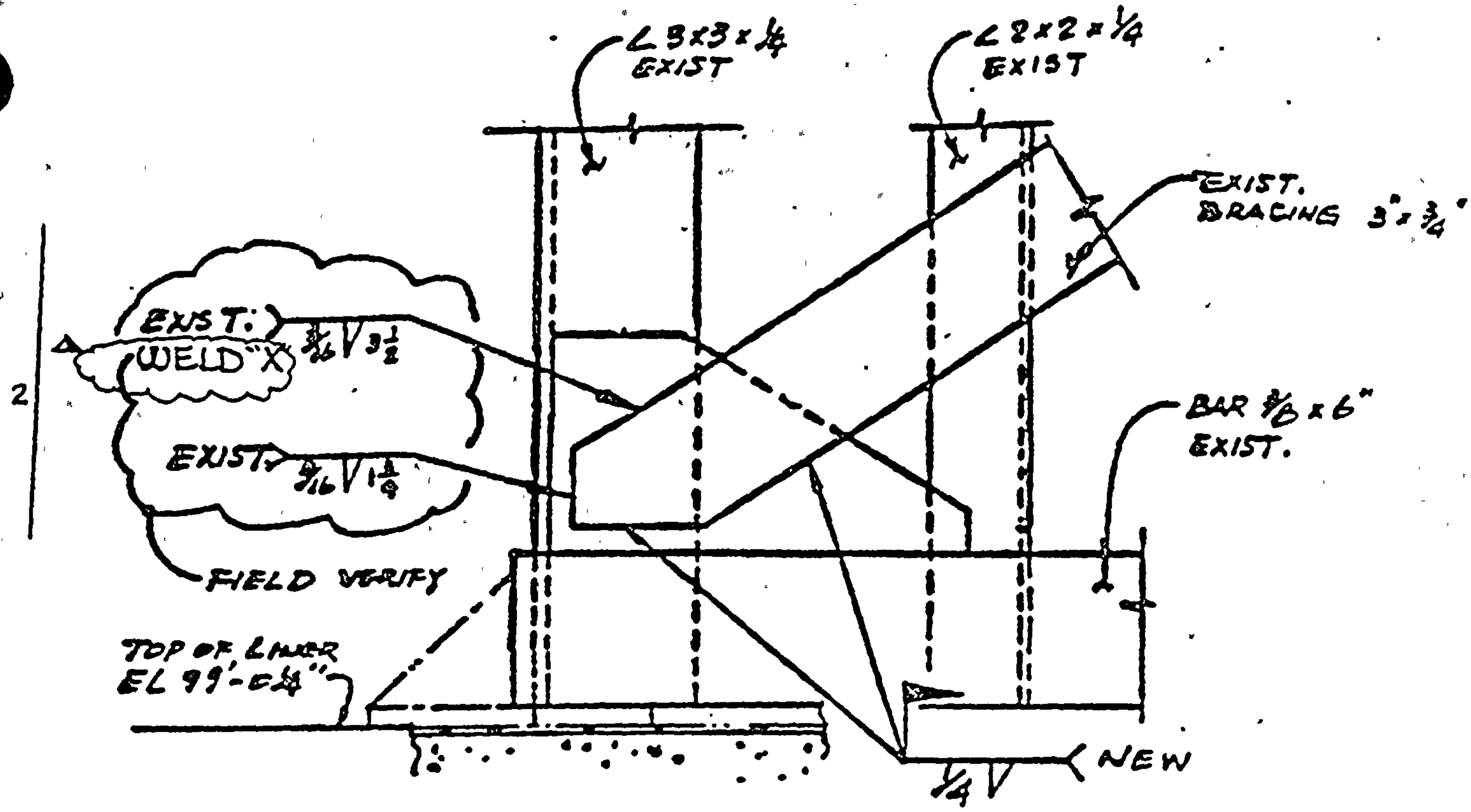
RACK ANCHORAGE



TYP 8 PLACES PER RACK

FIGURE 10

