SEISMIC EVALUATION OF WOLF CREEK GENERATING STATION
STRUCTURES USING LIVERMORE SPECTRUM

EVALUATION OF PIPING SYSTEMS AND SUPPORTS

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I. Introduction

This report is intended to outline the methodology and results of a stress evaluation performed for all site specific Essential Service Water System Nuclear Class 3 piping at Wolf Creek Generating Station, to determine the effects of increasing the current SSE ground motion design spectra g level linearly from 0.12g (zero period acceleration) to 0.15 g. The basis for the selection of a 0.15g SSE design spectrum, as well as its effects on the various plant buildings, buried piping, electrical duct banks and appurtenant structures have been discussed in a previous report dated April 2, 1982. This report is therefore limited to the evaluation of ESWS piping and associated supports within the pumphouse and in the valvehouse adjacent to the control building.

II. Stress Evaluation of Piping Systems

The Essential Service Water System site piping servicing the Wolf Creek plant power block extends from the pumphouse located adjacent to the ultimate heat sink through the valvehouse and into the west wall of the control building, where it enters the power block. The piping is buried below grade at all locations with the exception of the pumphouse and the valvehouse. Buried ESWS piping, although not a part of the standard power plant, was designed for seismic loads obtained from several SNUPPS sites and is not affected by the increased design spectra. Therefore, only the piping within the aforementioned structures has been considered in the stress evaluation.

For analytical purposes, all piping is divided into piping runs individually modeled and identified with a stress problem number. Each stress problem is modeled to include support and boundary conditions and analyzed using the applicable floor response accelerations. All piping stress problems within the pumphouse and valvehouse were investigated for possible stress increases resulting from higher floor response accelerations associated with a 0.15g SSE design spectrum.

SSE design accelerations used in the original dynamic analysis of each piping stress problem were compared to floor response spectral accelerations associated with the 0.15g design spectrum. Floor response accelerations resulting from the original "FLUSH" analysis, as well as the fixed base analysis (see April 2, 1982 report as transmitted via KMLNRC 82-192, G. L. Koester to H. R. Denton, dated May 3, 1982) were utilized as a basis for comparison. As per previous commitments, spectral accelerations for the original "FLUSH" curves used in the comparison were conservatively adjusted upward by 25% to reflect the rise of 0.12g to 0.15g.

Where the original SSE design accelerations were not greater than the scaled "FLUSH" curves or the fixed base analysis curves, the stress problem was reanalyzed utilizing original analysis methods as defined in the FSAR to evaluate the increased stress levels. Stress levels in the piping supports and their attachments, as well as the stress levels in the piping system were evaluated. The following stress problems were affected:

STRESS PROBLEM NO.	DESCRIPTION	LOCATION
317	30" Supply Lines. Pumps A&B to pumphouse wall.	ESWS Pumphouse
318	3" Traveling Water Screen Spray Piping. Train A	ESWS Pumphouse
318A	3" Traveling Water Screen Spray Piping. Train B	ESWS Pumphouse
319	3" Vent Line. Pump A	ESWS Pumphouse
319A	3" Vent Line. Pump B	ESWS Pumphouse
320	4" Backwash Line. Strainer A	ESWS Pumphouse
320A	4" Backwash Line. Strainer B	ESWS Pumphouse
322	30" Warming Line in Pipe Pit. Train A	ESWS Pumphouse
322A	30" Warming Line in Pipe Pit. Train B	ESWS Pumphouse
166	30" Supply Line. Train A	Valvehouse
166A	30" Supply Line. Train B	Valvehouse

III. Stress Evaluation Results

Of the eleven stress problems affected by the increased floor response accelerations, four problems, (317, 318, 322 and 166) required reanalysis. Problems 319 and 320 did not require reanalysis since the design accelerations used in the original analysis exceed or are reasonably close to the comparison basis curves. The evaluation showed that safety margins above those required for design, and outlined in the FSAR, exist in all stress levels for these problems to ensure their integrity even with the increased spectral accelerations.

Problems 319A and 320A are symmetrical to problems 319 and 320. Their evaluation is therefore identical.

The reanalysis of problems 317, 318, 322 and 166 indicated all pipe stresses, although greater than the original design stresses, are within ASME code allowables. The magnitude of load increase found at all piping supports for these problems, with the exception of hanger No. K-EF11-C009/011(Q), is not significant. Hanger No. K-EF11-C009/011(Q) will be subjected to a significant load increase, but will not require redesign, since this hanger is common to both the Callaway and Wolf Creek pumphouses and was originally designed for the higher Callaway loads associated with a 0.20g SSE design spectra. Problems 318A, 322A and 166A are symmetrical to problems 318, 322 and 166 and are evaluated similarly.

IV. Conclusions

All Essential Service Water System Nuclear Class 3 piping, including supports, have been reevaluated to spectral accelerations which, when compared to those resulting from the suggested design spectra for 0.15g as per previous commitments, yield conservative results.

The evaluation also considered the available stress margins in the piping and support systems and indicates that no modfications would be required for the piping or supports as a result of the suggested design spectra.