Consumers Power
POWERING MICHIGAN'S PROGRESS
Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
MODIFICATION ENGINEERING INSPECTION FOLLOW-UP ACTIONS - UPDATE

An NRC Special Assessment Branch engineering team inspection was conducted at the Palisades Plant from June 10, 1991 through June 21, 1991. During the inspection, the team reviewed various aspects of the plant's modification and engineering programs including the Steam Generator Replacement Project. The team reviewed their inspection findings at an exit meeting held on Friday, June 21, 1991.

After reviewing the team's observations, Consumers Power Company proposed six actions to improve the performance in the areas of modification engineering and engineering practices in general. These actions were committed to the NRC in our July 9, 1991 letter. Since then, many of the actions have been completed or have evolved such that an update on the status is warranted. Listed below are the original actions followed by the current status.

I. FSAR REVISIONS

Original Action

The FSAR, Sections 5.7 and 5.10, will be revised to clarify pipe and pipe support design criteria and reduce ambiguity. This revision will address design criteria such as faulted and test allowables.

It is expected that a draft FSAR revision will be available on or before July 19, 1991. At that time we will transmit the draft revision for NRC staff review. We have scheduled a working meeting with NRR for August 7, 1991, for discussions on the revision.

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Updated Status

The proposed revisions to FSAR Sections 5.7 and 5.10 were made during the summer of 1991 and presented to the NRC for review and discussion at the August 7, 1991, meeting at White Flint.

The revisions resulted from NRC inspection observations and recommendations and include revisions or clarifications to the plant FSAR in the areas of faulted stress allowables, broadening of response spectra, use of absolute sum rather than square root sum of squares (SRSS), friction loads from thermal expansion, seismic anchor movements (SAMs), new response spectra, anchor bolt allowables, support steel verses supplementary steel design, and other FSAR clarifications. Staff comments not resolved on August 7 were discussed in an August 15, 1991, teleconference and these outstanding comments were resolved. During the August 7, 1991, meeting, the proposed FSAR revisions were discussed to determine if they were clarifications of existing FSAR criteria or actual changes in plant design criteria requiring NRC review and approval.

It was determined jointly between the NRC and CPCo that of all of the items reviewed at the meeting, only the change stress allowables for piping would need to be approved by the NRC prior to implementation by the plant.

Consumers Power Company's October 7, 1991, letter proposed a change in the piping stress allowable limits and requested NRC written concurrence with the change. The NRC's January 30, 1992, letter transmitted the Safety Evaluation which approved the criteria change.

II. SPECIFICATION C-173 AND M-195 UPGRADES

Original Action

Specifications C-173, "Technical Requirements for the Analysis and Design of Safety Related Pipe Supports" and M-195, "Requirements for the Design and Analysis of Palisades Plant Safety Related Piping and Instrument Tubing," will be upgraded to reflect the FSAR revised criteria discussed in Item I, above.

It is expected that revisions to C-173 and M-195 will be drafted by July 19, 1991, and implemented following review with the NRC.

Updated Status

Draft upgrades of both specifications were completed, and the specifications were approved for use on September 17, 1991, for C-173, and on October 22, 1991, for M-195. The FSAR changes discussed above are incorporated in both specifications. Only M-195 contains reference to piping stress allowable criteria that required NRC approval. M-195,

Revision 2 was viewed as preliminary until NRC approval was obtained. By letter, dated January 30, 1992, the NRC transmitted a Safety Evaluation which approved the piping stress allowable criteria change. Based on this approval, designs which used this specification as preliminary can now be made final.

III. UMBRELLA DOCUMENT

Original Action

An umbrella document will be written and issued to tie specification and procedural requirements together. This document will be in commentary format and each individual within the Nuclear Engineering and Construction Organization (NECO) who performs piping and pipe support analyses will receive training to its content. Training will be completed by December 1, 1991.

Updated Status

Although originally scheduled for completion by December 1, 1991, we have concluded that the umbrella document which ties specifications and procedural requirements together should not be completed until a better definition of what needs to be included is available. We have determined that it should be drafted concurrent with a technical training program scheduled for the second quarter of 1992 involving both the System Engineering and the Nuclear Engineering and Construction Organization (NECO) staff. As a result, the umbrella document is now planned to be drafted by July 31, 1992.

IV. ASSESSMENT OF PIPE AND PIPING SUPPORT ENGINEERING

Original Action

An assessment of pipe and pipe support engineering by a contractor commenced on June 3, 1991. The purpose of this assessment is to:

* Identify design engineering strengths and weaknesses.
* Identify root causes of engineering design weaknesses.
* Suggest improvements to people, processes and equipment to address root causes of identified weaknesses.

Currently, the assessment is scheduled to be complete by July 31, 1991. Upon receipt of the final report, an action plan and schedule will be developed for implementation of the assessment recommendations.

Updated Status

The assessment was presented to the Palisades Plant staff on August 16, 1991. Updates of the assessment were discussed at the October 15, 1991 Enforcement Conference. Plans for implementing the suggestions in the assessment have been consolidated with those plans associated with the Plant's earlier Design Engineering Self Assessment. The implementation program is ongoing and evolving.

