February 5, 2004

MEMORANDUM TO: David Terao, Chief
Component and Containment Reliability Section
Mechanical and Civil Engineering Branch
Division of Engineering

FROM: Stephen Tingen, Mechanical Engineer ***/RA/***
Component and Containment Reliability Section
Mechanical and Civil Engineering Branch
Division of Engineering

SUBJECT: FORTHCOMING PUBLIC MEETING TO DISCUSS AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) CODE PIPING ISSUES

DATE & TIME: Monday, February 23, 2004
5:00 p.m. - 7:00 p.m.

LOCATION: Tradewinds Island Grand
Tarpon Key Conference Room
5500 Gulf Boulevard
St. Pete Beach, FL 33706

PURPOSE: Discuss NRC proposed modifications and limitations associated with the piping design criteria for reversing dynamic load (NB-3200, NB-3600, NC-3600, and NC-3600) presented in a proposed rule dated January 7, 2004 (69 FR 879). The rule proposes to amend Title 10 of the *Code of Federal Regulations* Section 50.55a, "Codes and Standards," to incorporate by reference the 2001 Edition and 2002 and 2003 Addenda of Section III, Division 1, of the ASME *Boiler and Pressure Vessel Code*.

CATEGORY 3*: The public is invited to participate in this meeting by providing comments and asking questions throughout the meeting.

PARTICIPANTS: Participants from the NRC include E. Imbro, D. Terao, S. Tingen, K. Manoly and J. Fair of the Office of Nuclear Reactor Regulation (NRR), members of the ASME, and the public.

Attachment: Agenda (ADAMS No. ML040360468)

cc w/att: See next page

MEETING CONTACT: Stephen Tingen, NRR
301-415-1280
sgt@nrc.gov

* Commission's Policy Statement on "Enhancing Public Participation in NRC Meetings," (67 FR 36920) May 28, 2002.

MEMORANDUM TO: David Terao, Chief
Component and Containment Reliability Section
Mechanical and Civil Engineering Branch
Division of Engineering

FROM: Stephen Tingen, Mechanical Engineer ***/RA/***
Component and Containment Reliability Section
Mechanical and Civil Engineering Branch
Division of Engineering

SUBJECT: FORTHCOMING PUBLIC MEETING TO DISCUSS AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) CODE PIPING ISSUES

DATE & TIME: Monday, February 23, 2004
5:00 p.m. - 7:00 p.m.

LOCATION: Tradewinds Island Grand
Tarpon Key Conference Room
5500 Gulf Boulevard
St. Pete Beach, FL 33706

PURPOSE: Discuss NRC proposed modifications and limitations associated with the piping design criteria for reversing dynamic load (NB-3200, NB-3600, NC-3600, and NC-3600) presented in a proposed rule dated January 7, 2004 (69 FR 879). The rule proposes to amend Title 10 of the *Code of Federal Regulations* Section 50.55a, "Codes and Standards," to incorporate by reference the 2001 Edition and 2002 and 2003 Addenda of Section III, Division 1, of the ASME *Boiler and Pressure Vessel Code*.

CATEGORY 3*: The public is invited to participate in this meeting by providing comments and asking questions throughout the meeting.

PARTICIPANTS: Participants from the NRC include E. Imbro, D. Terao, S. Tingen, K. Manoly and J. Fair of the Office of Nuclear Reactor Regulation (NRR), members of the ASME, and the public.

Attachment: Agenda (ADAMS No. ML)

cc w/att: See next page

MEETING CONTACT: Stephen Tingen, NRR
301-415-1280
sgt@nrc.gov

* Commission's Policy Statement on "Enhancing Public Participation in NRC Meetings," (67 FR 36920) May 28, 2002.

Accession No.: ML040360468

OFFICE	EMEB:DE		EMEB:DE	
NAME	STingen		DTerao	
DATE	2/3/04		2/5/04	

OFFICIAL RECORD COPY

Dated:

DISTRIBUTION:
Hard Copy:
PUBLIC
DE R/F

E-Mail:
M. Mayfield
E. Imbro
F. Cherny
W. Norris
J. Fair
S. Tingen
D. Terao
N. Chokshi
M. Hartzman
K. Manoly
W. Cheng-Ih

AGENDA

PUBLIC MEETING

SECTIONS III OF THE ASME BPV CODE (2001 EDITION, 2002, 2003 ADDENDA)

