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SUBJECT: Forwards specific corrective actions & closure plan re potential nonconforming conditions in certain PSCs.

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July 27, 1990.
NMP2L 1246

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: Nine Mile Point Unit 2
Docket No. 50-410
NPF-69

Gentlemen:

In its letter dated June 29, 1990, (NMP2L 1241), Niagara Mohawk Power Corporation (NMPC) provided information to the Nuclear Regulatory Commission (NRC) dealing with the discovery of potential nonconforming conditions in certain piping stress calculations for Nine Mile Point 2 (NMP2). In that letter, NMPC stated it would provide the NRC further input regarding specific actions and a closure plan for this issue by July 27, 1990. This letter fulfills that commitment.

If you have any questions regarding the information presented in this letter, please feel free to contact me.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

C. D. Terry
Vice President
Nuclear Engineering and Licensing

Attachment

CDT/lms
7298W

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# SPECIFIC CORRECTIVE ACTIONS AND CLOSURE PLAN

## I. INTRODUCTION

In its letter dated June 29, 1990, (NMP2L 1241), NMPC identified potential nonconforming conditions in certain piping stress calculations. In this context, nonconforming conditions were identified as: (1) the use of allowable stresses based upon CMTR's; and (2) deviations from analytical techniques and ASME Code Editions set forth in the USAR. As a result of further review, NMPC has concluded that the identified conditions were nonconforming as they are not appropriately documented in the Updated Safety Analysis Report (USAR). As a result of the identification of these nonconforming conditions, a root cause evaluation will be completed by October 26, 1990. In addition, based upon a preliminary evaluation, the modeling errors associated with the SLS system (see items (4) and (5), Section II) are believed to be isolated failures. The results of the completed root cause evaluation, a schedule of the implementation plan for the identified corrective actions from the root cause evaluation, and an implementation schedule for the corrective actions identified in this letter will be provided to the NRC by November 30, 1990.

The subsequent portions of this attachment discuss:

1. The specific corrective actions for:

   - Standby Liquid Control System (SLS) (Section II)
   - Reactor Water Cleanup System (RWCU) (Section III)
   - Main Steam System (MSS) (Section IV)
   - Primary Containment Penetrations (Section V)

2. The closure plan for:

   - the use of CMTR's (Section VI)
   - the use of ASME Code Editions (Section VI)
   - the use of ISM in combination with ASME Code Case N-411 damping values (Section VI)

The statements of the nonconforming conditions contained in Sections II, III, IV and V of this letter are restated from Niagara Mohawk's June 29, 1990 letter in order to facilitate the understanding of their associated corrective actions.

The specific corrective actions and closure plan entail a combination of plant modifications, revisions to analyses and calculations, and updates to the USAR. Modifications and USAR changes will be evaluated using the 10CFR50.59 process. Whenever a need for a modification is identified or information becomes available which brings into question the qualification of a system or plant safety, the need for an operability determination will also be evaluated, and if necessary, one will be developed.

## II. STANDBY LIQUID CONTROL SYSTEM

### NONCONFORMING CONDITIONS

1. Certain components were assessed using allowable stress values based on Certified Material Test Reports (CMTR's) during the as-built reconciliation program. However, the reconciliation program description in the USAR (paragraph 3.7.3.8.1A, pages 3.7A-23 and 3.7A-24) states that the load combinations and stress criteria are in accordance with the ASME Code[1] and refers back to the NMP2 design criteria (USAR paragraph 3.9.1.5A, page 3.9A-2b). The design criteria require piping system analyses to be in accordance with ASME Section III 1974 Edition, subarticles NB, NC and ND3600. The ASME Code does not address the use of CMTR's in as-built stress reconciliation except to state CMTR's shall not be used in the determination of vessel wall thickness. Therefore, the error was the lack of identification of CMTR use in the USAR.

2. Seismic analysis by the Independent Support Motion (ISM) method was used in combination with ASME Code Case N-411 damping values, and intergroup responses were combined using the square-root-sum-of-squares method. The USAR describes the seismic analysis technique by the Envelope Response Method (ERM) in paragraph 3.7.3.9A, page 3.7A-27a, for Stone and Webster Scope of Supply piping. However, use of ISM has been documented in the USAR (Section 3.7.2.1B) for GE Scope of Supply piping where Regulatory Guide 1.61 damping values are used.

3. Included in the stress analysis is documentation supporting an exception to the analysis requirement for ASME Code Class 1 piping. The justification is based on a Code subarticle NB-3630(d)(2) and a qualitative evaluation of the thermal transients defined for the SLS system. The qualitative evaluation is technically acceptable. However, the ASME Code subarticle is not valid as the 1974 Edition of ASME does not give conditions for exception from Class 1 rules. The intent was to reference a later Edition of the ASME Code (Summer of 1976 or later Edition) which gives the rules for exceptions from ASME Class 1 requirements. Therefore, the use of a later Code should have been reconciled with the 1974 Edition and listed in USAR Section 3.9.1.4.2A.

