Southern California Edison Company
P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

M. O. MEDFORD
MANAGER, NUCLEAR LICENSING

TELEPHONE
(818) 302-1749

May 19, 1986

Director, Office of Nuclear Reactor Regulation
Attention: G. E. Lear, Director
PWR Project Directorate No. 1
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206
SEP Topic III-6, Seismic Design Considerations
San Onofre Nuclear Generating Station
Unit 1

The purpose of this letter is to respond to a number of questions regarding the seismic reevaluation of San Onofre Unit 1. Accordingly, provided as Enclosure 1 are the responses to specific questions raised by the NRC Staff or its consultants.

If you have any questions on the enclosed information, please call me.

Very truly yours,

JRamsberry/for MOM

Enclosure

cc: F. R. Huey, USNRC Senior Resident Inspector, SONGS 1, 2 and 3
M. J. Russell, EG&G
L. Shieh, LLNL
N. C. Tsai, NCT Engineering

A001
1/1

CONCRETE EXPANSION ANCHORS AND ROCK ANCHORS

QUESTION

Explain how the group effect of bolts was considered for concrete expansion anchors and rock anchors.

RESPONSE

The group effect of bolts was considered by specifying the allowable design loads based on a minimum center to center spacing between bolts (see attached Table 3 column denoted as "Min. C/C Spacing"). A reduction in the minimum center to center spacing is permitted so long as allowable design loads are reduced according to Note A of Table 3. Similar provisions are considered in the design of concrete expansion anchors which have allowable design loads based on minimum center to center spacings of twelve bolt diameters.

TABLE 3

ALLOWABLE DESIGN LOADS FOR ROCK BOLT EXPANSION ANCHORS

Anchor Diameter (Inches)	Allowable Design Loads(1), (2) Tension (Kips)		Shear (Kips)		Torque (Ft-Lbs) to Expand Shell	Pretensioning Torque at Installation (Ft-Lbs) Threads Not Lubricated	Tension Test Load (Kips)	Min. Embedment (Inches)	Min. C/C Spacing (Inches)	Min. Edge Distance (Inches)
1	25(5)	33(6)	8(7)	12(8)	200-250	300	30	14	10	6
1-3/8	50(5)	66(6)	16(7)	24(8)	700-750	1100(3)	60	18	14	8
2	100(5)	133(6)	33(7)	48(8)	950-1000(4)	3300(3)	120	24	20	10

(1) For 4000 psi (f'_c) or higher concrete

(2) Subject to reduction per Notes A and B and combined interaction per Note C (see next page)

(3) Preferred method is to pretension to specified test load using calibrated hollowram hydraulic jack or calibrated stud tensioner.

(4) May be increased to 1500 ft. lbs. if required to prevent slight pullout of bolt which may be experienced upon application of 3300 ft-lb torque for pretensioning prior to grouting.

(5) Manufacturer's recommended design load at 2:1 safety factor.

(6) These increased allowable loads are applicable only for "Abnormal/Extreme Environmental" (Design Basis Earthquake) or faulted loading combinations. They are based on 0.9 times Manufacturer's maximum working load to elastic limit.

(7) Preferred design load based on AISC limits using manufacturer's ultimate strength values.

TABLE 3 (CONTINUED)

ALLOWABLE DESIGN LOADS FOR ROCK BOLT EXPANSION ANCHORS

(8) Design loads increased by 1.5 applicable only for "Abnormal/Extreme Environmental (Design Basis Earthquake) or Faulted Loading combinations.

Additional Notes:

A. A reduction in the minimum center to center spacing and edge distance for anchors is acceptable provided that the allowable design loads (tension and shear) are reduced by the same proportion (i.e.: 25 percent reduction in spacing - 25 percent reduction in allowable design loads). The reduction in spacing may not exceed 50 percent in any case.

B. A reduction in the minimum embedment for anchors is acceptable provided that the allowable design load (tension only) is reduced in proportion to the square of the reduced embedment (i.e: embedment reduced to $(.80)^2 = .64$ times allowable load specified). The reduced embedment may not be less than 70 percent of the specified minimum embedment.

C. For evaluation of simultaneous tension and shear loading, the loads shall be combined by the following interaction formulas:

$$\left(\frac{t}{T}\right)^2 + \left(\frac{s}{S}\right)^2 \leq 1.0 \text{ for rock bolt expansion anchors}$$

Where:

(t, s) = Actual design (tension, shear) loads, respectively

(T, S) = Specified allowable (tension, shear) loads, respectively

BATTERY RACKS

QUESTION

Provide information regarding the design of the new battery racks in Battery Room No. 1 of the Control-Administration Building.

