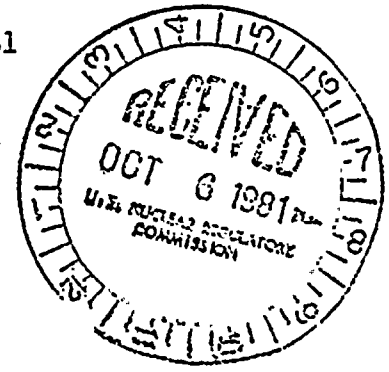
Lawrence Livermore National Laboratory

September 30, 1981
SM81-259/0121b
FIN A0415
Docket No. 50-244



Mr. William T. Russell, Branch Chief
Systematic Evaluation Program Branch
Division of Licensing
Office of Nuclear Reactor Reg.
Washington D.C. 20555

Dear Bill:

I have enclosed a copy of a report addressing resolution of open items for the Ginna plant as a result of the September 9, 1981 meeting at the RG & E offices.

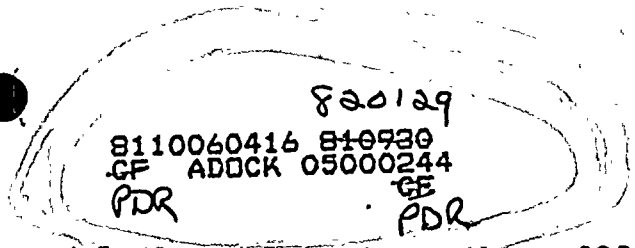
Sincerely,

Thomas A. Nelson

Thomas A. Nelson
Structural Mechanics Group
Nuclear Test Engineering Division

TAN/tlm
enclosure

X003
S1/1



STRUCTURAL MECHANICS ASSOCIATES

3645 Warrensville Center Road Cleveland, Ohio 44122 (216) 991-8842

16 September 1981

Mr. T. A. Nelson
Program Manager, SEP Seismic Review
Nuclear Test Engineering Division
Lawrence Livermore Laboratory
P. O. Box 808
Livermore, California 94550

Dear Tom:

Attached hereto please find my comments regarding the meeting held at RG&E offices on 9/9/81 to address the unresolved or open items in the mechanical electrical equipment SEP concerning seismic integrity. We have also updated Chapter 5 of NUREG/CR-1821 to reflect the resolution of items discussed at the meeting where appropriate.

Please advise if you require any clarification.

Sincerely,

for

John D. Stevenson
Vice President and General Manager

JDS:clj

Enclosure

c.c. Dr. Tom Cheng

RESULTS OF MEETING BETWEEN RG&E
THEIR CONSULTANTS AND THE NRC-SEP STAFF
AND THEIR CONSULTANTS

The following agenda items were discussed with resolution or comments as follows:

A. Component Cooling Surge Tank

The review comments contained in Section 5.3.1.3 of NUREG/CR-1821 were discussed by GAI personnel acting as consultants to RG&E. Basically, they confirmed that no positive anchorage against sliding currently existed in the longitudinal direction and they provided a stress summary, Attachment A which indicated that the horizontal base plate and anchor bolts are over stressed. They have proposed a solution of adding two additional bolts to each of the two support legs. This has the effect of reducing bending stresses in the horizontal base plate and helping to carry shear stress.

It was pointed out during the discussion by Dr. Stevenson that the addition of the two new bolts in each saddle would induce loads from restraint of free end displacement due to thermal gradients that currently are not identified in the design of supports and tank. GAI representatives stated that they had reviewed the effect of the restraint of thermal expansion in the tank and attached pipe and stated that the resultant stresses were quite low. They have not completed the analysis of their proposed fix but assured that the acceptable stress limits presented in Attachment A would be met. Dr. Stevenson stated that if the stress limit criteria of Attachment A were met the resultant design should demonstrate seismic design adequacy. However, he further stated a personal preference that, if at all possible, the modified support system should not provide thermal restraint.

B. Refueling Water Storage Tank

GAI has not finished the analysis which is scheduled now for a 1 December 1981 completion. Dr. Stevenson reported the concern and conclusions reached in Section 5.3.6.6 of NUREG/CR-1821, that if the potential amplified response of the tank under impulsive load was considered instead of the assumption of tank rigidity used in the original design, linear elastic analysis would indicate that the tank shell would buckle and the anchor bolts fail. Results of the GAI analysis should be available for review by 1 December 1981.