4. The outboard containment isolation valves (2SLS*MOV5A and 2SLS*MOV5B) contain significant eccentric masses which were incorrectly modeled.[2]

5. Stress intensification factors (SIF's) for socket welded end preparations were not included in the analysis as required by ASME.[2]

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1 Unless otherwise noted, the reference to the ASME Code is to ASME Section III, 1974 Edition.

2 Items (4) and (5) are not nonconforming conditions but rather calculational errors. They are included in this letter for purposes of completeness. These items will be addressed in the root cause evaluation.

## CORRECTIVE ACTIONS

The Standby Liquid Control piping system will be modified during the first refueling outage. The modification consists of the addition of supports to the motor operators on the outboard containment isolation valves, 2SLS*MOV5A and 2SLS*MOV5B, and the removal of pipe supports near the valves. To qualify the modified support arrangement, a reanalysis is being performed using analysis methodologies described in the USAR with the exception of one provision in a later Code Addenda being utilized. The use of editions to the ASME Code subsequent to the 1974 Edition is discussed in section VI of this attachment. The SLS pipe stress analysis for the modification will use the provisions of ASME subparagraph NB-3630 (d)(2) from the Summer 1976 Addenda to the 1974 Edition of the ASME Code. This subparagraph gives the conditions for analysis of a ASME Class 1 system using ASME Class 2 rules. Based upon a preliminary review of the conditions in ASME subparagraph NB-3630(d)(2) for analysis of ASME Class 1 piping, NMPC has concluded that the SLS system can be analyzed using ASME Class 2 rules. Seismic analysis by the Envelope Response Method (ERM) is being performed. ASME Code stress limits, without reliance on CMTR's, are being used to qualify pipe stresses.

In its June 29, 1990 letter to the NRC, NMPC stated that "A reanalysis, utilizing USAR criteria, was performed on the SLS piping subsystem. The reanalysis qualified pipe supports, containment penetration loads and valve accelerations to USAR criteria". To clarify that statement, the "penetration loads" were not qualified using existing USAR criteria but qualified using alternate load combinations. The acceptability of this approach is discussed in Section V, Item 2.

Once the previously identified corrective actions are completed, the operability determination for the SLS system, which was discussed in our June 29, 1990 letter, will no longer be required to support continued operation of NMP2.

## III. REACTOR WATER CLEANUP SYSTEM

### NONCONFORMING CONDITIONS

1. Certain components were qualified using allowable stress values based on Certified Material Test Reports (CMTR's) during the as-built reconciliation program. However, the reconciliation program description in the USAR (paragraph 3.7.3.8.1A, pages 3.7A-23 and 3.7A-24) states that the load combinations and stress criteria are in accordance with the ASME Code and refers back to the NMP2 design criteria (USAR paragraph 3.9.1.5A, page 3.9A-2b). The design criteria require piping system analyses to be in accordance with ASME Section III 1974 Edition, subarticles NB, NC and ND3600. The ASME Code does not address the use of CMTR's in as-built stress reconciliation except that CMTR's shall not be used in the determination of vessel wall thickness. Therefore, the error was the lack of specific identification of CMTR use in this instance in the USAR.

2. One of two piping components qualified using a CMTR also required that the CMTR be used in an equation from an ASME edition (ASME Section III, 1986, Section NC-3652) later than the code edition of record (ASME Section III, 1974). The use of the later code edition is not described in USAR Section 3.9.1.4.2A, which lists the specific provisions of later ASME Code addenda or editions that are substituted for requirements of the 1974 Edition. There is no documentation in the calculation which uses the .1986 Edition of the ASME Code demonstrating that the related requirements for the two codes were met as required by 10CFR50.55a.(c)(3) and ASME Section III, NA-1140.

### CORRECTIVE ACTIONS

The issue of the utilization of CMTR's on an Reactor Water Cleanup (WCS) subsystem was noted in the June 29, 1990 letter. In that letter, NMPC stated that there were two components qualified using CMTR's. There are actually three components one of which is already noted in the USAR: (1) two locations on a 3/4 inch vent/drain line pipe segment, (2) a tee, and (3) an elbow.

The use of CMTR's on the WCS subsystem has been re-evaluated for each of the three components where CMTR's were used. The following summarizes the evaluations that were made and the specific actions that resulted:

1. Two locations on the 3/4 inch vent/drain line were overstressed when compared to equation (9) for the upset condition. The major loading of concern was the OBE. A review of system geometry indicated that the applied spectra for this 3/4 inch line were being unreasonably controlled by the remainder of the Reactor Water Cleanup System. The 3/4 inch vent/drain line satisfies decoupling criteria by equivalent anchor which allowed the use of more appropriate spectra for that portion of the system and a subsequent reduction in seismic loading. All ASME Code requirements are now satisfied for these two locations.