RESPONSE

The new batteries and racks were designed and manufactured by Gould Industrial Battery Division. The battery rack is a two step, 19'-0" long x 3'-8" wide x 3'-2" high steel structure which supports 30 cells of batteries (Figure 1). The rack was designed for the .67g modified Housner seismic event and a 4% damping value was used. Dynamic analysis was performed with the computer code, STRUDL, and design was in accordance with Specifications IEEE 323-1983, IEEE 344-1975, AISC 8th Edition and AWS D1.1-1983. Allowable stresses were limited to 90% of minimum material yield strength.

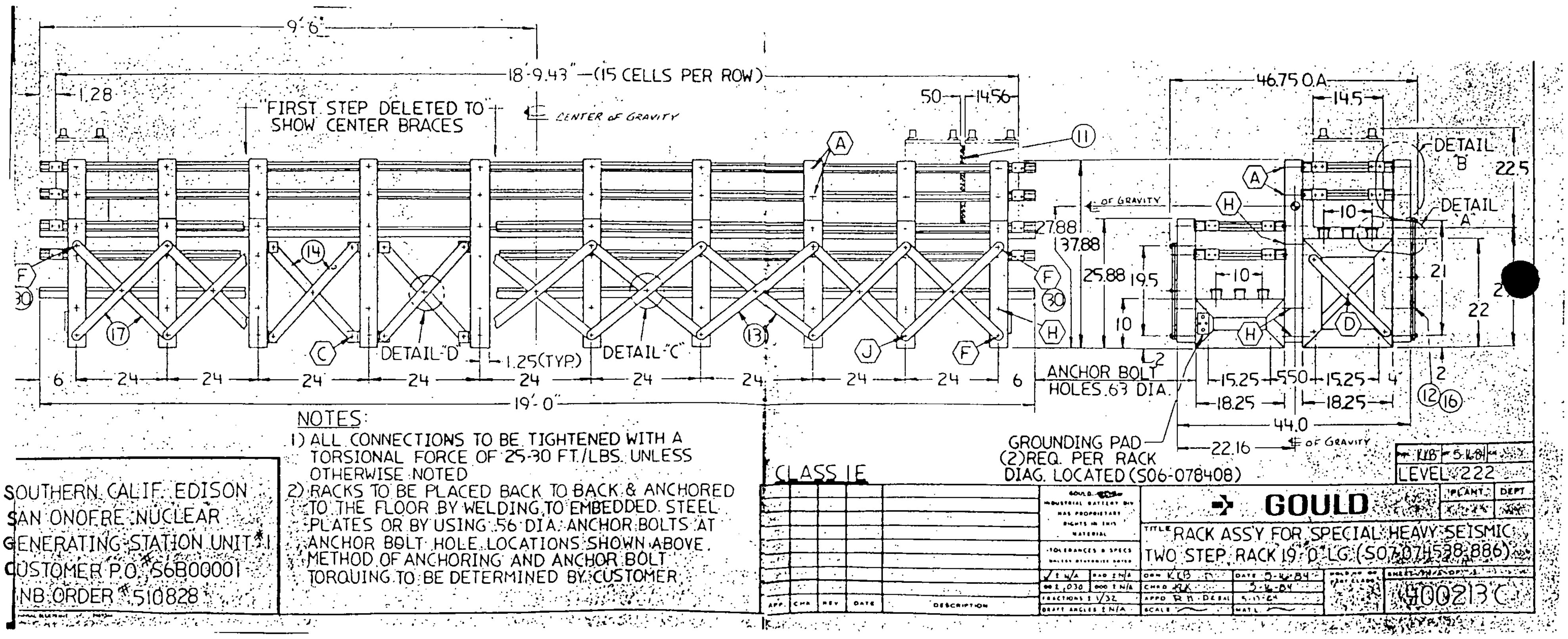

9'-6"
18'-9.43" — (15 CELLS PER ROW)
1.28
FIRST STEP DELETED TO SHOW CENTER BRACES
CENTER OF GRAVITY
50
14.56
46.75 O.A.
14.5
DETAIL B
DETAIL A
22.5
27.88
37.88
25.88
19.5
10
21
22
OF GRAVITY
DETAIL "D"
DETAIL "C"
1.25 (TYP)
6
24
19'-0"
ANCHOR BOLT HOLES .63 DIA.
15.25
5.50
18.25
44.0
22.16
4
2
OF GRAVITY
GROUNDING PAD (2) REQ. PER RACK DIAG. LOCATED (S06-078408)
NOTES:
1) ALL CONNECTIONS TO BE TIGHTENED WITH A TORSIONAL FORCE OF 25-30 FT./LBS. UNLESS OTHERWISE NOTED
2) RACKS TO BE PLACED BACK TO BACK & ANCHORED TO THE FLOOR BY WELDING TO EMBEDDED STEEL PLATES OR BY USING .56 DIA. ANCHOR BOLTS AT ANCHOR BOLT HOLE LOCATIONS SHOWN ABOVE. METHOD OF ANCHORING AND ANCHOR BOLT TORQUING TO BE DETERMINED BY CUSTOMER.
SOUTHERN CALIF. EDISON
SAN ONOFRE NUCLEAR
GENERATING STATION UNIT 1
CUSTOMER P.O. # S6B00001
NB ORDER # 510828
CLASS IE
LEVEL 222
GOULD
RACK ASS'Y FOR SPECIAL HEAVY SEISMIC TWO STEP RACK 19'-0" LG. (S07-074538-886)
400213 C

Figure 1

ORIGINAL CONSTRUCTION WELDING PRACTICES

QUESTION

Provide additional information regarding the welding practices for original pipe support A-36 steel.