REINFORCEMENT OF BRACING CONNECTION



SPENT FUEL RACK NO. 8

WEST FACE ONLY

FIGURE 11

REINFORCEMENT OF BRACING FOR RACK NO. 8

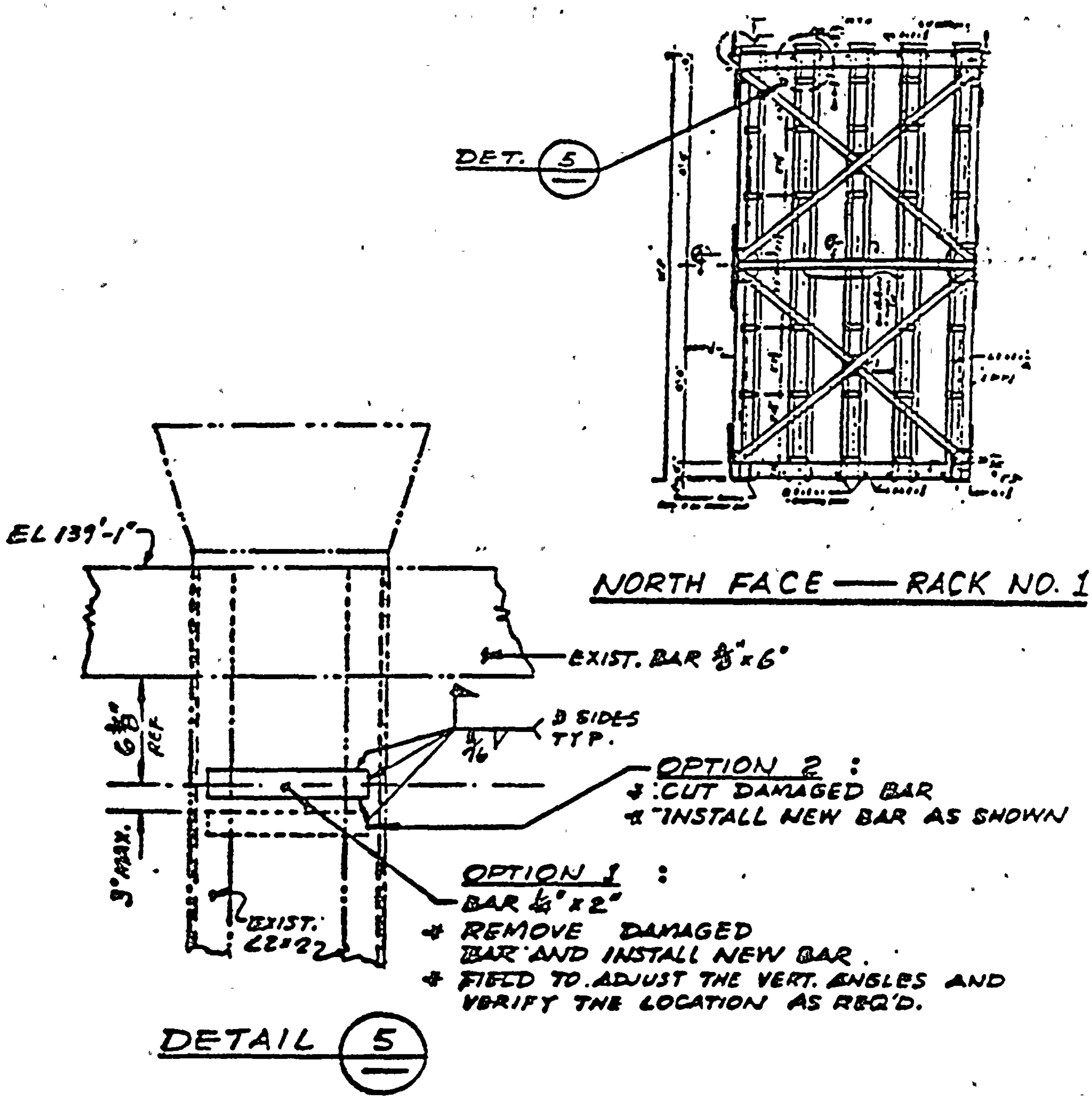
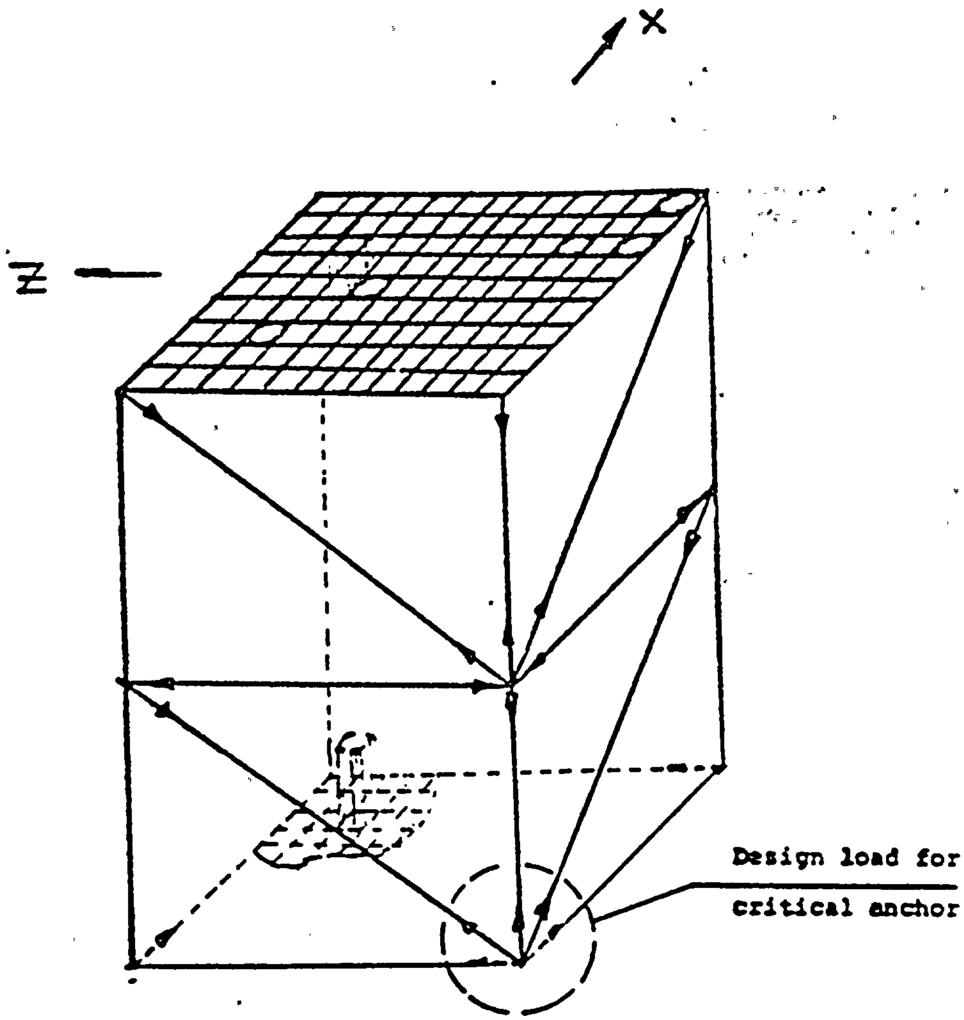


