NORTHEAST UTILITIES

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NORTHEAST NUCLEAR ENERGY COMPANY

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June 19, 1984

Docket No. 50-423
B11225

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: (1) W. G. Counsil letter to B. J. Youngblood, Revised Responses to Mechanical Engineering Branch Questions 210.31, 210.34, 210.36, 210.37, 210.44 and 210.45, May 22, 1984.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
NRC Mechanical Engineering Branch (MEB) Review Meeting

A meeting was held among representatives of the NRC-MEB, Northeast Nuclear Energy Company (NNECO) and Stone & Webster in Bethesda, MD on June 8, 1984. A list of attendees is attached. The purpose of the meeting was to discuss NNECO's responses to 6 questions which were transmitted to the NRC via Reference (1). The status of each question was noted as defined by one of the following three categories:

Closed - No further NNECO input or action is needed to resolve the NRC concern.

Confirmatory - NNECO must provide the requested information on the Millstone Unit No. 3 docket, either by a letter or FSAR amendment.

Open - No resolution possible at this time, NNECO to address.

Attachment I provides a summary of discussion and the status for each of the questions discussed at the meeting.

Attachment II provides the information necessary to resolve questions 210.31, 210.36 and 210.37.

B001
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If you have any questions, please contact our licensing representative directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY
et. al.

BY NORTHEAST NUCLEAR ENERGY COMPANY
Their Agent

W. G. Counsil
Senior Vice President

STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Notary Public

My Commission Expires March 31, 1988

ATTENDANCE

6/8/84 MEB Review Meeting

1.	E. Doolittle	NRC/OL	Lic. Proj. Manager
2.	J.L. Majewski	NU/Licensing	Asst. Engr.
3	PJ Quinlan	NU Mechanical Engineering Branch	Engineer
4	G.P. MILLEY	S&W " "	LEAD ENGR. EMD
5	R.F. HANKINSON	S&W " "	SECTION MANAGER
6.	A.L. Van Sickel	S&W EMD	Chief Engineer
7	C.J. GLADDING	NU Mech. Eng.	Supervisor
8	RE LEFEBVRE	NU MP3 PROJECT	LEAD MECH. ENG.
9	K.A. MANOLY	USNRC - REGION I	DIV of ENG.
10.	H.L. BRAMMER	NRC/DE/MEB	SECTION LEADER, MEB
11	Y.C. (Renee) Li	NRC/DE/MEB	Mechanical Engineer
12.	D. TERAO	NRC/DE/MEB	mech. Eng.
13	BOB BOSNAK	NRC/DE/MEB	Chief MEB

ATTACHMENT I

Status of the NRC-MEB Questions

Discussed at the June 8, 1984 Meeting

Question	Status	Remarks/Required Action
210.31	Open	NRC will not allow 80% of the endurance limit. They will accept either 60% of the 10^6 cycles curve or 100% of the 10^{11} cycles curve in ASME III. NNECO will also revise the response addressing transient vibrations to state that if instrumented results exceed acceptance criteria, the results will be reconciled with the design analysis and with the code allowables.
210.34	Closed	
210.36	Open	NNECO will perform a sampling of approximately 100 stress calculations to show that stress does not exceed 0.95 Sy. Also, show that displacements are small to justify not including A' term in loading combinations for faulted conditions in table 210.36-1. This should also consider component supports. Provide information on design of welds for pipe supports. Also, describe how requirements of AWS D1.1 are met.
210.37	Open	1/8" oversize is more conservative than that allowed by AISC. Therefore, we meet AISC requirements. The NRC questioned whether washers are used on bolts of smaller diameter. Washers are used on all bolt applications. The response will be revised to reflect this. Do stresses on bolts in NSSS scope fall below yield?
210.44	Confirmatory	MEB agrees that if exemption is granted, item can be closed.
210.45	Open	This item will be discussed in a separate conference call with D. Terao, NRC-MEB.

ATTACHMENT II

Responses to NRC Questions

210.31
210.36
210.37

Question No. Q210.31 (Section 3.9.2)

Provide the acceptance criteria that will be used to determine if the vibration levels observed or measured during the preoperational testing are acceptable. Specifically address how the vibration amplitudes will be related to a stress level and what stress levels will be used for both steady-state and transient vibration.

Response:

Vibration levels are observed or measured during preoperational testing for both steady state and transient vibration conditions. The programs used to monitor these conditions are described below.