February 23, 2004

10 CFR 50.55a(b)(1)(iii) - Seismic Design

The proposed amendment would revise the existing limitation for seismic design in § 50.55a(b)(1)(iii) to limit its application to the 1994 Addenda through 2000 Addenda of Section III, Division 1, of the ASME BPV Code. The limitation in § 50.55a(b)(1)(iii) would not apply to the 2001 Edition through 2003 Addenda of Section III because the earlier Code provisions that this regulation was based on were revised in the 2001 through 2003 Addenda of Section III to address a number of the underlying issues which led the NRC to impose the limitation on the ASME Code provisions. New modifications and limitations proposed by the NRC on seismic design provisions in the 2001 through 2003 Addenda of Section III are discussed in § 50.55a(b)(1)(vi) below.

10 CFR 50.55a(b)(1)(vi) - Piping Design Criteria For Reversing Dynamic Loads

The proposed amendment would add modifications and limitations, § 50.55a(b)(1)(vi)(A) through (F), that prohibit or supplement as discussed below the use of certain piping design criteria for reversing dynamic loads in the 2001 Edition and the 2002 and 2003 Addenda of Section III of the ASME BPV Code. These provisions involve the alternative method for evaluating reversing dynamic loads. Reversing dynamic loads are defined as those loads which cycle about a mean value and include building filtered loads, seismic (earthquake) loads, and reflected wave loads.

The alternative method for evaluating reversing dynamic loads was revised in the 1994 Addenda of Section III. The new provisions in the 1994 Addenda were based, in part, on industry evaluations of the data from tests performed under sponsorship of the Electric Power Research Institute (EPRI) and NRC. After reviewing changes in the 1994 Addenda, the NRC determined that the alternative method was unacceptable because evaluation of the test data did not support the changes. An ASME special working group was established to reevaluate the bases for the alternative method for evaluating reversing dynamic loads that was revised in the 1994 Addenda. An NRC sponsored research program was also initiated to evaluate the technical issues regarding the adequacy of the new provisions in the 1994 Addenda. These technical issues are summarized in NUREG/CR-5361, “Seismic Analysis of Piping,” dated June 1998. The technical issues summarized in NUREG/CR-5361 were subsequently evaluated by ASME committees, and Section III of the ASME BPV Code has been revised to resolve the technical issues in NUREG/CR-5361. However, in the NRC’s view, several technical issues in NUREG/CR-5361 have not been satisfactorily resolved. These technical issues are discussed below.

10 CFR 50.55a(b)(1)(vi)(A) - Reflected Waves Caused by Flow Transients

NB-3200, NB-3600, NC-3600, and ND-3600 of the 2001 Edition and the 2002 and 2003 Addenda allow the alternative method for evaluating reversing dynamic loads to be applied to calculations for piping subject to loads generated by reflected waves caused by flow transients (sudden closure of a valve is an example of a condition that could create a flow transient). Members on ASME committees used data from tests performed under the sponsorship of EPRI and NRC that focused on seismic loading conditions to demonstrate that use of the alternative method for evaluating reversing dynamic loads for piping subject to loads provided acceptable design margins. As discussed in NUREG/CR-5361, the limited amount of test data does not support a finding that the design margin is adequate for these types of loadings. Therefore, the NRC is proposing to disallow the use of the alternative method for evaluating reversing dynamic loads for piping subject to loads generated by reflected waves caused by flow transients in NB-3200, NB-3600, NC-3600, and ND-3600.

10 CFR 50.55a(b)(1)(vi)(B) - Inelastic Analysis for Evaluating Reversing Dynamic Loads

NB-3228.6 of the 2001 Edition and the 2002 and 2003 Addenda provides alternative provisions for performing an inelastic analysis for evaluating reversing dynamic loads. The NRC is proposing to disallow the use of NB-3228.6. As discussed in NUREG/CR-5361, the NRC's and industry's review of the limited amount of test data does not support a finding that the design margin is adequate. In addition, it would require validation of the nonlinear material modeling (constitutive relationships) in order to justify selection of the material models because of the high sensitivity of the dynamic analysis to these material models.

