FOLLOW-UP SEP EVALUATION
FOR THE
ROBERT E. GINNA NUCLEAR POWER PLANT

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The seismic design of the Robert E. Ginna Nuclear Power Plant, operated by Rochester Gas and Electric Corporation, has been reviewed as part of the Nuclear Regulatory Commission's (NRC) Systematic Evaluation Program (SEP). Since the SEP review was performed, the licensee prepared and submitted responses to previous requests for additional information and open items. This report summarizes the review of responses to unresolved items remaining from the original SEP Integrated Plant Safety Assessment.[1] Specifically, the unresolved items examined in this report were the adequacy of the main control board structure, the essential service water pump, and the essential storage tanks.

1. MAIN CONTROL BOARD STRUCTURE

Summary of RG&E Evaluation

Rochester Gas and Electric Corporation (RG&E) submitted their response[2] to the NRC for the acceptability of the main control board structure for weight and seismic loadings. The analysis of this structure was conducted in three phases: in situ modal testing, data processing, and structural analysis and evaluation.

The in situ modal testing involved dynamically loading the main control board structure with a small electromechanical vibration generator. The raw data obtained from the testing was saved on magnetic tapes. During the data processing phase, the test information gathered on tape was then evaluated for the frequencies and mode shapes of the main control board. Utilizing the processed information obtained from the in situ testing, the modal frequencies of the main control board were determined to fall within the range of maximum spectral response for the control building. The in situ testing also determined the measured damping to be in the range of one to three percent with a few measurements within a three to five percent damping range.

Structural analysis and evaluation of the main control board structure was initiated utilizing the modal frequencies previously obtained from the in situ test information. The peak of the floor response spectra of the control room building, elevation 289 ft, multiplied by a factor of 1.5 was used in a static analysis of the site specific postulated earthquake. A damping value of 7% for the horizontal floor response spectra was utilized. This damping value was considered because this structure is a part welded and part bolted structure. The welded steel and bolted steel damping values just below yield point were obtained from Reference 3. The damping value utilized for the vertical floor response spectra was 4%. The main control board stresses were then calculated using the square root sum of the squares (SRSS) method. These calculated stresses were compared to the acceptance criteria[3] to evaluate the integrity of the structure.

Acceptable stress limits were defined as 1.6 times the elastic design strength as defined in Part 1 of the AISC Manual.[4] However, these stress limits could not exceed 0.9 F_y for axial and bending stresses and 0.58 F_y for shear stresses.

The results of this evaluation indicated that the main control board structure is expected to withstand the postulated site specific earthquake with a few modifications. The main control board stresses were within the allowable stresses except for a few areas. The maximum overstressed component was 42% over the allowable stress. The six modifications recommended by URS/John A. Blume & Associates to alleviate these stress problems are listed in the Reference 2 conclusion. The modifications mostly consist of adding stiffeners to the main control board and the addition of connection plates between the vertical panels and the roof plates.

NRC Evaluation

The seismic evaluation of the R. E. Ginna main control board structure is considered reasonable and complete. All analysis assumptions and methodology are acceptable and the acceptance criteria utilized is in accordance with the AISC Manual. The floor response spectra generated from the NRC site specific spectrum at an elevation of 289 ft is considered appropriate for the main control board evaluation. In addition, the 7% damping value applied in this analysis was appropriately chosen and in accordance with NUREG-0800. The six modifications suggested for the main control board structure appear sufficient to warrant this main control board structurally adequate for the postulated site specific earthquake. In general, the main control board analysis satisfies the unresolved open item pertaining to control room electrical panels as stated in the initial SER.

2. ESSENTIAL SERVICE WATER PUMP

Summary of RG&E Evaluation

Rochester Gas and Electric Corporation submitted a report[5] on their seismic qualification analysis of the Essential Service Water (ESW) pump and lateral support. The pump and support system was qualified with a finite element analysis using response spectra to represent seismic loads.

In the analysis, a finite element model was developed for use in the WECAN computer code. The pump and support system were modeled using a combination of beam and pipe elements, and lumped masses were added to various locations along the pump centerline to include the mass of impellers, flanges, motor rotor, etc. Since seismic response spectra were not developed for the Screen House Building, where the ESW pump is located, the spectra corresponding to the same elevation in the Auxiliary Building were used in the analysis. The SSE RRS curves with 4% damping were used for the two horizontal directions and the vertical direction.

The seismic analysis included the response for all natural modes of vibration having frequencies up to 200 Hz in the vertical direction. The modal responses were combined using square root sum of the squares (SRSS) to determine the response to loading in each direction. The directional responses were then combined using SRSS to arrive at the total response to seismic loading.

In addition to seismic loads, the following normal operating loads were considered: deadweight, internal pressure, motor torque, nozzle loads, and thermal expansion loads. The nozzle loads and thermal expansion loads were deemed to be insignificant for this pump. The stresses and deflections due to the other operating loads were combined with the seismic stresses and deflections. The resulting stresses were compared to the normal (Level A) allowable stresses from the ASME Code Section III Subsection NC[6] to evaluate the structural integrity of the pump. The stresses and deflections were also used to assess operability of the pump.

Results of the evaluation showed that all of the calculated stresses and deflections resulting from the combined seismic and operating loads were within allowable limits. Therefore, it was concluded that seismic qualification of the pump and supports was demonstrated.

NRC Evaluation

The seismic evaluation of the ESW pump is complete and the methodology employed is in accordance with the qualification requirements of IEEE-STD-344-1975. The seismic response spectra and damping values were appropriately selected, and a significant number of vibration modes were included in the solution. The modal and directional responses were combined in accordance with Regulatory Guide 1.92 and the calculated stresses were compared with suitable allowables from the ASME Code Section III. Therefore, the seismic qualification for this item is acceptable.

3. STORAGE TANKS

The essential storage tanks at the R. E. Ginna plant consist of the Refueling Water Storage Tank, the Vertical Hold-up Tanks, and the Waste Hold-up Tank. In 1983 and 1984 Stevenson and Associates analyzed the above tanks in accordance with current methods. EG&G Idaho contracted Structural Mechanics Associates (SMA) to review these analyses. The SMA evaluation report is attached. EG&G has reviewed the SMA report and concurs with their conclusion that the subject tanks will withstand the postulated design earthquake for the R. E. Ginna site.

4. CONCLUSION

The issues addressed in this review concerning: (1) the Main Control Board, (2) the Essential Service Water Pump, and (3) the Essential Storage Tanks have been examined. These three specific components identified for seismic analysis are considered capable of withstanding the postulated site specific earthquake for the R. E. Ginna plant. All methods performed and conclusions drawn in these reports are acceptable.

5. REFERENCES

1. Integrated Plant Safety Assessment Report, Systematic Evaluation Program, R. E. Ginna Nuclear Power Plant, December 1982, NUPEG-0821.

2. .1. E. Maier ltr to D. M. Crutchfield; Docket No. 50244, SEP opic III-6, Seismic Considerations, R. E. Ginna Nuclear Plant; January 9, 1984.

3. U.S. Nuclear Regulatory Commission, STANDARD REVIEW PLAN, Section 3.8.4, Office of Nuclear Reactor Regulation, NUREG-0800, Washington D.C., July 1981.

4. American Institute of Steel Construction, SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS, New York, New York, 1969.

5. Westinghouse Electric Corporation, Seismic Qualification Analysis of RGE Service Water Pump and Lateral Support, January 1984.

6. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Nuclear Power Plant Components," Subsection NC.

ATTACHMENT

REVIEW OF THE SEISMIC QUALIFICATION
OF THE R. E. GINNA STORAGE TANK