Steady State Vibrations

Visual observations are used for judging acceptability of steady state vibration. Visual observations may be aided by hand-held instruments (e.g., vibrometers) when considered appropriate by engineers experienced in piping design.

A screening velocity or displacement will be established. If the measurement indicates that the velocity or displacement limit is exceeded, the measured values are reconciled with the respective analyses by considering the specific piping configuration, velocity or displacement amplitude measured, stress indices, and the endurance strength of the material properly accounting for the impact of high cycle effects. If system modifications are required, the applicable ASME design calculations are reconciled to assure acceptable system characteristics for all applicable design conditions.

The maximum alternating stress intensity (S_{alt}) will be used to establish the acceptance stress criteria for steady state vibrations.

For ASME Class 1 piping:

$$S_{alt} = C_2 K_2 \frac{M}{Z} \leq \alpha \quad S_{el}$$

where: α = 0.615 for materials covered by Figure I-9.1 of ASME III
α = 1.0 for materials covered by Figure I-9.2 of ASME III

C_2 = Secondary stress index defined in the ASME Code

K_2 = Local stress index defined in the ASME Code

M = Maximum zero to peak dynamic moment loading due to vibration displacement

Z = Section modulus of pipe

S_{el} = Alternating stress at 10^6 cycles from Figure I-9.1 or I-9.2 of Section III of the ASME Code or alternating stress at 10^{11} cycles* from Figure I-9.2 of ASME Section III.

For ASME Classes 2 and 3 piping, and for ANSI B31.1 piping the above equation is applicable, setting:

$$C_2 K_2 = 2i$$

where:

i = Stress intensification factor, as defined in the ASME Code, Subsection NC, ND; or B31.1.

Transient Vibrations

Transient vibration conditions are subjected to visual and instrumented observations as described in the response to NRC Question 210.30. When instrumented observations are taken, the acceptance criteria are based on the applicable fluid system transient analysis (stress, deflection, etc) results. Instrumented observations are considered acceptable if they are within the transient analysis results acceptance criteria. If instrumented results exceed the acceptance criteria, the results are reconciled with the design analysis including the appropriate code allowable. When system modifications are required to achieve acceptable levels of transient vibration, the ASME design calculations are reviewed and modified as necessary to assure acceptable system characteristics.

*An appropriate number of cycles less than 10^{11} may be specified by Engineering based on system operation and actual system response data.

NRC Letter: December 5, 1983

Question No. Q210.36 (Section 3.9.3)

The staff review of FSAR Section 3.9B.3.4 and 3.9N.3.4 finds that there is insufficient information regarding the design of component supports. Per SRP Section 3.9.3, our review includes an assessment of design and structural integrity of the supports. The review addresses three types of supports: (1) plate and shell, (2) linear, and (3) component standard types. For each of the above three types of supports, provide the following information (as applicable) for our review:

(a) Describe for typical support details which part of the support is designed and constructed as component supports and which part is designed and constructed as building steel (NF vs AISC jurisdictional boundaries).

(b) Provide the complete basis used for the design and construction of both the component support and the building steel up to the building structure. Include the applicable codes and standards used in the design, procurement, installation, examination, and inspection.

(c) Provide the loads, load combinations, and stress limits used for the component support up to the building structure.

(d) Provide the deformation limits used for the component supports.

(e) Describe the buckling criteria used for the design of component supports.

Response:

BOP Scope

a. The reactor vessel support system (RVSS) is classified "plate and shell". It has been designed, fabricated, and installed in accordance with ASME III, Subsection NF. The RVSS bears on a concrete floor. Connection to building structure is by embedded thread rod, designed in accordance with NF.

All other nonintegral supports for ASME III equipment are linear types but can have component standard elements within the load path. These are designed, fabricated, and installed in accordance with ASME III/NF. For linear type supports, the jurisdictional boundaries are defined as follows:

- Attachment to embedded plates via welding to or bolting into embedded plates; the plate is per AISC and bolts or welds fall within NF jurisdiction.

