



**Consumers  
Power**

**POWERING  
MICHIGAN'S PROGRESS**

Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

**G B Slade**  
General Manager

October 7, 1991

Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

**DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT - CLARIFICATION OF SEISMIC  
DESIGN CRITERIA IN RESPONSE TO INSPECTION REPORT 91-202**

The NRC completed a special inspection of engineering and design control at the Palisades Plant from June 10 through June 21, 1991. The report of the inspection was contained in the NRC's August 2, 1991 letter.

The inspection report (IR 91-202) identified a deficiency, (D-1 piping stress allowable limits), that concerned the plant use and application of stress allowables as final piping design criteria. These allowables had been approved by the NRC as interim allowable criteria for use in the resolution of IE Bulletin 79-14 issues. The attachment provides resolution to the deficiency identified in the June inspection and incorporates comments from an August 7, 1991 meeting with the NRC, and an August 15, 1991 conference call with the NRC Palisades Project Manager and NRR Reviewer. We request that the NRC review and provide written concurrences for the changes to close this deficiency. Following NRC approval, the change will be incorporated into the FSAR.

Also during our August 7, 1991 meeting with the NRC, we described various other changes in the way that piping analysis will be completed and how plant design criteria will be applied in piping analysis. We stated that once our piping analysis programs and criteria have been revised, we would review the work done under phase I of the IEB 79-14 Safety Related Piping Reverification Project. This recently completed work used the old criteria and methods. By comparing these results with work completed using the new methods, we will be

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able to gauge what effect the new criteria and methods have on the recently completed phase I analysis, and what future actions may be necessary to assure that an adequate demonstrated safety margin exists for the phase I systems. As was agreed in our August 15, 1991 conference call, we hereby reconfirm our intent to commit to review the phase I analysis after completion of revisions to our program, criteria and implementation methods.



Gerald B Slade  
General Manager

CC Administrator, Region III, USNRC  
NRC Resident Inspector - Palisades

Attachments

ATTACHMENT

Consumers Power Company  
Palisades Plant  
Docket 50-255

CLARIFICATION OF SEISMIC DESIGN CRITERIA  
IN RESPONSE TO INSPECTION REPORT 91-202

October 7, 1991

NRC INSPECTION REPORT 91-202 - DEFICIENCY D-1

FINDING TITLE: Piping Stress Allowable Limits

Background:

The licensee described the original Palisades seismic design criteria in Appendix A of the FSAR (Reference 1). In response to Inspection and Enforcement Bulletin (IEB) 79-14 (Reference 2), the Consumers Power Company (CPCo) informed the NRC that some of the seismic Class 1 piping did not conform to the Palisades FSAR acceptance criteria. CPCo provided an evaluation of the nonconformances and the planned corrective actions in subsequent submittals to the NRC (References 3, 4, 5, and 6). The corrective actions included the use of interim allowable stress criteria to determine the operability of piping systems. These interim criteria utilized piping allowable stress criteria from Reference 7. In Reference 3, CPCo committed to perform any modifications needed to upgrade the plant to the FSAR criteria by the end of the Cycle 4 refueling outage scheduled for 1981. The NRC performed a safety assessment and found the allowable stress criteria acceptable for interim use (Reference 8).

In a subsequent letter to the NRC (Reference 9) CPCo stated that it had revised certain pages of the Palisades FSAR in response to the IEB 79-14 work and that the revised FSAR page changes would be transmitted in a separate letter (Reference 10).

Description of Condition:

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 on the more current plants. These less conservative inputs and procedures were generally used with acceptance criteria for allowable stresses in piping and piping supports that are more conservative than those used on more current plants. In recognition 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, the NRC staff allowed CPCo to use the higher allowable stresses specified in the ASME Code as interim criteria until the original FSAR design margins were restored.

In inspection report 50-255/90-25, the staff identified a number of concerns with the seismic input used to evaluate piping systems at Palisades. This included concerns regarding the adequacy of the original floor response spectra and the application of the original floor response spectra to current modification design analysis. CPCo's preliminary response to these concerns was that the original response spectra were considered adequate when Palisades was licensed and that the concerns raised were beyond the original licensing basis.