10 CFR 50.55a(b)(1)(vi)(C) - Level A and B Service Limit Loadings

NC-3653.2(d) and ND-3653.2(d) of the 2001 Edition and the 2002 and 2003 Addenda provide a separate equation for evaluating reversing dynamic loads from other design basis loadings for Level A and B service limits. The NRC is proposing to disallow the use of NC-3653.2(d) and ND-3653.2(d) because it has not been demonstrated that these provisions provide an adequate design margin or that the treatment of reversing dynamic loads separate from other design basis loads is acceptable. The NRC is proposing the use of NC-3653.1 and NC-3653.2 instead of NC-3653.2(d), and ND-3653.1 and ND-3653.2 instead of ND-3653.2(d). Analysis using NC-3653.1 or ND-3653.1 must include pressure and reversing dynamic loads that are not required to be combined with nonreversing dynamic loads. The allowable B_2' stress indices defined in NC-3655(b)(3) may be used in these analyses. The anchor motions associated with reversing dynamic loads must be included as an anchor displacement in the definition of M_C when applying NC-3653.2 or ND-3653.2.

10 CFR 50.55a(b)(1)(vi)(D) - Appendix N Linear Elastic Response Spectrum Analysis

NB-3656(b)(3), NC-3655(b)(3), and ND-3655(b)(3) of the 2001 Edition and the 2002 and 2003 Addenda provide a definition of the moment, $M_{E,}$ to be used in the evaluation of reversing dynamic loads. The moment definition states that reversing dynamic loads must be computed from a linear elastic response spectrum analysis as defined in Appendix N of Section III. Linear elastic response spectrum analysis requirements are also addressed in the licensing basis for each nuclear power plant. Appendix N linear elastic response spectrum analysis provisions may be less conservative than licensing basis linear elastic response spectrum analysis provisions. The proposed rule would disallow the use of Appendix N in applications when Appendix N linear elastic response spectrum analysis provisions are less conservative than licensing basis linear elastic response spectrum analysis provisions. A licensee would be

required to compare the Appendix N linear elastic response spectrum analysis provisions to its licensing basis linear elastic response spectrum analysis provisions, and use the provisions that provide the most conservative calculation of M_E.

10 CFR 50.55a(b)(1)(vi)(E) - Stress Indices for Tees and Elbows

NB-3656(b)(3), NC-3655(b)(3), and ND-3655(b)(3) of the 2001 Edition and the 2002 and 2003 Addenda specify the maximum allowable B_2' stress indices for tees and elbows when using the alternative method for evaluating dynamic reversing loads. The allowable B_2' stress indices specified in ND-3655(b)(3) are not consistent with the allowable B_2' stress indices specified in NB-3656(b)(3) and NC-3655(b)(3). The allowable B_2' stress indices of 3/4 up to B_2 for tees and elbows as specified in NB-3656(b)(3) and NC-3655(b)(3) are acceptable. The NRC is proposing to disallow the use of the B_2' stress indices specified in ND-3655(b)(3), and to require that the allowable B_2' stress indices specified in NB-3656(b)(3) and NC-3655(b)(3) be used instead of the allowable B_2' stress indices specified in ND-3655(b)(3). The NRC is proposing to disallow the use of the B_2' stress indices specified in ND-3655(b)(3) for tees and elbows because the design margins associated with this application have not been established.

10 CFR 50.55a(b)(1)(vi)(F) - Anchor Motions

The proposed amendment would allow the use of an allowable stress limit of $6S_M$ in the evaluation of the range of resultant moment only when it is demonstrated that the global piping system response to the anchor movement does not create significant inelastic strain concentrations when using the provisions in NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4). The proposed amendment would not require a demonstration that the anchor movement does not create significant inelastic strain concentrations if an allowable stress limit of $3S_M$ is used instead of $6S_M$ in the evaluation of the range of resultant moment. NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4) of the 2001 Edition and the 2002 and 2003 Addenda provide provisions for evaluating anchor motions when using the alternative method for evaluating reversing dynamic loads. The allowable bending stress limit of $6S_M$ in NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4) is used in conjunction with the elastic analysis of the piping system. However, significant inelastic strains in the piping system could occur at the $6S_M$ stress limit. The elastic analysis of the piping system will ensure that the inelastic piping strains will remain within acceptable limits as long as the global piping system behaves elastic. However, if a significant strain concentration exists in the piping system, the maximum strain may be much greater than would be predicted by an elastic analysis. These larger strains could result in failure of the piping. The use of an allowable stress limit of $3S_M$ instead of $6S_M$ is acceptable because the adequacy of the $3S_M$ stress limit has been satisfactorily demonstrated by operating experience for thermal loads.