- Grouted in surface mounted plates anchored by threaded embedded rods, rods (bolting), and nuts are in accordance with AISC. Surface plates are designed and fabricated in accordance with ASME III/NF but are defined as being outside the NF jurisdictional boundary.

b. Equipment supports are designed, fabricated, inspected, and installed in accordance with ASME III/NF. This includes the component standard support elements included in the load path except leveling devices on the RVSS and hydraulic snubbers on the steam generator and RCP supports. These exceptions were in accordance with ASME III to the greatest extent feasible. There are no occurrences of intervening building steel within the load path. Design criteria for building steel is in FSAR Section 3.8.

c. Loading combinations are in accordance with FSAR Section 3.9B.3.1.1 for Class 1 supports and Section 3.9B.3.1.2 for Classes 2 and 3 supports. Allowable stress is in accordance with ASME III NF-3100 for plate and shell, normal and upset conditions. For linear type supports, including component standard types within the load path, stress allowables are in accordance with ASME III, Appendix XVII for normal and upset conditions. Faulted condition allowables are in accordance with Appendix F.

d. All equipment supports are elastic. Deformation limits are not used.

e. For the RVSS, buckling for a cylindrical shell was considered.

   For linear type supports the buckling criteria is in accordance with ASME III, Appendix XVII-2220.

Millstone 3 pipe supports consist of linear and component standard types. Plate and shell type supports are not used for pipe support applications. The response to items (a) through (e) of the question as applicable to pipe supports are:

a. All linear type supports (except for dual function restraints described in response to NRC Question 210.23) and component standard supports within the load path are designed according to AISC code with the exceptions noted in Tables Q210.36-1 and Q210.36-2

b. All pipe supports (except for dual function restraints described in the response to NRC Question 210.23) are designed, fabricated, installed, and inspected in accordance with AISC Code and with Tables Q210.36-1 and Q210.36-2. When pipe supports include integral welded attachments to pressure retaining boundaries, the integral welded attachments are designed, fabricated, installed, and inspected in accordance with the Code rules applicable to the pressure retaining members.

c. Loads and load combinations used for linear type pipe supports are described in Tables Q210.36-1, Q210.36-2, and Q210.36-3. The allowables are based on AISC Code and Tables Q210.36-1 and Q210.36-2. The loads, load combinations, and the corresponding allowables for designing integral welded attachments to pressure retaining boundaries are described in FSAR Section 3.9B.3, Tables 3.9B-10, 3.9B-11, and 3.9B-12.

d. All pipe supports are designed elastic. Deformation limits are not defined.

e. Buckling criteria used for pipe supports is in accordance with AISC Code, 7th Edition. (See Table Q210.36-4 for applicable AISC Code equations used for buckling check.)

NSSS Scope

a. Westinghouse has supplied supports only for those Class 2 and 3 components also supplied by Westinghouse to which the supports are attached. This equipment is divided into two groups.

The first group consists of auxiliary tanks and heat exchangers. The supports for these components are, for the most part, plate and shell type supports. These supports meet the requirements of Subsection NF of the ASME Code with the exception of the volume control tank supports, which, because of the procurement date, are designed to the requirements of the AISC Code. The FSAR will be amended to clarify this point by May 1984.

The second group consists of Class 2 and 3 auxiliary pumps. The supports for these pumps are linear type supports. The supports for the charging and safety injection pumps meet the requirements of Subsection NF of the ASME Code. Other auxiliary pump supports are designed by the pump manufacturer to pressure boundary stress limits, but in no case is yield stress exceeded. The FSAR will be amended to clarify the point by May 1984.

c. The loads and load combinations of the supports for the auxiliary equipment supplied by Westinghouse are the same as those of the supported component. These loads and load combinations are given in FSAR Table 3.9N-4

d. There are no permanent deformation limits for the supports for tanks, heat exchangers, or pumps since these supports are required to remain elastic. Additionally, the supports for active pumps must not deform such that specified critical clearances are maintained so that the pump remains operable. The clearances are specified in the pump specifications.

e. Buckling, for all auxiliary equipment supports, is prevented by maintaining the two thirds of critical buckling criteria.

Additional Response (5/84)

The staff raised several questions regarding the following topics.

a) Allowable tensile stress for faulted conditon

b) Load combination for faulted condition

c) Comparison of ASME-NF criteria versus Millstone 3

d) Clarification of Buckling Criteria

a) The Staff questioned the allowable stress values used for support design under faulted loading conditions. Millstone 3 support design is based on Appendix F of the ASME code. Appendix F first appeared in the Winter 1972 addenda and provides allowable values for member stress when linear elastic analysis is performed.