FIGURE 12

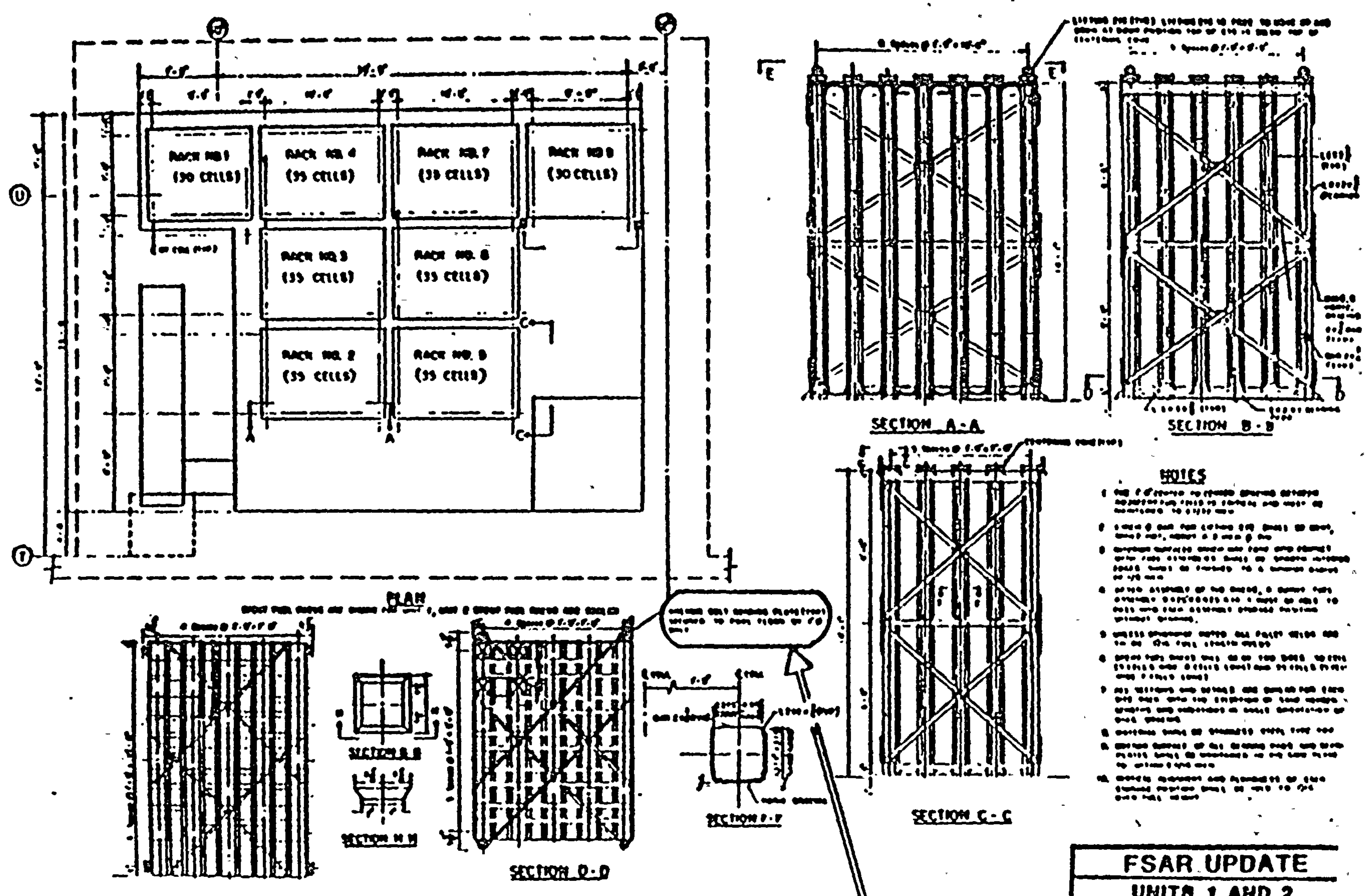
LACING MODIFICATION FOR RACK NO. 1



ISOMETRIC TYP. RACK

FIGURE 13

LOAD PATH FOR THE GLOBAL ANALYSIS



FSAR UPDATE
UNITS 1 AND 2
DIABLO CANYON SITE

FIGURE 9.1-2
SPENT FUEL STORAGE

FIGURE 14
PROPOSED FSAR CHANGE

080017

REVISED TO READ:

"ANCHOR BEARING PLATE (TYP.)
SECURED TO POOL FLOOR BY WELDS"

