

PIPE SUPPORT DESIGN CALCULATION DEFICIENCIES

San Onofre Nuclear Generating Station
Units 2 and 3

INTRODUCTION

This final report is submitted pursuant to 10CFR50.55(e)(3). It describes a deficiency related to the lack of documented design calculations for certain safety related pipe supports for which drawings have been released for construction. This final report includes a description of the deficiency, analysis of the safety implications and a summary of the corrective action taken.

BACKGROUND

By letter dated June 8, 1979, Edison confirmed notification to the NRC of a condition in construction of San Onofre Units 2 and 3 which was considered reportable in accordance with 10CFR50.55(e). The condition initially reported involved the lack of documented design calculations for certain safety related pipe supports (2½ inch and larger pipe size) for which drawings have been released for construction. Further review indicates that the condition also applies to supports for 2 inch and under pipe size designed to ASME B&PV Code Section III Class 1 requirements or with design temperatures equal to or exceeding 500°F. The design of pipe supports is provided by Bechtel Power Corporation. The deficiency was discovered as the result of Bechtel and Edison quality assurance audits and supervisory reviews of the pipe support design area.

Designs of pipe supports consist of mechanical attachments, component standard supports and miscellaneous structural steel to transmit the resultant piping loads at the supports to the building structure. These supports require engineering analysis to establish the type and size of items to be used, the connection details and the support response characteristics to imposed design loadings.

Supports are designed based on project design standards and criteria and are controlled in accordance with documented design control procedures. These procedures require that designs of safety related items are supported by documented design calculations which include a listing of design criteria, design assumptions, applicable codes and standards, reference data and required reviews and approvals. These procedures also specify that the calculations will be checked by an independent review engineer prior to release of related drawings for construction.

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DISCUSSION

The following discussion is responsive to 10CFR50.55(e)(3).

Description of Deficiency

As a result of Bechtel and Edison quality assurance audits and supervisory reviews of the pipe support design control process, it was determined that a portion of the process involving the design of pipe supports utilizing miscellaneous structural steel was not being documented consistent with the design control procedures described above. Specifically, documented calculations were not being provided in all cases by the civil/structural design personnel to support pipe support drawings which were issued for construction. Review and approval of the design of the pipe supports was documented by initials in the drawing title block by cognizant structural engineers. The design of the supports was based on informal calculations and analysis which were not being documented or retained in accordance with applicable design control procedures. This deficiency is limited to pipe supports for a) 2½ inch larger pipe size and b) 2 inch and under pipe size designed to ASME B&PV Code Class 1 requirements or with design temperatures equal to or exceeding 500°F. There are an estimated 7,600 safety related supports affected by this deficiency.

The design process for pipe supports involves the combination of generic type designs using simple beam undersupports or cantilevers and somewhat complex arrangements which require detailed analysis and evaluation. In addition, many supports are of similar design making the process repetitive in nature.

Cognizant structural engineers working in the pipe support design area have indicated that due to the relative simplicity of the design and the repetitive nature of the support configurations, the extent of the required supporting design documentation was not clearly understood and therefore was not explicitly provided in all cases.

Analysis of Safety Implications

Since the design of the miscellaneous structural steel portion of these pipe supports was reviewed and approved by structural engineers as part of the drawing release procedures, the lack of formal, documented calculations, of itself, is not expected to have resulted in significant design deficiencies that could have

adversely affected the safety of operations of the plant. The adequacy of the design of the pipe supports will be confirmed as part of the evaluation program discussed in the corrective action section of this report.

Corrective Action

A design verification program has been instituted whereby calculation approaches and the applicability and availability of generic designs have been established for completion and checking of all safety related pipe support calculations prior to turnover of individual piping systems and their supports from construction to the startup testing phase. The Bechtel project procedures will be revised by July 30, 1979 to describe the controls provided over this design verification program. In particular, a hold point will exist in the procedures requiring a design engineering confirmation that all pipe support structural calculations are complete and the pipe support is adequate to perform its safety related function considering all design criteria and as constructed conditions prior to turnover of the related system to the startup testing phase. Production of the required calculations is currently in progress. Additionally, any new pipe support design drawings will not be issued until the associated calculations have been documented and the adequacy of the design has been verified by checking of the calculations.

Individual design engineers working on the project have been counselled on the requirement for documented calculations to justify the adequacy of the pipe support designs.

Similar Bechtel component support design functions have been reviewed or audited to verify that documented calculations exist, including those for conduit, cable tray and instrument tubing supports. No deficiencies of a comparable nature were identified.

In conclusion, a program has been instituted to upgrade the adequacy of design verification activities and the extent of design documentation required to support safety related pipe support designs. The implementation of this program will assure that these supports are properly designed, documented and verified to perform their safety related function prior to system turnover to startup.