The use of Appendix F allowables for non-NF supports is justified based on the comparison of NF versus Millstone criteria provided in section c.) of this response. The design criteria and programs in place for material control and tracability, fabrication, erection, and inspection of pipe supports meet the intent of NF. With the exception of examination criteria for primary members welds on Class 1 supports and variations in inspector qualifications, the Millstone program is essentially equivalent to NF requirements.

Pipe supports are fabricated almost exclusively from SA-36 plate and SA-500 Grade B tube steel. For these materials .7Su governs design rather than 1.2 Sy. The ultimate tensile stress limits the design to 1.13 Sy by definition.

A consideration should be given to the fact that the support loads are developed from piping analyses which are extremely conservative. Damping values of 1/2% for OBE and 1% for SSE produce support loads which are much greater than could be expected from actual experience. The current Regulatory Guide position allows damping values greater than those used for Millstone 3 and actual test data supports the use of even higher damping values (especially for the SSE event). The response spectra utilized in the piping analyses are developed from a structural analysis which assumes conservative damping values. Without even considering other conservative factors, the damping values alone compensate for the variation between Appendix F allowables and the .95Sy allowable recommended by the Staff.

Also pertinent to this discussion is the fact that the containment spray systems (Quench Spray, Recirc Spray and portions of Safety Injection) are designed to Level B allowables for the Faulted condition.

From a design standpoint member stress is rarely the limiting factor for piping supports. Typically anchor bolts or weld stress have the least amount of design margin available whereas member stress is usually low.

The NF comparison in conjunction with the conservative factors outlined above justifies the use of Appendix F allowables for pipe support design.

b) The Staff questioned the load combinations used for the Faulted condition for support design. Specifically, thermal loads, loads due to SSE anchor movements and LOCA loads are not included in the load combination.

Justification for this position may be found in ASME III Subsection NF. For linear type supports NF 3231.1(c) states that faulted conditions may be considered independently of all other design and operating conditions and that constrained free end displacement and differential support motion effects need not be considered. Therefore loads imposed on supports due to contrained thermal expansion of piping and anchor movements due to thermal SSE and LOCA are not included in the Faulted loading combination.

From a practical standpoint, Level B load combination tends to govern design rather than Level D. LOCA induced loads were not included since it is our intention to request an exemption from postulating reactor coolant main loop breaks. As discussed in the response to Q210.34, the amplified response spectra are such that the OBE tends to govern design. As discussed in section a) above, the support loads which are the product of a very conservative piping analysis, result in an adequate support design considering the concerns of the Staff.

The fact that the code does not require these loads to be considered together with the inherent conservatism in the support design as outlined above adequately address the Staff's concerns.

c) The Staff requested a comparison of ASME III NF requirements versus the codes, standards and procedures envoked for Millstone 3 piping supports.

Subsection NF of Section III, Division 1, of the ASME Boiler and Pressure Vessel Code contains requirements for construction of supports for Code Class 1, 2, and 3 piping systems. The construction of most of the piping supports for Millstone 3 were ordered prior to the first publication of Subsection NF in Section III of the ASME Code. The effective ASME Code for the piping and supports for Millstone 3 is the 1971 Edition with the Summer 1973 Addenda.

At that time, the rules governing construction of piping supports included ANSI B31.7-1967, paragraphs 120 and 121 (for Class 2 and 3 supports). Neither of the ANSI documents provide specific guidance regarding loading combinations for upset, emergency, or faulted operating conditions. Both ANSI documents reference standards of the American Institute of Steel Construction for guidance in the design of supplementary steel for supporting structures, without providing specific rules for boundaries. Integral attachments associated with the supports, welded to the piping pressure boundary, are addressed in ASME Section III.

The piping supports for Millstone 3 are designed in accordance with the AISC Manual of Steel Construction except that the design limits of ASME Section III, Appendix F are used for the faulted condition. Other elements of the construction of these supports meet or exceed the requirements of the referenced ANSI and AISC Codes applicable to piping supports.

The Millstone 3 jurisdictional boundaries between piping, supports, and building structure are similar to NF boundaries. Integral attachments to piping meet the applicable requirements for the piping to which they are attached. Material wholly or partially embedded in concrete and material whose function is to support the building are considered building structure. Load carrying members between the piping or integral attachments and the building structure are considered piping supports.

