Rpto 9/22

September 21, 1982

Docket No. 50-206
LS05-82-09-070

Mr. R. Dietch, Vice President
Nuclear Engineering and Operations
Southern California Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, California 91770

Dear Mr. Dietch:

SUBJECT: SEP TOPIC III-7.B, DESIGN CODES, DESIGN CRITERIA AND LOAD COMBINATIONS - SAN ONOFRE 1

See Rpts. # 8208170083XA

Enclosed is a copy of our draft evaluation of SEP Topic III-7.B. The evaluation identifies areas of codes where changes have occurred to decrease safety margins. It also identifies loads applicable to some or all of the structures at San Onofre 1 which have increased in magnitude. After reviewing structural drawings of your facility, we concluded that some code changes of concern were not applicable to your facility because the structural elements to which these code changes are referring were not found in the structural drawings of San Onofre 1 which we reviewed. These changes are identified in Appendix A of the enclosure. The evaluation also concludes that further analysis is required by you, in order to determine whether the containment is capable of withstanding combined seismic and LOCA loads developed in other SEP topics. The report is in draft form and is currently being further reviewed by the staff before being finalized. You are to review how these areas of the codes were applied in the design of San Onofre 1 and the ability of structures to resist increased loads and assess the current safety margins.

SEQY
DSA use (08)
ADD:
E. McKenna

You are requested to examine the facts upon which the staff has based its evaluation and respond by confirming that the facts are correct or by identifying errors and supplying the corrected information. We encourage you to supply any other material that might affect the staff's evaluation of this topic or be significant in the integrated assessment of your facility.

You are requested to respond to the factual correctness of the SER and propose a schedule for resolution of the open items within 30 days of receipt of this letter.

Sincerely,

9/21/82

ORB#5:PM WPaulson 9/20/82
ORB#5:BC DCrutchfield 9/20/82
AD:SEPOL FMiraglia 9/21/82

Walt Paulson, Project Manager
Operating Reactors Branch No. 5
Division of Licensing

OFFICE	SEPB:DL	SEPB:DL	SEPB:DL				SEPB:DL
SURNAME	DPersinko:dk	EMcKenna	RHermann				WRussell
	9/16/82	9/17/82	9/17/82				9/17/82

Enclosure:
As stated

cc w/enclosure:
See next page

OFFICE ▶	.....	.....	.....	.....	.....	.....	.....
SURNAME ▶	.....	.....	.....	.....	.....	.....	.....
DATE ▶	.....	.....	.....	.....	.....	.....	.....

Mr. R. Dietch

cc
Charles R. Kocher, Assistant
General Counsel
James Beoletto, Esquire
Southern California Edison Company
Post Office Box 800
Rosemead, California 91770

David R. Pigott
Orrick, Herrington & Sutcliffe
600 Montgomery Street
San Francisco, California 94111

Harry B. Stoehr
San Diego Gas & Electric Company
P. O. Box 1831
San Diego, California 92112

Resident Inspector/San Onofre NPS
c/o U. S. NRC
P. O. Box 4329
San Clemente, California 92672

Mayor
City of San Clemente
San Clemente, California 92672

Chairman
Board of Supervisors
County of San Diego
San Diego, California 92101

California Department of Health
ATTN: Chief, Environmental
Radiation Control Unit
Radiological Health Section
714 P Street, Room 498
Sacramento, California 95814

U. S. Environmental Protection Agency
Region IX Office
ATTN: Regional Radiation Representative
215 Freemont Street
San Francisco, California 94111

Robert H. Engelken, Regional Administrator
Nuclear Regulatory Commission, Region V
1450 Maria Lane
Walnut Creek, California 94596

SYSTEMATIC EVALUATION PROGRAM

TOPIC III-7.B

SAN ONOFRE 1

TOPIC: III-7.B, DESIGN CODES, DESIGN CRITERIA AND LOAD COMBINATIONS

I. INTRODUCTION

SEP plants were generally designed and constructed during the time span from the late 1950's to late 1960's. They were designed according to criteria and codes which differ from those accepted by the NRC for new plants.

The purpose of this topic is to assess the safety margins existing in Category I structures as a result of changes in design codes and criteria.

II. REVIEW GUIDELINES

The current licensing criteria which governs the safety issue in this topic is 10 CFR 50, Appendix A, GDC 1, 2, and 4 as interpreted by Standard Review Plan 3.8.