However, CPCo had changed the original licensing basis in the FSAR amendment submitted in Reference 10. CPCo could not locate an NRC staff safety evaluation that accepted this change to the original licensing basis. The pipe stress allowables used by CPCo did not conform to the original Palisades licensing basis. The NRC staff had apparently only reviewed and accepted these allowables for use as interim criteria. The team concluded that CPCo's change to the original FSAR licensing basis should not have been performed under 10 CFR 50.59 but should be reviewed and accepted by NRC staff.

#### References:

1. Consumers Power Company Palisades Plant Final Safety Analysis Report, Amendment 14 (July 22, 1969) through Amendment 17 (November 14, 1969).
2. NRC office of Inspection and Enforcement Bulletin (IEB) 79-14, "Seismic Analysis for As-Build Safety-Related Piping Systems," July 2, 1979; Revision 1, July 19, 1979; Supplement 1, August 15, 1979; Supplement 2, September 7, 1979.
3. Consumers Power Company letter to the NRC, February 14, 1980.
4. Consumers Power Company letter to the NRC, February 27, 1980.
5. Consumers Power Company letter to the NRC, March 11, 1980.
6. Consumers Power Company letter to the NRC, April 14, 1980.
7. 1976 Winter Addenda of the 1974 Edition of the ASME Boiler and Pressure Vessel Code, Section III, Subsection NC.
8. NRC letter to Consumers Power Company, April 25, 1980.
9. Consumers Power Company letter to the NRC, September 26, 1980.
10. Consumers Power Company letter to the NRC, October 24, 1980.

#### CPCO RESPONSE: PIPING STRESS ALLOWABLE LIMITS

CPCo is proposing a piping design criteria change to resolve the issue of pipe stress allowable limits. The proposed change has been informally discussed with the Staff and is now being transmitted for your written concurrence.

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 Boiler and Pressure Vessel (B&PV) Code Case N-411 seismic analysis method. The deficiency described above concerns itself with seismic faulted allowables. The existing version of the FSAR describes the faulted allowable as the greater of  $1.1S_y$  or  $2.4S_h$ ; where  $S_y$  and  $S_h$  are defined in the appropriate code of record. This existing faulted allowable was introduced into the FSAR in 1980 and has been employed

for seismic analysis performed when utilizing either the original seismic analysis method or the ASME B&PV 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 alternative faulted allowable value  $2.4S_h$ . The  $2.4S_h$  value was a 1976 inclusion into Subsection NC of the ASME Code. The relative values of  $1.1S_y$  or  $2.4S_h$  vary as a function of piping material and temperature.

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  $1.1 S_y$  employed as a faulted allowable was derived from structural allowables. At the time 10% over yield stress was not considered to be detrimental for designing structures. The evolution of the ASME Code incorporated piping into its design requirements with the 1971 Edition and the faulted allowable for piping in a 1976 addenda to the 1974 Edition. That faulted allowable ( $2.4S_h$ ) was judged appropriate for analysis done to any ANSI B31.1 or ASME Code Section III, Subsection NC/ND-3600 rules. 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 employ higher faulted allowables for analysis employing its criteria which include stress indices rather than the stress intensification factors (SIF) of ANSI B31.1. Therefore, those higher allowables in NC/ND-3600 are not judged appropriate for ANSI B31.1 analysis. However, the  $2.4S_h$  faulted allowable of the 1976 vintage ASME Section III, NC/ND-3600 is appropriate for ANSI B31.1 use in that the load combination, SIFs and other analysis methods were very similar among these codes at that time. The  $2.4S_h$  has been used, not for conservatism, but for of appropriateness and consistency.

CPCo is requesting approval to revise the 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 allowable will be uniquely defined. The seismic faulted stress allowable for the original seismic analysis methodology shall be  $1.1S_y$  for all existing systems to which that method is applied. The seismic faulted stress allowable for the ASME Code Case N-411 methodology shall be  $2.4S_h$  for all systems to which that methodology is applied. The essence of the change is to maintain the original seismic analysis methodology and the original  $1.1S_y$  faulted allowable and to employ a more current seismic analysis methodology per USNRC Regulatory Guide 1.84, Rev. 24 along with a more current faulted allowable of  $2.4S_h$ . The companion methodologies and allowables are based upon guidelines arranged to provide similar margins of safety.

The original seismic analysis methodology and seismic faulted stress allowable of  $1.1S_y$  will be used on existing systems to evaluate existing conditions or minor changes to piping systems, like equipment replacements.

The ASME Code Class 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.