Materials and allowable stresses for piping supports are selected from those permitted by NF, including Section III, and Cases N-71-11 and N-224-1. Although material quality assurance activities do not necessarily meet the requirements of NF-2610, the requirements of 10CFR50, Appendix B and the ASTM material specifications have been met. Materials have been furnished with identification and Certificates of Compliance, and are currently being procured with Certified Material Test Reports. Welding filler material meets the requirements of Section III. NB-2400 and NB-4400. Material identification is controlled by physical segregation to assure identification to the point of installation.

Welding of piping supports meets the requirements of ASME Section IX, including welding procedure specifications and welding procedure and performance qualifications. Welder identification is traceable to a drawing, and not to individual welds.

Nondestructive examination includes visual examination of all welds. The surface and volumetric examinations of Subsection NF are not necessarily peformed. Visual examiners are qualified to NRC Reg. Guide 1.58 and ANSI N45.2.6. Some are also qualified to ASNT-SNT-TC-1A and/or AWS D1.1.

The only significant difference between the NF requirements and the construction program requirements is the examination criteria for Class 1 and/or primary member welds and the qualification of the examiners. However, the measures described herein are believed to be sufficiently in excess of the ANSI and AISC requirements referenced by the applicable Edition and Addenda of Section III to provide adequate assurance of the integrity of the piping supports.

d.) The Staff requested additional information regarding the buckling criteria utilized for both SWEC and W scopes.

NSSS Scope

Plate and shell type supports for Class 2 and 3 auxiliary equipment are evaluated for buckling and instability through selective use of the criteria of Appendi› ʼʼVII, Subarticle XVII-2200 and Subsection NC, Subparagraph NC-3133.6 o ction III of the ASME Code.

Subparagraph NC-3133.6 gives methods for calculating the maximum allowable compressive stress in cylindrical shells subjected to axial loadings that produce longitudinal compressive stresses in the shell.

Subarticle XVII-2200 gives requirements for structural steel members including allowable compressive loads based on slenderness ratios and interaction equations for combined stresses.

Use of the above requirements, in addition to those of Subsection NF, in the design of plate and shell type supports for Westinghouse supplied auxiliary equipment, ensures the dimensional stability of the support throughout the range of applied loadings.

BOP Scope

SWEC design utilized AISC buckling criteria as outlined in Table Q210.36-4. No increase in Fa (allowable stress) is allowed for either upset or faulted conditions.

Buckling does not typically govern pipe support member stress due to the fact that Millstone 3 supports are usually fabricated from short, heavy sections.

Additional Response (6/84)

The Staff requested the following information concerning pipe supports:

a.) Details of weld design.

b.) Comparison of AWS-D1.1 weld requirements versus Millstone Unit No. 3 weld requirements.

c.) Further justification of the Appendix F member stress allowable and exclusion of secondary type loads for the faulted load combination based upon a sample of actual pipe support designs.

a.) The weld design for Millstone Unit No. 3 essentially follows standard industry practice of determining required weld size based on either a calculation of the maximum unit force applied to the connection or the AISC minimum weld size, whichever is greater. The calculated weld size is based on an allowable shear stress S_s calculated on the effective throat of the weld regardless of direction of applied load.

S_s = 21,000 psi for Normal and Upset
S_s = 25,900 psi for Faulted

The Normal and Upset condition agrees with the AISC code normal allowables while the Faulted condition allows a modest increase in allowable stress, which is well within the AISC code allowable for occasional loadings (1/3 increase). It should be noted that the AISC minimum weld size based on material thickness typically governs the design for most joint configurations.

b.) A comparison of the welding requirements of AWS-D1.1 versus the Millstone Unit No. 3 requirements for pipe supports is contained in Table 210.36-4. The Millstone Unit No. 3 weld procedures for pipe supports invokes the requirements of ANSI B31.1 with additional requirements taken appropriately from AWS-D1.1. Other requirements were developed in cases where clarification of detail was necessary beyond that provided in either code. It is concluded from the comparison that the Millstone Unit No. 3 program meets the intent of the AWS-D1.1 code.

c.) As further justification for the use of the Appendix F member stress allowable and exclusion of secondary type loads from the Faulted condition, a representative sample of non-NF pipe supports was reviewed (see Table 210.36-5 for details). The sample consisted of 122 pipe supports taken from 8 typical plant systems.

For those pipe supports sampled, the load combination for the Faulted condition was revised to include the secondary type loads (T&R'&A' from Table 210.36-3) and compared to the lower allowable stress limit of $0.95S_y$ as suggested by the Staff. In all cases the maximum member stress was below the stress allowable, verifying the initial assumption that this question is not of practical concern since the Normal and Upset load combination tends to govern design.