C. Auxiliary Building Bracing

Bracing evaluation of the auxiliary building is scheduled for completion by 1 November 1981.

D. Anchorage of Electrical Equipment and Internally Mounted Components

Dr. Stevenson reviewed typical design fixes supplied by RG&E in response to I&E Bulletin 80-21 concerning anchorage of electrical equipment. The criteria used in modifying the anchorage as expressed in "Final Report Anchorage and Seismic Support of Safety Related Electrical Equipment" RG&E Project No. EWR-2831 dtd. 12/31/80 appeared quite conservative in that a factor of 1.5 times the peak of the applicable floor spectra was used for the design modification. The RG&E analysis also considered the effect of bolt prying in their reevaluation and redesign. In general, they used the expedient of providing new anchorage in the form of stick welded angles to the cabinet plate at the base which was then expansion bolt anchored to the concrete slab rather than evaluating the existing anchorage design and installation integrity. All internally mounted components and devices weighing more than 25 pounds were analyzed as separate assemblies. Attachment of all internal devices and components were surveyed to assure all indicated attachments in the form of bolts, screws, clips, etc. were installed.

Dr. Stevenson concurred that the electrical equipment anchorage design and internal mounted devices and components evaluations and modification appeared quite adequate. However, he expressed a concern that the load path structural design adequacy between an electrical component or device through the panel frame and bracing to the equipment anchorage had not been adequately demonstrated as required (see Attachment B). This was a notable concern in Ginna as compared to Dresden-2 in that Dresden-2 provided upper lateral supports as well as new base supports to the cabinets thereby effectively halving the reaction forces and reducing bending moments by a factor of four. In addition, cabinet fundamental frequencies are increased by a factor of 3 as a result of the upper lateral restraint which in this case should also reduce the inertia loads.

Dr. Stevenson suggested that RG&E should structurally evaluate, on a sample basis, electrical panelboards, cabinets and racks to demonstrate their structural design adequacy to the requirements of the AISC Code as modified by the SRP Section 3.8.4 for the load combination which included the SSE.

E. Battery Racks

The battery racks are essentially the same as the Gould racks used on Dresden-2. Detailed structural analysis of the Gould racks for Dresden-2 indicate the only area of potential failure is in the wooden battens. In Ginna the existing racks have been stiffened by an external structural steel bracing system which is independently expansion anchored to the floor. In Dr. Stevenson's opinion the design modification to the racks is obviously capable of carrying currently defined seismic loads.

G. Valve Operators

In general, RG&E has made evaluation of Seismic Category I motor operated valves larger than 2" part of their seismic upgrade program where stresses in piping including the effect of eccentricity are determined to be within code allowables. The valve assembly is modeled for analysis as an equivalent tee section.

Dr. Stevenson expressed a concern that it is the smaller diameter piping that is particularly sensitive to eccentric valve laods. RG&E agreed to review its Seismic Category I 2" and under lines to identify any MOV. A separate calculation would be performed to evaluate the effect of valve eccentricity on the piping stresses.

To date no additional evaluation of valve operability has been supplied. See Section 5.3.1.7 of NUREG/CR-1821.

H. Essential Service Water Pumps

No additional information has been supplied. Demonstration of functionality during a seismic disturbance is still an unresolved issue.

ATTACHMENT-A

ANALYSIS REPORT

Component Cooling Water Surge Tank (CCWST) Supports

I. Analysis Basis

A. Models

The CCWST was considered to be an idealized single degree-of freedom rigid body supported by two saddle supports. The saddle supports were considered to be fixed at the top at the weld joint connecting them to the tank body, and pin connected at the base at the anchor bolts connecting them to the supporting structural steel beams.

B. Loads

The three orthogonal components of SSE seismic loads were determined by 1) considering the support system (combined saddle and beam) frequency in each direction, respectively, 2) using damping equal to 3% of critical damping, and 3) interpolating between floor response curves at elevations 271'-0" and 315'-0". Pressure and temperature loads were determined considering the tank design conditions (section 7.0 of the Design Criteria) and the lateral stiffness of the supporting structural steel beams.

C. Stresses

Stresses were calculated by hand using conventional formulas for stress and strain.

II. Analysis Results

Nomenclature is consistent with the definitions given in section 8.0 of the Design Criteria (unless noted). Only maximum Actual Stresses resulting from the load combinations specified in the Design Criteria are presented below. Also, only controling Stress Limits are defined.