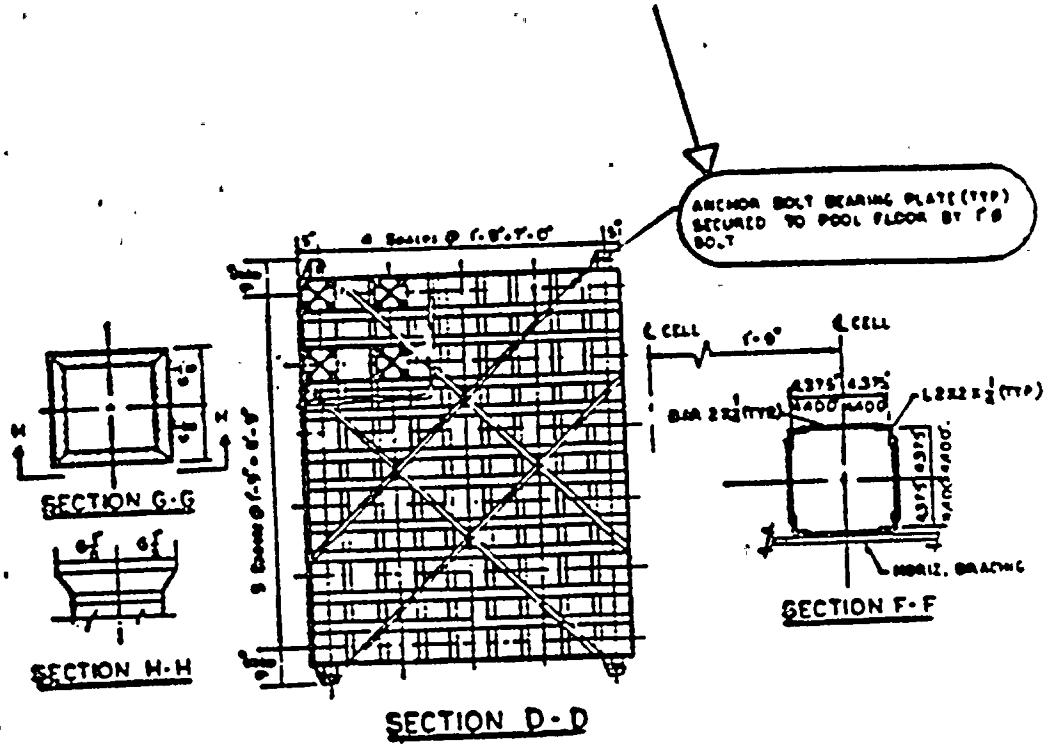


FIGURE 15

PROPOSED FSAR CHANGE

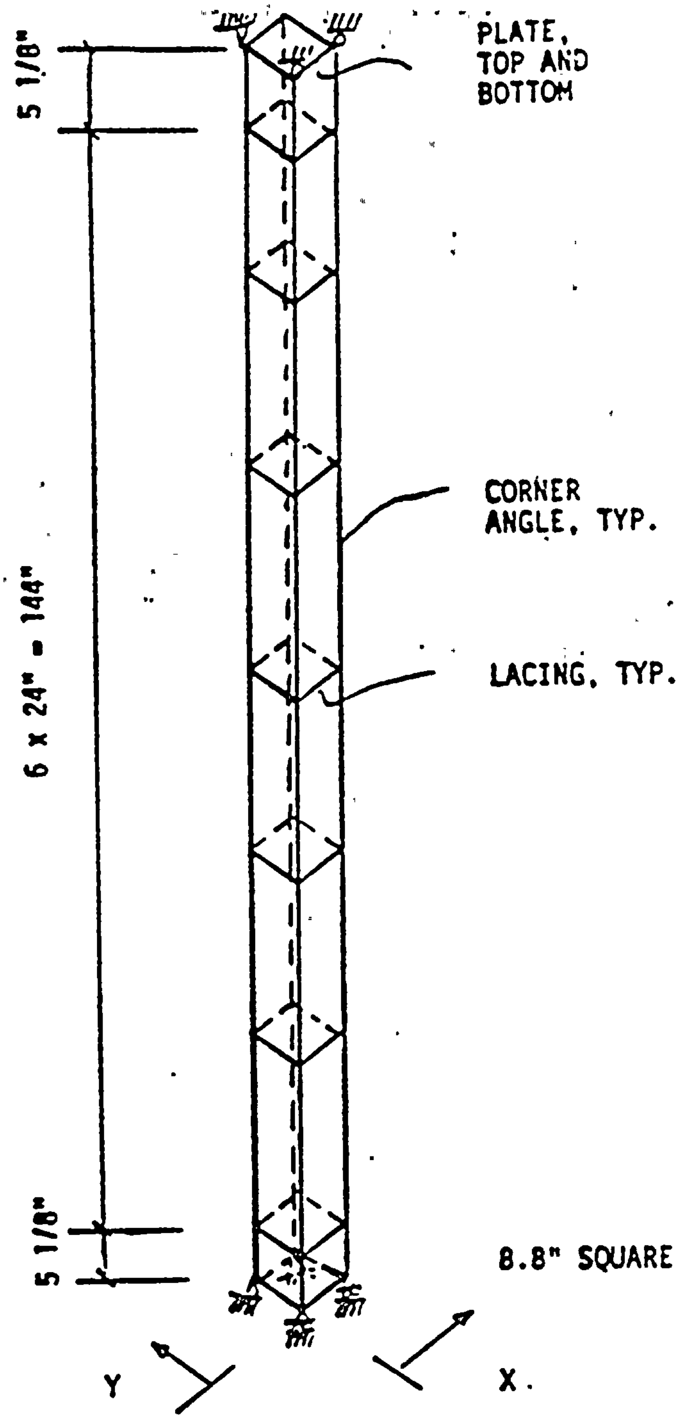


FIGURE 16

MATHEMATICAL MODEL - INDIVIDUAL CELL

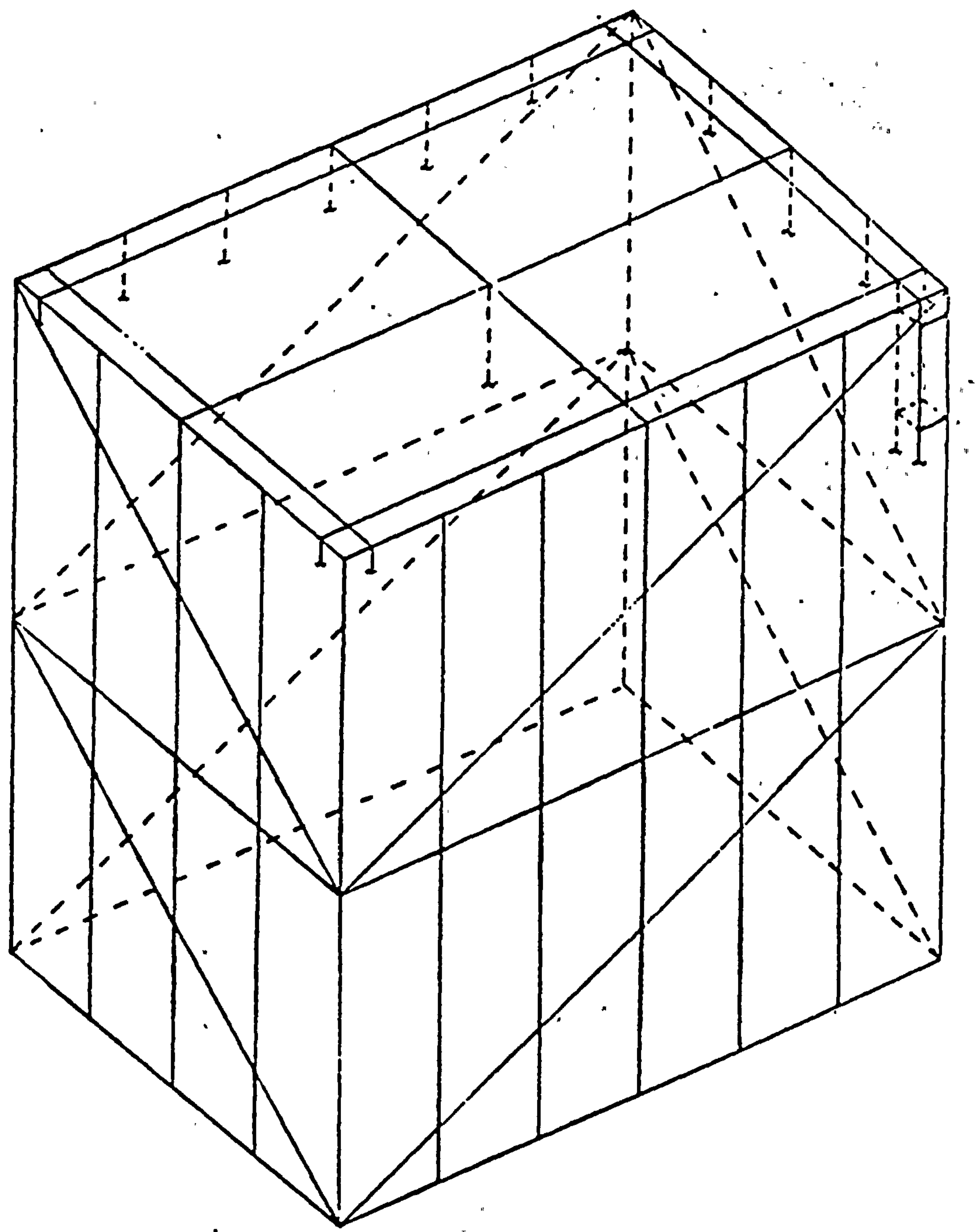


FIGURE 17

MATHEMATICAL MODEL - GLOBAL

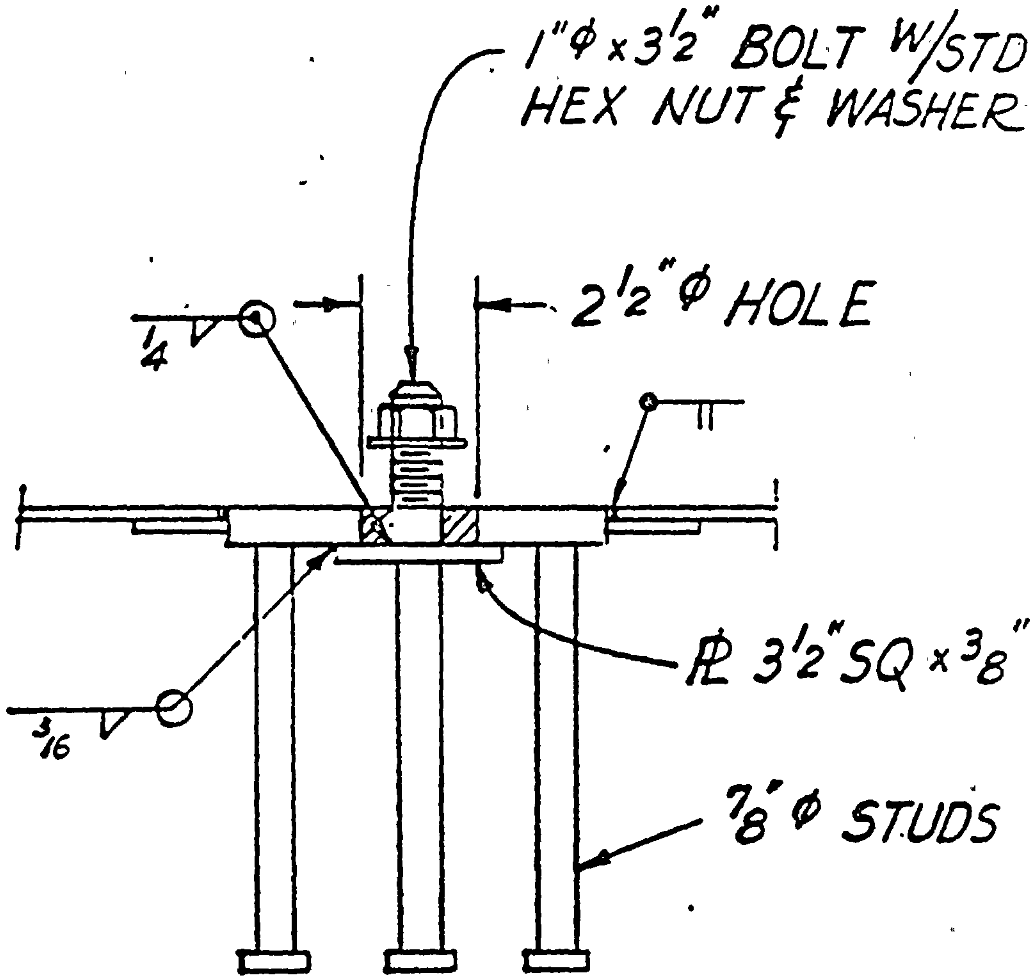


FIGURE 18

ORIGINAL BOLTED CONNECTION

NRC STAFF QUESTIONS

Questions	Response (Paragraph/Page)
1. What is the status of installation of the original racks?	Transmittal letter, DCL-86-273
What was done to remove the anchor bolts?	Sec. 2.0, p. 1 Sec. 4.4A, p. 6
2. NRR would like to review the proposed FSAR changes associated with reinstallation of the original racks.	Sec. 6.0, p. 10
3. What does "essentially unchanged" mean as used in the Mechanical design evaluation (DC1-EM-35152)? We should be more specific; what are the differences?	Sec. 3.0, pp. 2 and 3
4. What is the basis for the 50 pound criterion for drag load testing?	Sec. 5.0, p. 9