For the equipment supports the load combination includes all secondary type loads for support design, therefore the sample was limited to piping supports.

TABLE Q210.36-1

LOAD CONDITIONS FOR LINEAR TYPE PIPING SUPPORTS
(Except for Containment Spray Systems)[1][2]

Plant Operating Condition	Load Conditions[3]	Allowable[4] Tensile Stress
Normal/Upset	D + T + R	0.6 S_y
	D + E + H + T + R + A + W	0.8 S_y
Faulted[5]	D + E' + H + A' + W Delete	1.2 S_y or 0.7 S_u[6]

NOTES:

1. See Table Q210.36-2 for allowable tensile stress values for containment spray system pipe supports

2. Containment spray system is comprised of the following:

   - recirculation (containment) spray piping
   - quench spray piping
   - portions of SIL/SIH piping

3. See Table Q210.36-3 for identification of loadings.

4. Buckling check is performed using the provisons of AISC Code, 7th Edition. (See Table Q210.36-4 for list of AISC Code equations used.)

5. For ANSI B31.1 piping, faulted conditions noted above do not apply; and under normal/upset condition, unless otherwise specified in applicable support summaries, loads due to seismic conditions are not considered. When seismic load becomes applicable, the allowable of 0.8 S is used as stated above.

6. The faulted allowables are based upon the guidance provided in Appendix XVII of ASME III, 1974 Edition.

TABLE Q210.36-2

LOAD CONDITIONS FOR LINEAR TYPE PIPING SUPPORTS
FOR CONTAINMENT SPRAY SYSTEMS[1][2]

Plant Operating Condition	Load Conditions[3]	Allowable[4] Tensile Stress
Normal/Upset	D + T + R	0.6 S_y
	D + T + R + E + A + H + W	0.8 S_y
Faulted[5]	D + E' + H + W	0.8 S_y
	T + R' + A'	0.8 S_y

NOTES:

Refer to notes on Table Q210.36-1.

TABLE Q210.36-3

LOADING APPLICABLE TO PIPE SUPPORT DESIGNS
(See Tables Q210.36-1 and Q210.36-2)

D - Sustained mechanical loads, including deadweight of piping, components, contents, and insulation

T - Loads due to thermal expansion of the system in response to average fluid temperature

R - Loads induced in the piping due to the thermal growth of equipment and/or structures to which the piping is connected as a result of plant normal or upset plant conditions.

R' - Loads induced in the piping due to the thermal and pressure growth of equipment and/or structures to which the piping is connected as a result of plant faulted conditions.

E - Inertia effects of the OBE.

E' - Inertia effects of the SSE.

A - Loads induced in the piping due to response of the connected equipment and/or civil structures to the OBE (commonly referred to as OBE anchor movements).

A' - Loads induced in the piping due to response of the connected equipment and/or civil structures to the SSE (commonly referred to as SSE movements).

H - Loads resulting from occasional loads other than seismic. Examples of these loads would be: water hammer, steam hammer, opening and closing of safety relief valves, etc.

Y - Effects of components striking pipe (pipe whip) or effects of blowdown of an adjacent system (jet impingement loads), as defined for the emergency plant condition.

W - Loads imposed by wind. (Wind load is not considered to occur concurrently with earthquake loads.)

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
WELD TERMINATION Welds shall be terminated at the ends of a Joint in a Manner that will ensure sound Welds.	Not addressed	COMPLY W31.1 Specifies that Welds shall be terminated at the ends in a manner that will ensure sound Welds.	
ASSEMBLY FIT UP AWS D1.1 has requirements for the assembly and fit up of Weld Joints.	Partially addressed	COMPLY W31.1 provides specific requirements for Alignment and Fit-Up, exceeding AWS requirements.	
Welder Qualifications AWS D1.1 has Specific Requirements for the Qualification of Welders.	Comply ANSI B31.1 Requires Qualfication in Accordance with ASME IX.ASME IX Requirements are more stringent than AWS. For Example, ASME IX requires more positions to be tested for plate Welding than AWS. Note: AWS accepts ASME IX Qualified Welders.		