Component/Location	Actual Stress (KSI)	Stress Limit (KSI)
A. Saddle		
1. All Vertical Plates	$\sigma_1 = 1.16$	$1.5S = 21.75$
2. Corner of Outside Vertical Flange Plate	$\sigma_1 + \sigma_2 = 32.23$	$2.25S = 32.63$
3. Shear Stress in Vertical Flange Plates	$\tau = 2.30$	Not defined by ASME code for Class III plate and shell structures, considered acceptable

Component/Location	Actual Stress (KSI)	Stress Limit (KSI)
4. Shear Stress in Vertical Web Plate	$\tau = 0.39$	"
5. Horizontal Base Plate	$\sigma_1 + \sigma_2 = 76.73$	$2.25S = 32.63$
6. Shear Stress in Welds joining Saddle Plates	$\tau = 33.17$	$F_v = 2.25S = 36.90$
B. Shear Stress in Weld joining Tank and Saddle	$\tau = 16.14$	$F_v = 2.25S = 36.90$
C. Anchor Bolts		
1. Shear Stress	$f_v = 15.90$	$F_v = 1.6S = 16.00$
2. Tension Stress	$f_t = 21.31$	$F_t = 1.6(26) - 1.8f_v = 12.97$

ATTACHMENT B

ATTACHMENT 1
ANCHORAGE AND SUPPORT OF SAFETY RELATED ELECTRICAL EQUIPMENT POINTS TO BE ADDRESSED BY SEP LICENSEES IN DECEMBER 31, 1980 SUBMITTAL

1. Information should be provided not only for the anchorage of electrical equipment but also the entire support that provides a load path (such as bracing and frames), as well as support for internally attached components. The latter is especially important for cabinet or panel type electrical equipment (such as control panels, instrument panels, etc.) which has internally supported components. An example of a potential improperly supported internal component would be a heavy component cantilevered off a front sheet metal panel without additional support to a stronger and stiffer location. These inadequate supports for internal components also should be identified and corrected before December 31, 1980.

2. In order to verify that an anchorage or a support of safety related electrical equipment has adequate capacity, provide justification by test, or analytical means. If expansion anchor bolts exist, justification provided previously for IE Bulletin 79-02 can be utilized if applicable. The acceptance criteria for substantiating these judgements should be provided, this may involve specifying the factor of safety and allowable stress limits used for design and justifying the overturning moment and shear force used.

3. Provide a table listing all (to include both floor and wall mounted) safety related electrical equipment in the plant. For each piece of equipment provide the information described in the attached table (attachment 2).

   These investigations of each piece of equipment should determine:

   a. Whether positive anchorage or support exists

   b. The type of anchorage

   c. Whether internally attached components are properly supported

   d. Identify non-seismic Category I equipment, the dislodgement of which during an earthquake may be detrimental to safety related equipment and render them inoperable. Inspection of the anchorages of such non-seismic Category I equipment should be conducted. If positive anchorages do not exist, they should be identified and modified before December 31, 1980.

4. Wherever modifications of anchorages or supports are required, these modifications should be implemented and thoroughly documented.

5. The seismic design of cable trays may be treated as a separate problem, because of its complexity. Each licensee or the SEP Owner's Group should provide a separate action plan for the resolution of this issue within 30 days of receipt of this letter.

ATTACHMENT 2
SUMMARY OF INVESTIGATION OF ANCHORAGE AND SUPPORT OF
SAFETY RELATED ELECTRICAL EQUIPMENT AND NON-SEISMIC CATEGORY I .
ITEMS THAT MAY DAMAGE THIS EQUIPMENT

Equip. Name	Equip. ID	System in Which Installed	Location Bldg. & Elev.	Type of Anchorage*	Was Anchorage Modified Since Jan. 1, 1980	Internally Attached Components			Non-Seismic Cat I Items that could potentially interact with this equip.			I.D. of Document Supporting Conclusion
						Equip. Name & ID	Type of Support	Was Support Evaluated	Name & ID	Type of Support	Was Support Evaluated	

*Examples of Type of Anchorage:
1. Bolted to Equipment
2. Bolted to Concrete Wall
3. Bolted to Concrete Slab
4. Bolted to Block Wall
5. Welded to Embedded Channel