2. The tee is slightly overstressed (0.5%) in Code Equation 9 (emergency plant condition) when compared to ASME allowables. The very small overstress is insignificant and the Code has been met since the magnitude of overstress is within the accuracy of the analysis. For this case the reference to the use of CMTR's will be removed from USAR Table 6.9A-5.

3. The WCS elbow has been re-evaluated and now meets all ASME Code requirements including subparagraph NB-3630(d)(2) from the Summer of 1976 Addenda to the 1974 Edition.

The WCS calculation will be revised to reflect this approach. The use of editions to the ASME Code subsequent to the 1974 Edition is discussed in Section VI of this attachment.

## IV. MAIN STEAM SYSTEM

### NONCONFORMING CONDITION

The main steam piping system was analyzed using ISM in combination with ASME Code Case N-411 damping values.

### CORRECTIVE ACTION

Section VI of this attachment, under the subheading "ISM & ASME Code Case N-411", discusses the corrective action associated with the main steam system.

V. PRIMARY CONTAINMENT PENETRATIONS

NONCONFORMING CONDITIONS

The nonconforming conditions identified in containment penetration calculations fall into one of four categories. They are:

1. The use of allowable stresses and stress intensities based on CMTR's.

2. The use of an alternate load combination not described in the USAR. Loads were combined differently from that stated in the USAR for Primary Containment Penetrations when the faulted load combination did not meet ASME allowables in the calculation. Pipe rupture loads were evaluated separately by comparison to ASME faulted allowables.

3. The incorrect reference to the 1974 Edition of the ASME Code in the penetration calculations.

4. The USAR requires MC Design equations I and II to include LOCA loads.

CORRECTIVE ACTION

The following specific corrective actions correspond to the statement of the nonconforming issues:

1. The use of allowable stresses and stress intensities based on CMTR's is dispositioned in accordance with the closure plan described in Section VI, under the subheading "CMTR's".

2. NMPC is continuing to evaluate the inconsistency between the load combinations for penetration qualification described in the USAR and those used in the calculations. The evaluation includes investigating the need for the use of the alternate load combinations and the existence of conservatisms in the generation of the maximum envelope pipe rupture loads. The circumstances that led to the use of the alternate load combination without proper documentation will be considered in the root cause evaluation. NMPC has a high degree of confidence that the penetrations can qualify to existing USAR requirements utilizing more refined analysis techniques and CMTR's. See Section VI regarding the acceptance for the use of CMTR's.

3. The incorrect reference to the 1974 Edition of the ASME Code in the penetration calculations is being evaluated. The calculations reference a code edition which is different from the code edition referenced in the design specification and the USAR. The corrective actions will entail either a revision to the penetration calculations or a revision to the USAR and the design specification.

4. USAR Table 3.8-7 will be corrected editorially for consistency with the containment penetration design specification. The load combination for Class MC penetrations should not include LOCA loads in Design Conditions I and II. LOCA loads need not be included in Design Conditions I and II as they are presently included in load combinations for the emergency and faulted conditions.

## VI. CLOSURE PLAN FOR CMTR's, ASME CODE EDITIONS, AND ISM & ASME CODE CASE N-411

This section of this attachment addresses the closure plan for the use of CMTR's, the use of editions of the ASME Code subsequent to the 1974 Edition and ISM in conjunction with ASME Code Case N-411 as they were used.

### CMTR's

Pipe stress calculations were evaluated based upon a selective sampling of plant systems (ECCS, safe shutdown and non-safety-related seismically qualified systems; see Table 1). The results of this evaluation, based on a sampling of 198 pipe stress calculations, indicate that CMTR's may be needed for (1) qualification of integral attachments on the Residual Heat Removal System (RHS); and (2) qualification of two reducers in the Feedwater System (FWS). The evaluations based on the sampling demonstrate that CMTR's were used on a limited basis. NMPC has also identified that CMTR's were used in the course of qualifying certain containment penetrations and certain pipe supports. After completion of the root cause evaluation, NMPC will re-evaluate the adequacy of the sample as well as the final disposition to ensure the closure plan adequately addresses this issue.

As stated in NMPC's June 29, 1990 letter to the NRC, the use of CMTR's for as-built reconciliation of piping systems and containment penetrations is reasonable since adequate design margin is still maintained between the increased allowable and the actual yield stress values. While CMTR's are generally not permitted for the design of systems and components, their use is appropriate for reconciliation once the system or component is installed and actual strength properties are known.