5. We indicated the original racks will be cleaned before reinstallation; what procedures will be used? (i.e., no iron, etc.)	Sec. 5.0, p. 8
6. Justify why there is no need to change the design calculations for the racks; address seismic adequacy. Are the earlier conclusions still valid?	Sec. 4.1 through 4.4, pp. 3 to 8
7. Discuss the engineering analysis to show how the load transfer path may have changed from bolting to welding. (State assumptions, etc.)	Sec. 4.2.1, pp. 4 and 5
8. Discuss asymmetric loadings on the rack modules.	Sec. 3.0, p. 2 Sec. 7.0A, p. 10
9. Bracing weld reinforcement - Why did we make the modification to the rack bracing? Did we consider all the effects of the change? (i.e., local considerations, temperature, etc.)	Sec. 4.4B, C and D, pp. 7 and 8 Sec. 5.0, p. 9
10. DCN, Sheet 9 of 9 - What is the basis for 1983 version of ASME Code?	Sec. 5.0, pp. 8 and 9

NRC STAFF QUESTIONS (CONT'D)

	Questions	Response (Paragraph/Page)
11.	Discuss the installation sequence for the original racks welding access and sequence, etc.	Sec. 5.0, p. 9
12.	Why were the anchor bolts not restored to the original condition?	Sec. 4.4A, p. 6
13.	Are QC requirements and the materials the same as initially reviewed by the Staff? What are the differences?	Sec. 5.0, p. 8
14.	Clarify the details of the embedded plates and the liner plate. Explain the load path for seismic loads to the base slab.	Sec. 3.0, p. 2 Sec. 4.2.1, pp. 4 and 5
15.	Elaborate further on the statement that M&QS foresees no problem with distortion, warping, etc. with regard to welding to the embedded plates. Will welding affect the leak-tightness of the liner?	Sec. 5.0, p. 9 Sec. 7.0A and B, p. 11
16.	Have the holddown brackets on the corner of each rack been revised in any way from the original design? If so, how? Are the load paths different?	Sec. 3.0A, p. 3 Sec. 4.2.1, pp. 4 and 5 Sec. 4.0A, p. 7
17.	Were warping and distortion considered when designing the rack bracing modification?	Sec. 4.2.1 through 4.4B, pp. 4 through 7 Sec. 5.0, p. 9
18.	Do the new anchorage and other rack modifications affect the seismic analysis and qualification of the original racks? In particular, the tension and compression aspects arising from rack rocking should be addressed.	Sec. 4.4, p. 7, Table 1 Sec. 4.2.1, pp. 4 and 5
19.	Considering the limited access, how can we be assured that the anchorage weldments will be of good quality and able to transfer the design loads?	Sec. 5.0, p. 9
20.	What type of analysis was originally performed for the racks? What was done recently that caused the changes? How did we consider the interaction of the eight rack modules as part of the original qualification of the racks?	Sec. 4.1, pp. 3 and 4