RESPONSE

Overall information regarding the original welding practices at San Onofre Unit 1 was provided in our April 16, 1986 submittal to the NRC. The additional procedure qualification record (PQR) for welding A-36 steel is attached. The PQR shows that the minimum tested tensile strength was 59.4 ksi which was greater than the minimum base metal strength of 58.0 ksi.

ENCLOSURE (1)
PAGE 1 of 1
Log BPC/SCE-86-4[illegible]4

Form No. WR-2A

BECHTEL CORPORATION
San Francisco, California

PROCEDURE QUALIFICATION RECORD

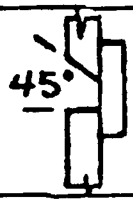
Procedure Specification No. P1-A-c (NC) Date November 4, 1966
Welding Process Shielded Metal Arc Location San Francisco, California

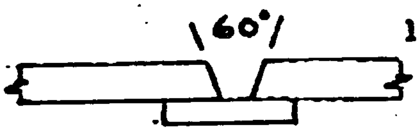
Name W. B. Keyser Symbol
Test Conducted by H.J. Mantle

Parent Material Qualified On:
Chemical C.S. Spec. ASTM A-36
P-No 1 Shape PLATE
Thickness 0.25"

Electrode or Filler Material Used:
AWS Class E 6010 ASTM Spec. A-233
E 6010
F-No. 3 A-No. 1
Manufacturer and Trade Name Lincoln 5P

2 G ONLY





1G, 3G & 4G

Joint Design
oot Gap: 3/16 Backing Strips Used YES

Heat Treatment
Preheat — Stress Relieve Temp. - Stress relieve Time -

Radiographic Results
Physical Testing Tensile and bends by Anamet Labs, Berkeley
bends interpreted by Bechtel Corp.

SPECIMEN	POSITION	HORIZONTAL (2G)		VERTICAL (3G)		OVERHEAD (4G)	
Reduced	Yield Strength psi						
Section	Tensile Strength ksi	60.0	59.4	67.1	65.0	67.1	65.7
Tensile	Elongation, % in 2"						
Bend	Free %						
Bend	Root	180 OK	180 OK	180 OK	180 OK	180 OK	180 OK
Bend	Face	180 OK	180 OK	180 OK	180 OK	180 OK	180 OK

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

BECHTEL CORPORATION

002-1

Date 11/4/66

By H.J. Mantle
Welding Engineer

SEISMIC QUALIFICATION OF ELECTRICAL EQUIPMENT

QUESTION

Provide information regarding the seismic qualification of electrical equipment.

RESPONSE

The anchorage of safety related electrical equipment was evaluated and modifications were implemented, where required, as documented in SCE's letters to the NRC dated March 25, 1981, May 29, 1981 and June 28, 1982. These evaluations included the anchorage of electrical cabinets. The seismic adequacy of the electrical cabinets themselves will be demonstrated during the implementation phase of the resolution of Unresolved Safety Issue A-46, Seismic Qualification of Electrical Equipment. It is our understanding that the NRC resolution of A-46 is scheduled for issuance later this year.

SUPPORT STIFFNESS

QUESTION

Is the influence of beam flexibility considered in the piping analyses?

RESPONSE

Beam flexibilty was considered when support structures could affect the response of piping systems. Beams were determined to be non-rigid if the beam deflection under the pipe support seismic load was greater than 1/8 inch or the beam's first modal frequency was below the zero period acceleration region of the applicable instructure response spectra (Reference SER Section 3.13). Non-rigid support beams were evaluated for their effect on piping analyses by calculating the beam stiffnesses at the pipe support locations. These beam stiffnesses were either considered in the piping analyses or compared with generic pipe support stiffnesses to confirm that the analysis results would not be significantly affected.

1854X:jk

<u>CONDENSATE STORAGE TANK</u>

<u>QUESTION</u>

Evaluate the effect of a seismic event on the condensate storage tank.

<u>RESPONSE</u>

The results of the evaluation of the condensate storage tank are included in the enclosed report "Seismic Evaluation of the SONGS 1 Condensate Storage Tank" dated May 1986.

JLR:6750F