III. RELATED SAFETY TOPICS

The following SEP topics are related to III-7.B:

1. III-2, Wind and Tornado Loadings
2. III-3.A, Effects of High Water Level on Structures
3. III-4.A, Tornado Missiles
4. III-5.A, Effects of High Energy Pipe Breaks Inside Containment
5. III-5.B, Effects of High Energy Pipe Breaks Outside Containment
6. III-6, Seismic Design Considerations
7. VI-2.D, Mass and Energy Release for Postulated Pipe Break Inside Containment
8. VI-3, Containment Pressure and Heat Removal Capability

IV. EVALUATION

The evaluation is based on a Technical Evaluation Report (TER) prepared by the Franklin Research Center (FRC) in conjunction with the NRC staff through contract. The report is entitled, "Design Codes, Design Criteria and Loading Combinations" and is attached to this Safety Evaluation Report as Enclosure (1).

We have compared structural design codes employed in the design of Category I structures at San Onofre 1 to present codes. This was done through generic code versus code comparison without investigating specifically how the original code was applied to the San Onofre 1 design; however, after reviewing drawings of structures at San Onofre 1

we concluded that certain portions of the codes were not applicable to San Onofre 1 because the types of structures to which the codes are referring were non-existent at San Onofre 1. We have compared the loads and loading combinations employed in the design of San Onofre 1.

A result of these comparisons is that a number of code changes could potentially impact significantly margins of safety (denoted by scale A and Ax in Enclosure 1). This can be attributed to several factors such as:

1. New codes have imposed stricter limitations than old,

2. New codes have included sections governing design of certain types of structures which were not included in the older codes,

3. Design loads required today were not included in the plant design, and

4. Certain load combinations judged to be significant were not included in plant design.

In Enclosure (1), some items have been judged to potentially impact margins of safety regarding the containment as a result of comparing ASME Section III, Subsection B, 1963 to ASME Section III Subsection NE, 1980.

The code changes of concern from Enclosure (1) are:

Structural Elements to be Examined	Code Change Affecting These Elements		
	New Code	Old Codes	
Beams/Columns	AISC 1980	AISC 1963	AISC 1971
Hollow circular sections subject to bending	1.5.1.4.1 Subpara 7	1.5.1.4.1	1.5.1.4.1
Composite Beams			
1. Shear connectors in composite beams	1.11.4	1.11.4	NA
2. Composite beams or girders with formed steel deck	1.11.5	--	--*
Compression Elements	AISC 1980	AISC 1963	AISC 1971
With width-to-thickness ratio higher than specified in 1.9.1.2	1.9.1.2 and Appendix C	1.9.1	NA
Hollow circular sections subject to axial compression	1.9.2.3 and Appendix C	--*	--
Tension Members	AISC 1980	AISC 1963	AISC 1971
When load is transmitted by bolts or rivets	1.14.2.2	--	--
Connections	AISC 1980	AISC 1963	AISC 1971
a. Beam ends with top flange coped, if subject to shear	1.5.1.2.2	--	--
b. Connections carrying moment or restrained member connection	1.15.5.2 1.15.5.3 1.15.5.4	--	--

*Double dash (--) indicates that older code had no provisions.
NA indicates not applicable.

Structural Elements to be Examined	Code Change Affecting These Elements		
	New Code	Old Codes	
Members Designed to Operate in an Inelastic Regime	AISC 1980	AISC 1963	AISC 1971
Spacing of lateral bracing	2.9	2.8	NA
Short Brackets and Corbels having a shear span-to-depth ratio of unity or less	ACI 349-76 11.13	ACI 318-63 --	ACI 318-71 NA
Shear Walls used as a primary load-carrying member	ACI 349-76 11.16	ACI 318-63 --	ACI 318-71 NA
Precast Concrete Structural Elements, where shear is not a member of diagonal tension	ACI 349-76 11.15	ACI 318-63 --	ACI 318-71 NA
Concrete Regions Subject to High Temperatures	ACI 349-76	ACI 318-63	ACI 318-71
Time-dependent and position-dependent temperature variations	Appendix A	--	--
Columns with Spliced Reinforcement subject to stress reversals; f_y in compression to $1/2\ f_y$ in tension	ACI 349-76 7.10.3	ACI 318-63 805	ACI 318-71 NA
Steel Embedments used to transmit load to concrete	ACI 349-76 Appendix B	ACI 318-63 --	ACI 318-71 --
Element Subject to Impulsive and Impactive Loads whose failure must be precluded	ACI 349-76 Appendix C	ACI 318-63 --	ACI 318-71 --
Shell Structures with thickness equal to or greater than 12 inches	ACI 349-76 19.1	ACI 318-63 --	ACI 318-71 19.1