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
LAYER THICKNESS		DO NOT COMPLY	
The maximum weld layer thicknesses are as follows: 1/4" for root passes of groove weld. 1/8" for subsequent layers in flat position. 3/16" for subsequent layers in all other positions.	Not addressed	Recommended layer thickness - 1/16"-3/16". No layer shall exceed 1/2" thickness.	
WELD Profiles		COMPLY	
AWS D1.1 provides illustrations of acceptable weld profiles.	B31.1 provides certain information concerning weld profiles.	W31.1 specifies and illustrates weld profile requirements.	
UNDERCUT		DO NOT COMPLY	
AWS D1.1 specifies .01" transverse to load path 1/32" parallel to load path.	B31.1 specifies max undercut of 1/32"	Max undercut = 1/32"	

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
BASE METALS	COMPLY	COMPLY	
AWS permits certain materials to be welded without Qualification (Pre-Qualified). If a material is not Pre-Qualified it must be uniquely qualified.	ANSI B31.1 requires qualification to ASME IX. Per ASME IX, all materials (P-No's) must be qualified.	Comply by reference to ANSI B31.1.	
WELDING PROCESS	COMPLY	COMPLY	
AWS permits the following prequalified processes: SMAW, SAW, GMAW (except short circuiting) and FCAW. Any other processes must be uniquely qualified.	ANSI B31.3 requires qualification to ASME IX. Per ASME IX, each process is qualified for each material (P-No.)	Comply by reference to ANSI B31.1.	
WELD JOINT DETAILS			PARTIALLY COMPLY
AWS joint designs are prequalified with specific tolerances i.e. root opening, groove angle, land.	Not addressed. ASME IX non-essential variable.	No specific requirements for groove angle and land.	Basic weld joints specified in spec. 627 are the same as those specified in AWS D1.1. Some tolerances in groove angle, root opening, and land vary from those allowed by AWS.

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
Retests of Welders AWS D1.1 has specific Requirements for allowing/requiring Retests.	COMPLY ASME IX Requirements are the same as AWS.		
Period of Effectiveness for Welder Qualifications Welder is Qualified indefinately unless the welder does not use the welding process for a period of six months, or if his ability is in question.	Comply ASME IX time periods are more stringent.		
Butt Weld Reinforcements AWS Specifies a specific Weld Reinforcement based on Material Thickness not to exceed 1/8".	Do Not Comply B31.1 Specifies Weld Reinforcement based on Material thickness & temp.		

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
WELD REPAIR		COMPLY	
Specifies that defective portions of the weld metal shall be removed and repaired.	B31.1 specifies that unacceptable defects shall be removed and repaired.	W31.1 provides specific requirements for rework and repair more detailed than required by AWS D1.1	
PREHEAT	COMPLY FOR MATERIAL THICKNESS 2 1/2" AND LESS		
For Materials Typically used in Pipe Supports, AWS D1.1 Specifies the following Minimum Preheat Requirements:			
Thickness t — Preheat $t < 3/4"$ — 32°F $3/4" < t \leq 1\frac{1}{2}"$ — 70°F $1\frac{1}{2}" < t \leq 2\frac{1}{2}"$ — 150°F $2\frac{1}{2}" < t$ — 225°F	Thickness t — Preheat $t \leq 3/4"$ — 50°F $t \geq 3/4"$ — 175°F $t > 1\frac{1}{2}"$ — 200°F		
ARC STRIKES		COMPLY	
Cracks resulting from Arc Strikes shall be removed.	Not addressed	Cracks are removed all Arc Strikes on Cat I Components are removed.	

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
FILLER METAL AWS D1.1 specifies prequalified filler metal classifications for use with specific materials. Filler metals not listed as prequalified must be separately qualified.	COMPLY ANSI B31.1 does not designate filler materials as prequalified. All filler materials are qualified for use by F number (SFA designation) and A number (weld metal chemical analysis)		
PREPARATION OF BASE METAL AWS specifies requirements for the preparation, cutting, and cleaning of base metal.	Partially addressed	COMPLY W31.1 provides detailed instructions for cleaning and cutting of base metal exceeding AWS requirements.	
ELECTRODE SIZE (SMAW) AWS D1.1 specifies the maximum size electrode that may be used, depending on pass and position.	Not addressed	COMPLY All electrode size specified in W31.1 are below the maximum sizes allowed by AWS D1.1.	