V. CURRENT MODIFICATIONS

Original Action

Until such time as Items I and II are completed, no safety related modifications involving pipe and pipe support analyses will be implemented. Upon completion of the FSAR revision and revisions to specifications C-173 and M-195, a third party review of all NECO initiated pipe and pipe support analyses will be performed. Analyses performed by contractors will receive an in-depth review by NECO engineering prior to implementation. The third party review of NECO analyses will continue until the results of the contractor assessment are received and an action plan is developed and implemented. Based on the action plan and schedule, a milestone will be established for termination of the third party review of NECO initiated pipe and pipe support analyses. Exact timing of termination of third party review will be discussed with NRC staff at a later date.

Updated Status

a. Preliminary analysis, designs and drawings have been developed based upon the completed C-173, the proposed FSAR change, and preliminary M-195. No safety related pipe and pipe support modifications have been made between July 1991 and January 1992. Now that we have received the NRC's SER on the FSAR changes (discussed in Item I above), we plan to go forward with a number of pipe and pipe support modifications.

b. The third party review program is in place. Calculations for review now exist and the review began January 13, 1992. We recognize this review was implemented 6 months following our commitment letter date; however, this is due to little pipe and pipe support analysis being generated during the intervening period. The analyses that were generated have been held preliminary, pending letting of the third party review contract.

c. NECO (or its designated contractor) is performing the owner's review of analysis completed by contractors. The scope of that review has been proceduralized for ongoing projects and has been in the process of being implemented for a number of months. That procedure was formally incorporated as Attachment A to

Engineering Manual Procedure 18-03 (which relates to the engineering documentation requirements for Palisades Plant piping stress package material) in January 1992. A plan for the termination of these reviews will be made when they no longer are shown to be beneficial.

VI. MAIN STEAM LINE REANALYSIS

Original Action

As discussed during the NRC Special Assessment Branch engineering team inspection exit, the main steam line design will be reanalyzed after the FSAR and design specifications are revised. Consumers Power will align with NRC staff on the details of the reanalysis during the August 7, 1991, meeting and expect to be able to complete the work by the end of November.

Updated Status

The reanalysis of the main steam lines inside containment was initiated in September of 1991. A criteria change in specification M-195, Revision 2, associated with spectra broadening had a significant impact on the analysis associated with the steam generator replacement project. The broadening of the response spectra had the impact of making the seismic loads associated with the original plant seismic analysis method and the ASME, Section III Code Case N-411 method similar in magnitude. Therefore, the Code Case N-411 method was adopted for subsequent analysis and design for the main steam line and its supports. The Code Case N-411 method is associated with a more complete set of response spectra than the original seismic analysis method. Thus, issues with regard to spectra extrapolation and enveloping no longer become a concern.

The results of the piping reanalysis associated with the existing design indicated that an additional pipe support was required. That additional support can be provided by changing the uppermost main steam line whip restraint attached to the containment shell to a pipe support. This conversion will be achieved by shimming the pipe to the whip restraint to provide lateral restraint in the perpendicular directions. This modification, also, resolves the pipe stress and steam generator nozzle load concern.

During the design and analysis associated with the conversion of the whip restraint into a pipe support, a calculational error was found in the analysis of that restraint. The analysis was performed during the steam generator replacement project. The error involved the use of an incorrect radius of gyration for the back-to-back angle sets which support the weight of the whip restraint from underneath. These angles may also share the constant hanger load supported by the whip restraint with solid rods attached to the top side of the whip restraint. The Steam Generator Replacement Project used the larger (rather than

smaller) radius of gyration when computing critical buckling capacity. The result of the error is an overestimate of the back-to-back angle support buckling strength and a marginal design of the whip restraint with regard to whip restraint self weight and constant support hanger loads. The angles become overloaded when seismic self weight excitation is added to static loads as it must be for the analysis of a new support. The repair of the condition involves the use of a span brace back to the whip restraint (new support) to cut down the unsupported length and increase buckling capacity.

Additional support design concerns were identified with two constant support hangers, one on each of the main steam lines. One concern on these supports focuses on the potential interference of a washer plate with a hanger rod where the pipe is subject to large lateral deflections. The interference could place the rod in local bending which is not permitted by the pipe support design specification. A second concern on these supports is with the capacity of a weld made during the steam generator replacement project. The interaction ratio calculated for the weld during the project was 0.97. A more appropriate calculation of the interaction ratio, assuming the drawing weld size, yields a ratio greater than unity. The welds, washer plate and rod condition need to be inspected before a repair decision is made. If the drawings are correct, the weld will have to be enlarged and the washer plate repaired. Any modifications to resolve these identified discrepancies are planned to be completed during the 1992 refueling outage.

We have determined that the interim operability criteria are met for the piping system despite the washer plate, support weld, and back-to-back angle discrepancies.

We will be contacting the contractor, who completed this work, for an explanation and justification of methods used in calculations for these discrepancies to resolve our concerns. Once we reach resolution on those identified issues we will review the results and determine if any additional reviews of the contractor's work are needed.

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