Structural Elements to be Examined	Code Change Affecting These Elements	
	New Code	Old Codes
Containment Vessels		
1. Containment vessels of materials no longer listed as code acceptable	ASME Sec. III, NE-3112.4	ASME Sec. VIII, UG-23
2. Containment vessels containing telltale holes	ASME Sec. III, ---	ASME Sec. VIII, 1962 UG-25(d)
3. Containment vessels designed by formula and subject to substantial loads	ASME Sec. III, NE-3131	ASME Sec. VIII, ---
4. Stiffening rings for cylindrical shells subject to external pressure	ASME Sec. III, NE-3133.5(a)	ASME Sec. VIII, UG-29
5. Different materials used for the shell and stiffening rings	ASME Sec. III, NE-3133.5(b)	ASME Sec. VIII, ---
6. Vessels with reducer section with "reversed" curvature when $R_L/t < 23$	ASME Sec. III, Fig. 3324.11 (a)(6)-1	ASME Sec. VIII, Fig. UG-36(d)
7. Vessels with positive locking devices - Quick actuating closures	ASME Sec. III, NE-3327.1	ASME Sec. VIII, ---
8. Pressure indicating devices for vessels having quick actuating closures	ASME Sec. III, NE-3327.4	ASME Sec. VIII, ---
Shell Openings and Attachments		
1. Openings and reinforcements; Provisions for fatigue analysis	ASME Sec. III, NE-3331(b)	ASME Sec. VIII, UG-36

Structural Elements to be Examined	Code Change Affecting These Elements	
	New Code	Old Codes
2. Reinforcement for openings	ASME Sec. III, NE-3334.1 NE-3334.2	ASME Sec. VIII, UG-40(b) UG-40(c)
3. Bellows expansion joints, over 6 inches in diameter	ASME Sec. III, NE-3365(f)	ASME Sec. VIII, ---
4. Bellows - New design requirements	ASME Sec. III, NE-3365.2	ASME Sec. VIII, ---

Section 10 of Enclosure (1) addresses load and load combination changes which occurred as a result of code changes and identifies specific plant structures for which various load combinations may be significant. Based upon a lack of detailed information on the stress results for loads and load combinations used during design of structures at San Onofre 1, these loads and load combinations may be potentially significant.

Enclosure (2) provides details of an analysis of the containment for combined seismic and LOCA loads performed by our contractor, Lawrence Livermore Laboratory. The conclusion of the report is that a more refined analysis is required in order to determine whether the containment will adequately resist the combined seismic and LOCA loads.

V. CONCLUSIONS

We conclude that after comparing design codes, criteria, loads and load combinations, a number of changes have occurred which could potentially impact margins of safety. These changes are identified above. These differences between plant design and current licensing criteria should be resolved as follows:

1. Review Seismic Category I Structures at San Onofre 1 to determine if any of the structural elements for which a concern exists are a part of the facility design of San Onofre 1. For those that are, assess the impact of the code changes on margins of safety on a plant specific basis.

2. Examine on a sampling basis the margins of safety of Seismic Category I Structures for loads and load combinations not covered by another SEP topic and denoted by Ax in Enclosure (1). (The load tables should be reviewed to assure their technical accuracy concerning applicability of the loads for each of the structures and their significance. The Category I Structures considered should be reviewed to insure completeness.)

It is concluded that the licensee should perform a more refined analysis of the San Onofre 1 containment in order to determine if it is adequate to resist the combined seismic and LOCA loads described in Enclosure (2).

TECHNICAL EVALUATION REPORT

DESIGN CODES, DESIGN CRITERIA, AND LOADING COMBINATIONS (SEP, III-7B)

SOUTHERN CALIFORNIA EDISON AND SAN DIEGO GAS AND ELECTRIC COMPANY
SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1

NRC DOCKET NO. 50-206

NRC TAC NO. 41604

NRC CONTRACT NO. NRC-03-79-118

FRC PROJECT C5257

FRC ASSIGNMENT 11

FRC TASK 318

Prepared by

Franklin Research Center
20th and Race Street
Philadelphia, PA 19103

FRC Group Leader: T. C. Stilwell

Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: D. Persinko

August 13, 1982

Franklin Research Center
A Division of The Franklin Institute
The Benjamin Franklin Parkway, Phila., Pa. 19103 (215) 448-1000