

UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CONSUMERS POWER COMPANY

PALISADES PLANT

DOCKET NO. 50-255

INTRODUCTION

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The original Palisades seismic design criteria are described in Appendix A of the final safety analysis report (FSAR). In response to Inspection and Enforcement Bulletin (IEB) 79-14 the Consumers Power Company (CPCO), the licensee, informed the NRC that some of the seismic Class 1 piping did not conform to the Palisades FSAR acceptance criteria. Since then CPCO had provided an evaluation of the nonconformances and the planned corrective actions in the subsequent submittals of February 14, February 27, March 11, and April 14, 1980, to the NRC. The corrective actions included the use of interim allowable stress criteria to determine the operability of piping system.

The seismic design criteria for nuclear power plant piping systems have changed significantly since older plants, such as Palisades, were licensed. Older nuclear power plants generally were designed using less conservative seismic inputs and less rigorous analysis procedures than those used in more current These less conservative inputs and procedures were genplants. erally used with acceptance criteria for stress allowables in piping and piping supports that are more conservative than those used on more current plants. In reconginition of this, the NRC, in Revision 1 of IEB 79-14, requested that nonconformances be evaluated to either FSAR or other NRC approved acceptance criteria. Consistent with other staff positions taken during the implementation of IEB 79-14, CPCo proposed the use of the higher stress allowables specified in the ASME Code as interim criteria until the original FSAR design margins were restored. The staff had previously performed a safety evaluation in April 1980 of the proposed stress criteria and found them to be acceptable for interim use.

In October 1980, the licensee proceeded to change the original licensing basis in an FSAR amendment by incorporating the higher stress allowables. However, there is no documented evidence of staff acceptance of the change. The licensee appears to have performed the change under 10 CFR 50.59 which the staff considers to be unacceptable in view of its potential safety impact. The higher ASME Code piping stress allowables used by CPCo, therefore, did not conform to the original Palisades licensing basis.

As documented in Inspection Reports 50-255/90-25 and 50-255/ 91-202, the staff has identified a number of seismic related piping analysis concerns at Palisades, as a result of the special engineering inspections conducted in 1990 and in 1991, respectively. This included concerns regarding the adequacy of the original floor response spectra and their application to the more current analysis procedures and criteria, as well as the above mentioned higher ASME Code piping stress allowables. Such a practice, if adopted, would further create inconsistency in the Palisade licensee basis.

In view of the above, the licensee is proposing a change to the Palisades piping design criteria in order to resolve the current issue of inconsistency in piping design analysis. The proposed change has been discussed with the staff in the August 7, 1991 meeting, and the August 15, 1991, conference call.

EVALUATION

The original design code of record for Palisades piping design is USAS Code B31.1, 1967 Edition. As per the UFSAR, CPCo Design Class 1 systems were designed to a combination of USAS Code B31.1, 1967 Edition and ANSI Code B31.1, 1973 Edition. Since mid-1986, CPCo has used two methodologies to develop seismic pipe stresses and support loads. These methods have been referred to as the original seismic analysis method and the ASME Code Case N-411 seismic analysis method. The deficiency described above concerns itself mainly with seismic faulted allowables. The existing version of the FSAR described the faulted allowable as the greater of $1.1S_v$ or $2.4S_h$; where S_v and S_h are defined in the appropriate codes of record. This existing faulted allowable was introduced into the FSAR through an FSAR amendment in 1980 and has been used in seismic analysis when utilizing either the original seismic analysis method or the ASME Code Case N-411 seismic analysis method. In letters dated July 28, 1986 and October 20, 1986, CPCo applied for and received approval for the use of Code Case N-411.

Prior to the FSAR change of 1980, the faulted allowable for pipe stress was simply $1.1S_y$. The 1980 FSAR change reflected the addition of an alternative faulted allowable of $2.4S_h$. The $2.4S_h$ allowable was a 1976 inclusion into Subsection NC of the ASME Code. The relative values of $1.1S_y$ against $2.4S_h$ vary as a function of piping material and temperature.

used on existing systems to evaluate existing conditions or minor changes to piping systems, like equipment replacements. The ASME Code Case N-411 methodology and seismic faulted stress allowable of $2.4S_h$ will be used to design new systems and to evaluate piping systems that are significantly modified by pipe addition or rerouting of the pipe itself.

The staff finds the above proposed design criteria to be consistent with the current staff position of seismic analysis of piping and pipe supports, and are, therefore, acceptable.

CONCLUSION

Based on the above evaluation, the staff concludes that the piping stress criteria as proposed by CPCo constitute an acceptable alternative to the Palisades' original licensing basis. It is clear that the faulted stress allowable of $1.1S_y$ will continue to be used for existing piping systems or minor changes to the systems where the original seismic responses spectra are judged to be adequate for application. The stress allowable of $2.4S_h$, on the other hand, will only be used to design new piping systems or for the existing systems which are significantly modified. Under such circumstances, the ASME Code Case N-411 methodology, including the corresponding seismic response spectra are to be applied.

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At the time of the development of the initial FSAR requirements for piping, specific faulted allowables did not exist for piping in B31.1 or in the ASME Code. The original 1.15, represents a 10% over yield stress and was derived from structural allowables. This was considered appropriate for designing structures, under a faulted loading condition. The evolution of the ASME Code incorporated piping into its design requirements with the 1971 Edition and the faulted allowable of $2.4S_h$ for piping in a 1976 addenda to the 1974 Edition. It is noted that ANSI B31.1 still does not contain a faulted allowable for analysis conducted to its loading combinations. Current versions of NC/ND-3600 of the ASME code specify even higher faulted allowables for analysis employing its criteria which include stress indices rather than the stress intensification factor (SIFs) of ANSI B31.1. Therefore, those higher allowables in the current versions of NC/ND-3600 are not judged appropriate for ANSI B31.1 analysis. However, CPCo stated that the $2.4S_h$ faulted allowable of the 1976 vintage ASME Section III, NC/ND-3600 would be appropriate for ANSI B31.1 use because the load combination, SIFs and other analysis methods were very similar among these codes at that As previously stated, based on the information presented time. by CPCo at the time, the NRC staff reviewed and accepted this stress allowable of 2.4S_h only for use as an interim criteria. It has been inconsistently employed by CPCo, however, for seismic analyses performed using the original, less conservative FSAR analysis methodology.

CPCo is now requesting staff approval to revise the FSAR seismic faulted allowable stress criteria to be consistent with the application of the ASME Code Case N-411 methodology. This revision will, in effect, result in different faulted allowables for the two different seismic analysis methodologies. The result of the revision reflects consistency between the seismic load development methodologies and the associated allowables. Therefore, given the seismic analysis methodology the faulted stress allowables will be uniquely defined. The seismic faulted stress allowable for the original seismic analysis methodology shall be 1.15, for all existing systems to which that method is The seismic faulted stress allowable for the ASME Code applied. Case N-411 methodology shall be 2.4S_h for all systems to which that methodology is applied. This includes the use of Code Case N-411 response spectra rather than the original response spectra. The essence of the change is to maintain the original seismic analysis methodology and the associated original 1.1S, faulted allowable and to employ a more current seismic analysis methodology per USNRC Regulatory Guide 1.84, Rev. 27 along with a more current faulted allowable of 2.4S_h. The companion methodologies and allowables are based upon CPCo guidelines established to ensure similar margins of safety. The original seismic analysis methodology and seismic faulted stress allowable of 1.1S, will be