The final disposition of this issue will entail the following approach: (1) develop procedural controls and limitations on the use of CMTR's; (2) modify repair/replacement procedures to ensure proper review of future repair/replacement work; (3) review past modifications and work requests; and (4) discuss the use of CMTR's in the USAR, as appropriate.

## ASME CODE EDITIONS

In order to support the use of editions of the ASME Code subsequent to the 1974 Edition, the following will be done:

(1) development of a procedure for code reconciliation

(2) notification of the NRC by letter of the use of ASME Addendum subsequent to the 1974 Edition.

(3) revision of the USAR to reflect the use of ASME Code Editions subsequent to the 1974 Edition.

Items (1) and (2) will be implemented prior to the submittal of the 1991 USAR update. Item (3) will be processed in accordance with the 10CFR50.59 process and reflected in the 1991 USAR update.

## ISM & ASME CODE CASE N-411

As stated in NMPC's June 29 letter to the NRC, seismic analysis by the ISM method in conjunction with ASME Code Case N-411 damping values is not described in the USAR for piping supplied by the architect-engineer (AE). NMPC's previous letter stated the following:

> In our previous discussion we identified two potential nonconforming conditions relating to the use of Independent Support Method (ISM) and ASME Code Case N-411 damping values without NRC review. Our subsequent review appears to show that the staff has previously reviewed these conditions. Specifically, the Staff's Safety Evaluation Report (SER) for Nine Mile Point Unit 2 (NUREG-1047, February, 1985) Section 3.9.2.2; Page 3-38; the third and fourth paragraphs from the top of the page; and Supplemental Safety Evaluation Report 4; Section 3.9.2.2 discuss the use of ISM and ASME Code Case N-411 damping values. This staff analysis was examined by NMPC during the course of review of this matter just prior to the submittal of this letter. To avoid any delay, NMPC has not revised the attachment to this letter to reflect this recent finding regarding ISM and Code Case N-411. However, certain language contained in these safety evaluation reports can be reasonably interpreted as permitting the use of ISM in combination with ASME Code Case N-411 for NMP2. NMPC is continuing its review of this matter. If confirmed, such approval will adequately address this issue.

As a result of further review, NMPC has concluded that the NRC's SER's endorsed the use of ISM and ASME Code Case N-411 without restriction on the specific analysis method employed. A review of the letter (October 11, 1984; NMP2L 0198) from NMPC requesting Code Case N-411 approval as well as the NRC's letter (January 22, 1985) endorsing its use indicates that no restrictions were explicitly stated or implied regarding the method of seismic analysis to be used with Code Case N-411. Not withstanding this conclusion, NMPC is pursuing this issue further as discussed below.

A review has been completed of a sampling of 198 pipe stress calculations for AE supplied piping. Table 1 identifies the systems sampled and the number of calculations reviewed per system.

The results of this review indicate that nine analyses of the 198 reviewed utilized ISM in conjunction with Code Case N-411. The affected systems are:

(1) Main Steam, 5 calculations,
(2) Residual Heat Removal, 2 calculations,
(3) Standby Liquid Control, 1 calculation, and
(4) Reactor Core Isolation Cooling, 1 calculation.

The Standby Liquid Control System has been dispositioned using the approach described in Section II of this attachment. The remaining eight calculations are currently being evaluated against the following criteria:

1. The use of ISM with ASME Code Case N-411 damping values will be applied in its entirety to both the operating basis earthquake (OBE) and the safe shutdown earthquake (SSE);

2. The use of ISM in conjunction with ASME Code Case N-411 damping values, will meet, as a minimum, the guidance set forth in Welding Research Council Bulletin 352.

Any variances in the sample calculations from these criteria will be resolved. The final disposition of the issue will entail, as a minimum, the updating of the USAR to discuss the use of ISM with Code Case N-411 damping values. The final disposition may also include plant modifications, updates to the USAR and/or revisions to calculations. The results of the review of these remaining eight calculations will be included in the root cause evaluation.

TABLE #1

PIPING SYSTEMS REVIEWED

| SYSTEM | TITLE | NUMBER OF STRESS CALCS | NUMBER OF STRESS CALCS REVIEWED |
|---|---|---|---|
| MSS | Main Steam | 16 | 15 |
| SVV | Main Steam Safety Valves | 59 | 59 |
| IWS | Feedwater | 9 | 3 |
| RHS | Residual Heat Removal | 52 | 49 |
| SLS | Standby Liquid Control | 4 | 4 |
| ICS | Reactor Core Isolation Cooling | 17 | 15 |
| CSH | High-Pressure Core Spray | 15 | 15 |
| CSL | Low Pressure Core Spray | 9 | 9 |
| ISC | Reactor Vessel Instrumentation | 24 | 5 |
| SWP | Service Water | 86 | 20 |
| CCP | Reactor Building Closed Loop Cooling Water | 46 | 4 |
| | TOTALS | 337 | 198 |