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
FILLET WELD SIZE		COMPLY	
AWS specifies specific minimum fillet weld size requirements.	Not addressed	Specifies AWS D1.1 fillet weld size requirements.	
Single pass min weld size requirement AWS requires that min weld size be obtained by single pass for certain fillet welds	Not addressed	Do not comply	
POST WELD HEAT TREATMENT		COMPLY	
AWS D1.1 does not require post weld heat treatment unless it is specifically required by the specification.	ANSI B31.1 does not address non-pressure to non-pressure welds in its post weld heat treatment requirements.	SWEC's welding technique sheet W31.1-01 of welding procedure W31.1, does not require post weld heat treatment of pipe support (Non-pressure to non-pressure) welds.	
CLEANING	Not addressed	COMPLY	
AWS D1.1 requires that slag be removed from all welds.		Welding procedure W31.1 requires the removal of slag from welds.	

Table Q210.36-4

DESCRIPTION OF AWS-D1.1 ATTRIBUTE	COMPLIANCE BY ANSI B31.1	COMPLIANCE BY WELDING PROCEDURE W31.1	COMPLIANCE BY MILLSTONE III PIPE SUPPORT WELDING DESIGN GUIDE AND/OR SPECIFICATION 2280.000-627
Groove Weld Backing		COMPLY	
Backing shall be continuous for the full length of the Weld.	Not addressed	Backing is used on the full length of the Joint.	
Electrode Storage Requirements		Comply	
AWS D1.1 Requires that Filler Metal be Protected, and Stored so that its characteristics or welding properties are not affected.	Not addressed	SWEC Electrode Control Spec. 2199.170-700, which is referenced in W31.1, includes specific requirements for the storage and control of Weld Filler Metal.	
Welding Symbols			Comply
AWS D1.1 requires welding symbols to be in accordance with AWS A2.4.	Not addressed	Not addressed	Use AWS A2.4

TABLE 210.36-5

System Name	Stress Package (AX No.)	No. of Supports Reviewed on AX	No. that Pass (i.e. $S \leq .95 S_y$)
Feedwater	1701	10	All
Residual Heat	7101	30	All
Component Cooling	7202	9	All
Quench Spray	7926	13	All
H.P. Safety Inj.	7003	3	All
Recirculation Spray	7920	21	All
H.P. Safety Inj.	7927	21	All
H.P. Safety Inj.	10700	3	All
Service Water	1910	12	All

Note: The above sample included (6) Class 1 supports installed on the High Pressure Safety Injection System.

NRC Letter: December 5, 1983

Question No. Q210.37 (Section 3.9.3)

The staff's review of your component support design finds that additional information is required regarding the design basis used for bolts.

(a) Describe the allowable stress limits used in equipment anchorage, component supports, and flanged connections.

(b) Provide a discussion of the design methods used for expansion anchor bolts used in component supports.

Response:

BOP Scope

a. All bolting within the ASME III, NF jurisdictional boundaries, whether for equipment anchorage, support, or flange connection, is in accordance with ASME III, Appendix XVII and Code Case 1644. Bolt stresses are maintained below yield strength for all load combinations.

   Bolts for flange connections are designed in accordance with ASME III.

   All other bolts are per AISC (7th Edition) specifications.

b. Basic allowable values of shear and tension, including rules for consideration of interaction, are used based on manufacturers' test data and SWEC analysis.

   Performance specifications and testing assure a minimum safety factor of 4 against anchor failure.

The criteria for determining design load on anchor bolts consider base plate flexibility effects where applicable.

The maximum bolt hole diameter allowed for surface mounted base plates utilizing expansion type anchor bolts or poured-in-place inserts is the nominal bolt diameter plus one eighth of an inch.

NSSS Scope

Westinghouse has no responsibility for bolting used for equipment anchorage. The only bolting for tanks and heat exchanger supports is on the regenerative heat exchanger. These bolts, as are any support bolts for the NF designed pump supports (charging and safety injection pumps; see response to Question 210.36), meet the requirements of ASME Code Case 1644. Any bolting on other pump supports are to pressure boundary limits, as are valve body-to-bonnet bolts. Flanged connections for Westinghouse supplied equipment are to the requirements of Appendix XI of the ASME Code.

Additional Response (6/84)

The Staff questioned whether bolting material within the NSSS vendor scope is designed below yield strength and whether washers are utilized for anchor bolts.

NSSS Scope:

Bolt stresses for component support bolting provided by Westinghouse are maintained below yield strength for all loading combinations.

BOP Scope:

Flat washers are utilized for all expansion type anchor bolts and poured-in-place inserts for surface mounted base plate connections.